THE

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AND OF THE

INSTITUTIONS IN UNION.

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115TH SESSION.] FRIDAY, NOVEMBER 27, 1868. [No. 836. VOL. XVII.

Announcements by the Council.

ORDINARY MEETINGS.

Wednesday Evenings at eight o'clock :—

DECEMBER 2.—"Further Notes on the Productive Industries of Natal." By Dr. MANN, Superintendent of Education and Special Commissioner for the Colony.

DECEMBER 9.—"On the Drying Properties of various kinds of House Paint." By CHAS. TOMLINSON, Esq., F.R.S., F.C.S.

DECEMBER 16.—"On Artificial Freezing." By Dr. B. H. PAUL.

DECEMBER 23.—"Description of the Electric Organ." By HENRY BRYCESON, Esq.

CANTOR LECTURES.

The first Course of Cantor Lectures for the ensuing Session will be "On the Aniline or Coal Tar Colours," by W. H. PERKIN, Esq., F.R.S., and will consist of three Lectures, to be delivered on Monday evenings, as follows :—

LECTURE I.—MONDAY, DECEMBER 7TH.

Coal Tar, Benzol, Nitrobenzol, Aniline, and Aniline Purple or Mauve.

Coal-tar: its formation and constitution—Aniline a constituent of coal-tar—History of aniline—Discovery of aniline purple—Benzol: its properties, and separation from coal-tar—Nitrobenzol—Manufacture of nitrobenzol and aniline—Preparation of aniline purple, or mauve.

LECTURE II.—MONDAY, DECEMBER 14TH.

Mauve, Magenta, and some of their Derivatives.

Chemical nature of mauve—Runge's blue—Magenta: its discovery and manufacture—Phosphine—Bleu de Lyon—Bleu de Paris—Violet Imperial—Hofmann's violets—Britannia violets.

LECTURE III.—MONDAY, DECEMBER 21ST.

Various Aniline, Phenol, and Naphthalin Colours—Application of the Coal Tar Colours to the Arts.

Aldehyd green—Iodine green—Perkin's green—Aniline pink—Black, browns, &c.—Phenol—Picric and isopurpuric acids—Aurine, coralline, and azuline—Naphthalin yellow—Chloroxynaphthalic acid, &c.—Application of the coal-tar colours to the arts of dyeing and printing—Paper staining and colouring—Lithographic and other printing.—Conclusion.

Each lecture will begin at eight o'clock. These Lectures are open to Members, each of whom has the privilege of introducing two friends to each Lecture. Tickets for this purpose will be forwarded with next week's *Journal*.

Other courses are being arranged, particulars of which will be announced.

INSTITUTIONS.

The following Institution has been received into Union since the last announcement :—

Weston-super-Mare, Albert Night School and Industrial Institution.

SUBSCRIPTIONS.

The Michaelmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

FIRST ORDINARY MEETING.

Monday, November 23rd, 1868; Lord HENRY GORDON LENNOX, M.P., Chairman of the Council, in the chair.

The following candidates were proposed for election as members of the Society :—

Arkwright, John H., Hampton-court, Leominster.
Ashby, John, Staines, Middlesex.
Aubert, William, 96, Strand, W.C.
Baily, Farmer, Hall-place, Tunbridge.
Botfield, W. B. Garnett, Windham Club, St. James's-square, S.W., and Decker Hill, Shiffnal.
Briscoe, John Ivatt, Fox-hills, near Chertsey.
Burr, Daniel Higford Davall, Aldermaston-court, Reading.
Clarke, Henry, 6, Regent's-park-villas, N.W.
Coleman, Alfred, 13, St. Mary-at-hill, E.C.
Courthorpe, George C., Whiligh, Hurst-green, Sussex.
Davidson, Elias A., 29, Clarendon-gardens, Maida-hill, W.
Davis, William, 208, Euston-road, N.W.
Day, John B., Savoy Steam Press, 3, Savoy-street, Strand, W.C.
Denison, Colonel Sir William, K.C.B., F.R.S., Observatory, East Sheen.
Drummond, George James, 11, Wilton-crescent, S.W.
Dunmore, Edward, 81, Malden-road, N.W.
Ellis, Benjamin Trapp, 17, London-road, Croydon.
Erle, Rt. Hon. Sir William, Bramshott-grange, Liphook, Hants, and 12, Princes-gardens, W.

Fernie, Kirwin J., Chaise-lodge, Hendon, and Union Club, S.W.
Fielder, C. H., 30, Moorgate-street, E.C.
Frost, Meadows, St. John's-house, Chester.
Gibson, William, Percy-villas, Maple-road, Penge.
Harrison, Charles, J.P., Stourport, Worcestershire.
Hollis, Alfred Henry, 14, Highbury-place, N.
Hopkinson, William Lander, M.D., St. Martin's, Stamford.
Horner, Rev. John S. H., Mells Rectory, Frome.
Kearns, H. W., 4, Granville-terrace, Jeffries-road, Clapham, S.W.
King-Harman, Hon. Laurence Harman, New Castle, Ballymahon, Ireland.
Jesse, John Fairfax, Llanbedr Hall, Ruthin, N. Wales.
Johnston, Thomas, 12, Camden-place, Bath.
Mast, Christian, Belgrave College, Pimlico, S.W.
Murdoch, George B., 14, Walbrook, E.C.
Nevile, Ralph Henry Christopher, 20, Jesus-lane, Cambridge.
Oakes, Thomas Haden, Riddings, Alfreton.
Pearce, Charles Thomas, M.D., 28 Maddox-street, W.
Perkin, W. H., Seymour-villa, Sudbury, N.W.
Peter, John Thomas Henry, Chyverton, near Truro.
Rait, George, 238 Kingsland-road, N.E.
Reeve, William, 40, Cambridge-terrace, W.
Rodd, Francis, Trebartha-hall, Launceston, Cornwall.
Rowley, Rev. W. W., M.A., Coombe-lodge, Weston-super-Mare.
Tayler, Henry Joseph, Collegiate School, Glastonbury.
Taylor, James, J.P., Culverlands, near Reading.
Thomas, W., Cwmaman Collieries, Aberdare
Simms, William Hawes, 21, Thurloe-place, S.W.
Stephens, John, Leytonstone, Essex.
Wade, Thomas, Stonehouse, Plymouth.
Weston, Rev. Henry Austin, Long Preston, Leeds.
Windle, Hattam, 5, Princes-street, E.C.
Wheatley, John Hewitt, Abbey-view, Sligo, Ireland.
Wood, F. C., 483, Oxford-street, W.C.
Woodd, Basil George, Hillfield, Hampstead, N.W.

The Chairman delivered the following

ADDRESS.

Ladies and Gentlemen,—Conscious of my own deficiences, I regret very much that I should appear before you as Chairman of the Council of this important Society. I can assure you that the honour which I thus bear was of no seeking on my part, and it was not until I had been assured that my services would be acceptable to the Council, and might be of advantage to the Society, that I agreed to undertake a post for which I feel that there are many better fitted. My time is much occupied, not simply by my duties as Secretary to the Admiralty—though it is not for me to say how long I may continue to fill that office—but also by my parliamentary duties, which, I am thankful to think, I shall continue to discharge for some time to come. Having so many occupations which may trench very largely on my time, I did feel very doubtful whether I was the proper person to occupy the chair of your Council; but the earnest desire expressed by His Royal Highness the Prince of Wales, our President—whom I consulted upon the subject, and who takes a deep interest in the welfare of the Society—that I should accede to the wish of the Council, decided me to accept the office, and to do my best to discharge its duties satisfactorily. I have, however, on this the first occasion of appearing before you in my present capacity, a double appeal to make to your forbearance—in the first place, on account of my official duties; and, secondly, because I have so recently emerged from a very hard-fought battle that I have not had even time to write my address, as is usual on these occasions, and must trust to my notes and your forbearance. For several weeks past I have been engaged in the contest I allude to from ten o'clock in the morning until six in the evening, in the streets, with the electors, and again from eight until a late hour, in addressing populous meetings; and, therefore, as it has been physically impossible for me to write my address, I must trust to your kindness to fill up any shortcomings you may discover.

My first duty this evening, as that of my predecessors on every occasion at an inaugural meeting, is a melancholy one, that of referring to those whom, during the last year, the Society has lost. The first and greatest name which meets me, is that of the Very Rev. the Dean of St. Paul's. Dean Milman was a scholar and a man of letters, his works extending over a very long period of his life. If I mistake not, one of his works, "The Fall of Jerusalem," was published more than forty years ago. His greatest work was his "History of Latin Christianity;" and one of his latest efforts was in 1862, when, although then far advanced in years, he addressed the annual meeting of the Association for the Promotion of Social Science, on the subject of education. Still more recently, however, he wrote the memoir of Lord Macaulay, which forms the preface to the popular edition of that distinguished man's history, and this biographical sketch, brief though it be, is, I believe, well worthy of his name. Dean Milman's connection with this Society arose from his co-operating with us many years ago in a movement for erecting a monument to the memory of Caxton, in the vicinity of Westminster Abbey, the Dean being at that time Rector of St. Margaret's. Ever since that time he took a deep interest in the operations of the Society, particularly those in the art department, but, from his advancing age, he was unable to take a prominent part in our proceedings. I cannot conclude these remarks more appropriately than in the words of the *Times*—"With Dean Milman—scholar, poet, historian, and divine in one—has passed away one of the last links which joined the scholarship of the 18th century with that of the present."

The next gentleman whose death we have to deplore is one whom I myself cannot allude to without considerable feeling, and I think there is no one who is in the habit of attending our meetings but must feel deeply the loss of Mr.

Harry Chester. He was mainly known to the public in connection with this Society from his efforts to affiliate with the Society of Arts the various literary societies and Mechanics' Institutions throughout the kingdom—a movement which proved thoroughly successful, and out of which grew the Society's system of examinations, the arrangements for which, as at present conducted, were the work of Mr. Chester himself. The great success of this system is sufficiently evinced by the fact that, while, in 1856, only 52 candidates presented themselves for examination, in the past year the number approached 2,000. Mr. Chester was also mainly instrumental in bringing about the Exhibition of Educational Appliances, which was held, in 1854, at St. Martin's Hall, and to his more recent exertions was in great measure due the establishment of the Food Committee, which has obtained and disseminated so much useful information. Mr. Chester and myself were educated at the same school—Westminster—and, I need hardly say, were on terms of the greatest cordiality. He was most constant in his attendance at our meetings, was possessed of the most genial and kindly temperament, and his every act was marked by the most entire absence of self-seeking. I cannot help thinking, gentlemen, that amongst those assembled here this evening, and especially amongst my colleagues at the Council board, there must be many who, on this opening night of another session, feel that their eye involuntarily wanders in search of a familiar face, and who cannot but be conscious that both the Society and themselves have sustained a heavy loss, when they miss the genial, kindly countenance of our lamented and beloved colleague, Harry Chester.

The only other distinguished man whose death I have to mention was not a member of our Society, but, as during the last few years we have made such great efforts in the way of musical education, it is impossible to omit a passing tribute to the memory of the great Rossini, who was laid in his grave only the day before yesterday. His works you all know, but it is rather a remarkable circumstance, which may have been forgotten by many present, that his greatest work, which is now become almost a household word, *Il Barbiere di Siviglia*, narrowly escaped utter condemnation the first night it was produced before a critical audience. His *Semiramide* you all know, and also how his favourite pupil, Alboni, performed the part of "Arsace," to the delight of a London audience. The Italian government offered to place the remains of the great master in the Italian Westminster Abbey, at Florence, as one of the greatest of her sons, but his relations preferred that where the tree fell there it should lie, and with a funeral service performed by all the great musical celebrities of the day—Alboni, Gardoni, Patti, Nilsson—Rossini was laid in the grave to the music of strains he had himself composed, the *Stabat Mater*, *Mose in Egitto*, and other great works which have made his name immortal.

Gentlemen, I think my province this evening is to give you something in the nature of a Queen's speech, only I hope that it will not be followed by a vote of want of confidence. It is my duty to sketch for you in outline the operations of the Society, to run over in retrospect what has been done, and, as far as I can, to suggest what we may do in furtherance of the cause which we all have at heart. First, I may allude to the Artistic Copyright Bill, drawn up by the Council, which it is intended to again introduce during the coming Session. You are all aware that it was last year introduced by Lord Westbury, but owing to circumstances, which I need not further allude to, it did not pass into law. I believe there is no one belonging to this Society who does not entirely approve of the objects of that bill, which is to supplement the Act of 1862, also the work of this Society, and by consolidating and amending the laws of artistic copyright generally, to bring this branch of the law into one consistent whole, worthy of the nation, and more in harmony with the laws which regulate this subject in foreign countries. It must also be borne in mind that it is not ourselves only who are concerned in this matter, but also various foreign states, at present thirteen in number, with whom we have conventions for international copyright, and who feel deeply the present defective state of our artistic copyright law.

The next matter which I have to bring before your notice is our system of giving prizes to competitors in Art Workmanship. To me, this is one of the most interesting of the Society's operations. I always attend the exhibitions, and my principal regret, is that they are not more widely known outside the circle of our members. This year the conditions of the prizes have been somewhat altered, and I think with advantage. Hitherto the system has been to require copies only of choice models of ancient art, but this year the competitors are to be allowed, so to speak, to run alone, and are to have more scope for the display of their own talent or genius. I think this is a step in the right direction, and that it was time we left the groove in which we had been running, although it is not for me to say whether, after a time, it may not be advisable to return to the study of the *chefs-d'œuvre* of the old masters. In painting, for example, a copyist, however successful he may be in the reproduction of a work by an old master, is but a copyist still; and so with the workmen whom, year by year, we have invited to compete at our exhibitions; they

have reproduced as nearly as they could the models we gave them, but nothing more. Now, gentlemen, we have issued new regulations and conditions, under which, if there is any creative genius, and doubtless there will be amongst them, it will be able to show itself, and we shall admire it even more than mere mechanical dexterity in producing beautiful effects. In our great International Exhibitions one cannot help admiring the magnificent specimens of Art-workmanship which are exhibited by leading English and foreign firms; but I, for one, feel a much deeper interest in these exhibitions of ours, because we are there brought face to face, so to speak, with the very men who have produced the work which is exciting our admiration. I cannot say that I approve of all the applications of artistic workmanship for which prizes are offered. For instance, I think the ladies present will agree with me that pianoforte keys will not be much improved for practical musical purposes by being elaborately ornamented, but that is a minor consideration. The main principle is, that these men having been educated for years in the study of objects of art, are now expected to show the results of the education which they have received.

The artisans' visit to Paris I will not do more than allude to. The able paper read by Mr. Hawes (my predecessor in office) last session, when I had the honour of presiding, was so exhaustive of the subject, that it would be impertinent on my part to attempt to add anything thereto, except to say that Mr. Coningsby, one of the reporters on the Paris Exhibition, has recently returned from a tour of inspection in the United States, where he was sent by the Society, and his report will shortly be published. I may also refer to the "Artisans' Reports on the Paris Exhibition," for the purpose of remarking that, while the various writers differed in many things, they all agreed as to the great disadvantage under which English workmen labour in the want of anything like technical education; and, also, as to the great advantage which French workmen possess in being able to walk about the streets of Paris, meeting at every turn objects of great beauty and elegance, and thus becoming insensibly educated in the principles of art, a result which certainly would never follow the most lengthened perambulation of the streets of London.

On the subject of Technical Education I feel that I must again appeal to your forbearance. I have read a good deal of what is to be said on this question, and have formed my own opinions, but doubtless I am speaking in the presence of many gentlemen so much more practically acquainted with these matters than I am, that, if politeness permitted, I fear they might get up and tell me I was talking nonsense. However, gentlemen, this subject is of such importance, that it would be unbecoming in me not to give it some consideration. A most important and influential conference was held here in the course of last session, and the conclusions which were arrived at by the Committee then appointed, are, I think, beyond the region of controversy. At first they met with some difficulty, owing to the largeness of the subject, but it appears to me the great point they arrived at was this, that scientific principles should form the groundwork of all technical education; that is to say, as I understand it, that it is of no use to cram a child or young man hitherto uneducated with scientific facts, without teaching him the principles upon which those facts depend. This is what I take to be the meaning of the principle that science is to be the foundation of all education of this kind; and in this view I appear to be borne out by the remarks of Mr. Ayrton, on the occasion when the report of the sub-committee was presented. He says that, after deliberately examining the subject, he is strongly of opinion that the system of cramming, as at present practised in some of our seminaries of learning, is fatal to anything like success in the various occupations in life which those who are the subjects of it are afterwards called upon to engage in. The great mental defect of ordinary English workmen is, that for want of early training, they seem totally unable to apply the knowledge or skill which they possess to any new circumstances outside of the groove in which they have been accustomed to run. And this reflection leads me to remark, without wishing in the slightest degree to throw cold water on technical education, that we must not expect too much from it all at once, and must look for its first and chief results in a higher class of foremen and directors of industry, rather than in an immediate and general advance in the intelligence and capabilities of our mechanics themselves. We all know that the great and increasing tendency of the present day is towards a more and more minute subdivision of the processes of manufacture, which, though exercising an advantageous economical influence upon all parties concerned, the public, the employers, and the workmen themselves, cannot fail, in some degree, to have an injurious effect upon the last intellectually, as their employment is rendered thereby more and more mechanical. As this tendency is one which we must expect to continue, we must, as I have said, direct our efforts to enabling men of perseverance and ability to raise themselves to the position of foremen, and to providing the highest possible means of education for the latter class, amongst whom, indeed, there is at present the greatest necessity for higher scientific training. At the same time, it must not be forgotten that every mechanic will, from the nature of

things, perform his work better from knowing something of the principles upon which he is acting.

Mr. Whitworth's munificent gift for the foundation of thirty scholarships, to be held by those who are more or less intimately connected with mechanical pursuits, is an example which others interested in the spread of technical knowledge, and endowed with the same liberal spirit, will, it is to be hoped, sooner or later emulate. The benefit to our arts, manufactures, and commerce cannot fail to be great, when the sciences connected with their successful prosecution are unfolded to the workmen engaged in them. While the general spread of the knowledge of what I may call the trade-sciences is, from the above causes, in a fair way of being realised, there is another aspect of technical education of which there is, perhaps, some risk of losing sight under present circumstances, but which I hold to be of the last importance, and the bearing of which upon that department in which I am a subordinate officer (although, from various circumstances, I have been called upon to be its principal representative during the last two years in the House of Commons), I am desirous of illustrating. I refer to the necessity that exists for a few members of a profession being specially trained in the highest branches of the sciences connected with their occupation. As I have said, in most professions and trades the multitude of workmen will necessarily acquire but a limited knowledge of science, even under the most perfect and extended system of public instruction. A complete mastery of even a single science will be acquired by but few only. But that a few should become complete masters of their special branches of science is in the highest degree desirable. It would be easy to illustrate the necessity for this by reference to almost any trade; but my official association with naval affairs during the last few years, inclines me to draw my present example from naval architecture. The repeated establishment of Government schools of naval architecture, during the present century evinces the great importance which successive administrations have attached to the training of scientific shipbuilders, and the cordial assistance which this Society has, on various occasions, rendered to the Institution of Naval Architects, from which has sprung the Royal School of Naval Architecture and Marine Engineering, attests the estimation in which you yourselves hold that branch of science. The progress of that school up to the present time has, on the whole, given great satisfaction to the Admiralty; it is already sending out into the shipbuilding profession a valuable body of young, well-trained men; and it is a pleasure to me to be permitted, on this occasion, to tell you how much the Admiralty appreciate the services thus rendered to naval architecture.

I now go on to say that this art of shipbuilding is one which well illustrates the great necessity that exists for imparting the highest scientific training to a few of the most promising youths engaged in it. It is true that even a limited mathematical training is valuable to the shipbuilder, and not only to the draughtsman of ships but to the working shipwright, for many of the rules and methods which both of them daily employ are immediate deductions from geometrical principles within the easy reach of all. I am assured by those who understand this subject most intimately—for, though during my connection with the Admiralty I have become pretty well acquainted with most of the processes of shipbuilding, I preferred going for such details to the best practical authority—that the laying-off and the trimming of the timbers of a wooden ship or the frames of an iron ship often bring into play very interesting examples of practical geometry, especially in building the ends of the ship; and that of two men equally skilled in the use of their tools, he who has made this science his study will certainly be the better workman. I am even assured that, up to a quite recent period, some of the minor operations of laying-off a ship upon the mould-loft floor were universally performed by an inexact method, where geometrical science, not at all of the highest order, would have pointed to an exact method which could have been performed more simply, so that, even in the minor branches of the shipbuilders' art, such scientific knowledge as may be generally diffused will find direct application and produce immediate advantage. But what I wish now to point out and to urge is, that naval architecture embraces problems which can only be discussed and solved by those who receive a degree of scientific training much higher than that which we can reasonably expect to be imparted in ordinary public schools where science is taught. The rolling of ships is one of those profound and difficult problems upon which I have more than once had to answer questions in the House of Commons. A glance into the "Transactions of the Institution of Naval Architects" will show that, in this very room, mathematicians of such eminence as Dr. Woolley, Canon Moseley, Mr. Froude, Professor Rankine, and others of like distinction, have brought their profoundest knowledge to bear upon this intricate subject; and great as has been the light which they have thrown upon it, it is not too much to say that it still awaits a final and perfect settlement. The dependence of the forms of ships upon the weight of the materials composing their hulls is another difficult question. It was opened up by the Chief Constructor of the Navy,

in a paper read at the Royal Society in March last, but still awaits further development. The protection of iron ships from fouling is another unsolved problem, requiring scientific knowledge of quite another, but not inferior, kind. All the resources of chemical science have hitherto failed to accomplish this important object, although I am happy to say that the experiments of Dr. Sim and of some other chemists have recently renewed our expectation of seeing it, ere long, achieved. Indeed, so favourably have these experiments been received, that the Admiralty have given, or are about to give, orders that one of the monster ships now being constructed at Chatham, the *Monarch*, a turret ship, shall be coated with this preparation of Dr. Sim's invention, which from all we learn seems more likely to succeed than anything which has yet been tried.

I have already alluded to Mr. Whitworth's munificent donation, but I must not leave this subject without expressing the gratitude of the Society for the confidence which that gentleman has shown in us, by placing at our disposal three exhibitions, intended to prepare the holders to compete for the scholarships in May next. These Exhibitions the Council have bestowed upon three artisans, who they trust will make the best possible use of the advantages thus given them. Their names are as follows :—Mr. Richd. J. Ellis, of the Devonport Mechanics' Institute, shipwright; Mr. Edmond F. Mondy, of Deptford, shipwright; and Mr. William Whitford, of the Belfast Academy Science School, flax dresser. I am sorry that Mr. Whitworth will not be here this evening to receive the Albert medal, although his absence relieves me of an onerous duty, for I feel that I should not have been able, in presenting that medal, to do full justice to the feelings of the Society.

You will not be surprised to learn from me that I am one of those who think that, in the education of our artisans, national museums play an important part, for it was on this subject that I raised my voice for almost the first time in the House of Commons. I hold that our national collections, which are of inestimable value, should be made as far as possible means of education, instruction, and amusement for the people. The principles upon which the South Kensington Museum was founded and is conducted render it eminently an educational institution, but I cannot say as much for the British Museum, and I never did say so, because it is not open at times when the mass of the people are able to visit it; and I do not think that anyone but a *savant*, who knows exactly where to look for what he wants, will ever be educated by the treasures which are there collected. Some time ago I was assailed with a good many hard words for venturing to suggest that the surplus art treasures of the country should be sent round and exhibited in the many museums which are now established in the midst of several of our hives of industry. For example, I said that the great collection of Turner drawings, which up to this time are buried in the cellars under the National Gallery, would be better placed in the museums at Manchester, Birmingham, and other great centres of industry, and I was told that I was talking nonsense, and speaking of what I did not in the least understand. That may be so, but still I think that it was in the main very sound sense, and I hope yet that I may live to see the day when these collections may be utilised for the instruction and education of our population.

I must congratulate the Society upon the establishment of the East London Museum, towards which we gave a donation of £100, and upon the character of the provisions which will govern it. You are doubtless aware that this most valuable institution will almost owe its existence to one of my colleagues in the Council, Mr. Antonio Brady, whose exertions in the matter are so well known. I understand that it will be opened in the evenings, that classes will be established in connection with it, and that every effort will be made to render it a truly educational institution for the benefit of the teeming population amongst whom it will soon be erected.

While upon the subject of museums, I cannot forbear alluding to an extract which I saw yesterday from the early history of the Society. In the year 1759, before there was such a thing in existence as a public Gallery of Art, the Society of Arts, wishing to encourage the study of Art, offered premiums for the best drawings, but, unfortunately, in those days they had no specimens which the pupils could copy; they therefore applied to my ancestor, the third Duke of Richmond, who had formed a collection of statues, busts, models, and pictures, which he allowed to be copied by the pupils of the Society. When I read that extract it gave me more confidence in undertaking my duties this evening, as I thought perhaps you might credit the brother of the present Duke of Richmond with some of the interest shown in the Society by the third Duke in 1759.

The next point to which I have to allude in connection with the operations of the Society, is the Food Committee. The supply of food for the people is a subject of the greatest importance, and is one in which the Society has done great things in the past, and we hope will do not less in the future. More than a hundred years ago, by offering premiums to the amount of more than £2,000, the Society of Arts effected a great improvement and increase in the supply of fish to the London market, breaking up the monopoly which then existed; and the same subject—that of the fish

supply—has been, during the past session, under the consideration of the Committee. They have received valuable information on the subject from Mr. Buckland, Mr. Lloyd and other gentlemen, particularly with reference to oyster culture and the preservation of salmon, and they recommend the appointment of a Piscicultural Committee to specially watch this subject. Valuable suggestions have been made as to certain modifications in the law upon the subject of fisheries, and I may remark, in reference to allowing time for the salmon to ascend the rivers for the purpose of spawning, that, although greatly extended in the present day, the principle is as old as the thirteenth century, for, on referring to an old book in my brother's library, I find that in the time of Alexander II. of Scotland there was a distinct law, prescribing that, "na man shall tak a fisch after evensong on Saturday until after sunrise on Monday."

With regard to the supply of meat, which is perhaps of more importance, the result of the committee's investigations seems, speaking generally, to be this — that they have not yet met with any process for preserving meat for importation from abroad which they can thoroughly recommend for adoption, but that their inquiries seem to point to the use of ice as the most probable solution of the problem, how to bring meat from Australia in good condition for the London market. It would certainly be rather a curious coincidence if the same means by which we succeeded in transporting salmon and other fish *ova* alive to the antipodes should also be successful in replenishing our own markets with dead meat. It is not improbable that this will be the case, but what seems still more extraordinary is, that the supply of food for the people of London seems likely to depend in the future, not so much upon the excellence of our own farming and stock breeding, as upon the cheapness with which artificial ice may be made. I understand that a paper is shortly to be read here on this subject by Dr. B. H. Paul, which will no doubt be very interesting. The Food Committee have also considered the question of the supply of milk, and in accordance with their recommendations the Council now offer prizes for the best form of can for conveying milk by railway, and also for the best form of railway van for the transport of meat. The Committee also suggest, with regard to poultry shows, that which I wonder has not long ago recommended itself to the intelligence of those who manage such things, that prizes should be given not only for live poultry of choice breeds, but also for dead poultry, shown side by side with the former, plucked and ready for the table.

I have now, I think, run briefly over the operations of the Society for the past year, but, in turning to the future, the field of view over which one is called to glance, as extended by the great improvements that are making in arts and sciences, is now so vast as to be absolutely bewildering. I suppose those present are aware that there are serious projects for bridging or tunneling the channel, and connecting England and France by a roadway either over the water or under it. In these days science is so omnipotent that it does not seem to matter which plan is determined upon, for if you must get across the water either way is open to you.

We all know that one of the greatest characteristics of the present state of knowledge is, that whatever was formerly considered refuse or waste, is now turned to good account; a striking instance of this is to be found in aniline dyes, made from coal-tar, which was formerly of little or no value. These dyes have, as I am informed, made a perfect revolution in the art of dyeing and calico-printing, and I am glad to hear that a course of Cantor Lectures upon them is about to be given by Mr. Perkin, to whom we owe this most valuable discovery. In the face of all these wonderful improvements which are daily being made, I do not even despair of seeing the streets of London improved, and our monuments and public buildings made decent. I do not see why those monuments should not be made instructive to our artisans, and to French artisans when they come over, as those beautiful monuments and buildings in Paris were to the artisans whom this Society sent over to the Exhibition. But before we indulge in too sanguine expectations on this head, it behoves us to look around and see what is our present position. Everything seems to have been left to chance, and chance seems to have been upon the worst possible terms with good taste. Wherever there is an imposing site it is disfigured by unsightly edifices, whilst nearly all our buildings, possessing any pretensions to architectural merit, are carefully hidden from public observation. First, let us look at Trafalgar-square, designated, and rightly so, by the late Sir Robert Peel as "the finest site in Europe." Landseer's lions are certainly perfection, but when you have said that, I think the less you say of Trafalgar-square the better. The north side is occupied by the National Gallery, the exterior of which happily is doomed, while the interior is to be remodelled, towards which desirable end I hope my humble efforts have in some degree contributed. But until this takes place, what must be the feelings of any French artisan, coming over here to improve his taste, as he places himself between those two puny fountains and looks at the façade of the National Gallery.

Probably you would not suspect the Secretary to the Admiralty of having anything to do with the decoration of the metropolis, but it

did so happen that when that great General, Sir Colin Campbell (Lord Clyde), died, universally lamented, a large sum was subscribed for a statue to his memory, which was executed by Baron Marochetti. The next thing, of course, was to select the most suitable spot for the statue, and they not only had selected the site, but had proceeded so far as to prepare the basement, when, by my exertions, I had the plan altered for the sake of the credit of the metropolis. They were about to place the statue of this great general against the corner of the Admiralty-wall, out of sight of the Horse Guards, in fact, on nearly as inappropriate a spot as could have been chosen. If you want further examples, I would ask you to look at Portland-place, which, being one of the finest thoroughfares in London, is adorned at one end with an extinguisher-like steeple, and at the other by a statue of the Duke of Kent, so diminutive that I doubt not many persons are unaware of its existence. If we go to Hyde-park Corner, we find a heavy archway, disfigured by an equestrian statue, never intended for such an elevation, and on the other side of the road, a statue of Achilles, upon which public opinion has long ago passed its judgment. Many other instances might be given, but I think they are needless, and it is pleasing to be able to pay a tribute of admiration to the new Belgravia being built by Lord Westminster, much of the beauty of which we owe to the admirable taste and artistic feeling of Lord Grosvenor.

In the Thames Embankment there is a fine opportunity for the architectural improvement of the metropolis if it be taken advantage of; but the result will depend entirely upon what buildings are erected in its vicinity, and how the ground is laid out. I speak with the greatest possible diffidence, not having had an opportunity of consulting my colleagues at the Council Board on the subject; but, nevertheless, I say deliberately that I think it would be very advisable if this Society could call into existence, before that site is occupied, a Committee of gentlemen of taste and practical knowledge, who should send in a report to the Board of Works, saying that a Committee connected with the Society of Arts, which has done so much in this and cognate subjects, recommends certain principles for adoption. The Board of Works could take no exception to such a committee. We should assume no authority; but we, as a Society, should leave on record our opinions as to what was the best manner of occupying that which will certainly be a most magnificent site.

There is one thing which has made a deep impression upon me in connection with many of the movements of the present day. It strikes me, and has done for some time, that a great change has come over us since what I may call the period of Great Exhibitions. There has arisen, not only in London but all over the country, a spirit of rivalry among men who feel that they have something in them, and that they would like to have an opportunity of distinguishing themselves, and I will mention an instance which came under my own notice. In the rural county of Buckingham last year Sir Anthony Rothschild announced his intention to have an exhibition, which he intended to confine to his own and the neighbouring parish, but as soon as it was announced there were such a number of applications from persons who wished to send in their little contributions that he was obliged to extend the area, so as to embrace a circuit of twenty miles round. The result was that there were no less than 3,000 contributors, including even farm-servants amongst the number, and on the first day there were 5,000 visitors present. I believe that before the Great Exhibition of 1851, the creation of this Society, under the presidency of the late Prince Consort, such a thing would have been utterly impossible, and its great success says much for the progress of intelligence and healthy emulation amongst our industrial population.

The very title of our Society, the object of which is to advance Arts, Manufactures, and Commerce, suggests to the mind the causes which have operated to place England at the head of the civilised world. No one can dispute that she owes her eminent position to her commerce and manufactures, and, carrying on the idea one step further, it is indisputable that it is her machinery which has given her the command of the markets of the world. Other nations, however, within the last few years have made such rapid strides in the same direction as to have nearly overtaken us, and with the advantage, in many cases, of a cheaper labour market, are beginning to undersell us even at home, for it is a fact, known doubtless to many whom I am addressing, that a short time ago a contract for locomotive engines, advertised by an English railway company, was taken by a foreign house. When things are assuming such a serious aspect, it behoves us all, and especially the members of such a Society as I am addressing, to consider whether the same means which brought us so far may not be used to carry us still farther; in other words, whether further applications of mechanical, chemical, physical, and economic science to arts, manufactures, and commerce, will not again enable us to take and keep the lead we have so long been accustomed to. In electricity we have an agent whose powers have as yet been but sparingly applied, save in electro-metallurgy and the telegraph—two important fields, no doubt, but it may be questioned whether they exhaust its capabilities. A few years ago a very interesting paper on the application of electricity to the

Jacquard loom, by M. Bonelli, was read in this room by our esteemed secretary, Mr. Foster, but the idea does not seem to have been taken up by the manufacturing community. A more recent invention is the electric organ, which I am told is a great success, and I observe with satisfaction that a paper upon this subject will shortly be read here. These are remarkable instances of the application of science to industry, and many such we trust will, ere long, suggest themselves to scientific men; but the direction in which the greatest economical effects are to be looked for is probably that of replacing costly and tedious manual labour by means of machinery. The sewing-machine, printing machinery of all kinds, and steam hammers, planing machines, and self-acting engineering tools of all descriptions, are notable cases in point; and I believe that experiments are now in progress which lead to the hope that the puddling of iron by machinery is not so hopeless as it has long been deemed. There are still grave difficulties to be surmounted, but, as I have said before, in these days science is all but omnipotent, and a result which would effect a saving to this country of upwards of a million sterling per annum is certainly well worth striving after.

The water supply and lighting of towns, regulations for public conveyances, and the cheap postage of circulars—as to which a warfare has recently been going on with the post-office—are all matters to which I think the Society may profitably and properly devote its attention; but the point which I wished especially to remark upon was the greatly enlarged area over which our inquiries now extend. I hardly know whether the appliances of the Society are equal to all the calls which appear, day by day, to be pressing upon us in increasing numbers, but if they are not, I am sure more will be provided.

Whilst the range of the arts and sciences is continually increasing, I may also remark that the sphere for our commerce, and the facilities afforded to it, are no less swiftly extending. How rapidly is a network of railways being constructed over the whole of the civilised world. Indeed, whether as regards communication by water or land transit, the improvement in our means of progression is equally remarkable. The great chain of the Alps, which hitherto has been an insurmountable barrier to the interchange of commerce between France and Italy, is now, thanks to railways and tunnels, a barrier no longer. The obstacle which the Lake of Lucerne has always interposed to direct communication by rail is about to be removed, for, by means of steamers, the trains are to be transported bodily from shore to shore, and you know that the same principle of trains and steamers has been for a long time considered by some of our most eminent shipbuilders and engineers to be applicable to join the shores of France and England. Meanwhile, the great barrier to our water communication with the East—the Isthmus of Suez—is rapidly disappearing. I do not know whether you are all aware that the Admiralty have already sent small vessels from Alexandria to Suez by the minor canal; but such is the fact; and a recent number of *Engineering* gives the following interesting figures as to the state in which the works of the great canal are at present:—"The total quantity of excavation removed and to be removed on the line of the Suez Canal is nearly one hundred million cubic yards, being 74,112,130 cubic mètres, or 96,864,554 cubic yards. Of this vast quantity almost exactly two-thirds, or 64,447,545 cubic yards, had been removed on the 15th September last, and the work of removal was going on at the rate of more than two and a-half million yards a month." That is in one part of the world; and the same journal contains a statement that a plan has been set on foot in New York for constructing a ship canal across the Isthmus of Darien, that a company has been formed and the necessary funds guaranteed, and that the United States Government has sanctioned and adopted it. At the same time new railway extensions are continually going on all over the East. What facilities for commerce do all these changes foreshadow! I am a Conservative, and therefore may go slower than some people, but I confess that to my mind it does not seem improbable that even in our own lifetime we may hope to see, without being over sanguine, the time when we may circumnavigate the northern hemisphere in a ship, or travel from London to Pekin in a railway carriage.

In concluding my inaugural address at the opening of the 115th session of your Society—and there is something very venerable in that phrase—I must again ask your kind consideration of the circumstances under which I have been called upon to address you, and assure you of my earnest desire by every means in my power to promote the objects which you as well as myself have so earnestly at heart.

The Chairman then presented the Society's gold medal, with a prize of fifty guineas, to Mr. W. A. Gibbs for his essay on "The Harvesting of Corn in Wet Weather."

Mr. Gibbs thanked the Society for the honour which had been conferred upon him.*

The Albert medal, awarded to Mr. Joseph Whitworth, was, in the absence of that gentleman, handed to the Secretary to be forwarded.

The Prince Consort's prize of twenty-five guineas was given to Mr. Robert Creaser Kingston, gardener, of the classes at the Royal Polytechnic Institute, who had obtained the greatest number of first-class certificates at the Society's examinations in the present and the three previous years.

* See p. 27.

Mr. Benjamin Shaw then proposed a vote of thanks to the chairman for his kindness in presiding and for the interesting address which he had delivered. In so doing he desired to pay a tribute to the zeal of the noble lord in keeping his engagement when suffering manifestly from physical infirmity, consequent upon the exciting and laborious contest through which he had just passed.

Mr. S. Teulon, in seconding the motion, said they were much indebted to Lord Henry Lennox for bringing before them various interesting facts which had come under his notice as Secretary to the Admiralty. It was quite certain that Technical Education was the great question of the day, and the information they had received upon that point was most interesting and valuable.

The motion was put by Mr. Shaw, and carried by acclamation.

Second Ordinary Meeting.

Wednesday, November 25th, 1868; Seymour Teulon, Esq., Member of the Council, in the Chair.

The following candidates were proposed for election as Members of the Society:—

Huggins, Henry, Gordon-house, Kentish-town, N.W.
Rönn, Hermann S. Von, 21, Kensington-park-grdns, W.
Sadgrove, Archer W., Ellerslie, Eltham-road, Kent.

The Paper read was—

A GLANCE AT THE PAST AND PRESENT OF THE SOCIETY OF ARTS, WITH SOME SUGGESTIONS AS TO THE FUTURE.

By S. T. Davenport, Esq., Financial Officer of the Society.

Introduction.

Gentlemen,—I feel that it is due to you that I should state the reasons which have induced me to seek to occupy this place on the present occasion. Twenty-five Novembers have now passed since I first appeared in this room as an officer of the Society of Arts, and it may, therefore, seem not unnatural that one who has known the Society for a quarter of a century, and has spent the best, and possibly the brightest, years of his life in its service, should feel an earnest, and, perhaps he may say, an affectionate interest in its welfare, and should venture to come before you this evening, in order to pass in review some of its proceedings since he has been connected with it, and to compare its action during that time with the action taken by the founders of the Society one hundred and fifteen years ago. I propose, with your kind indulgence, to bring before you, in as few words as possible, a comparative view of the Society's work in early and in more recent years, and to compare the results of the action taken in each case; and, in conclusion, I shall venture to suggest what I consider might, with advantage, be the Society's course of action in future.

Before I do so, however, it will, perhaps, be convenient that I should endeavour to describe the position of the Society a little more than a quarter of a century since, and to that I will at once proceed.

On the 29th May, 1839, Mr. Arthur Aikin resigned the office of secretary, which office he had filled for twenty-two years; he was succeeded by Mr. W. A. Graham, on the 11th December, 1839; that gentleman continued in office till the 21st December, 1842, when he was succeeded by Mr. Francis Whishaw, who was elected secretary by the Society on the 19th April, 1843; that gentleman, in turn, resigned office in 1845, and was succeeded by Mr. John Scott Russell.

In 1840, the year following Mr. Aikin's resignation, an order of the Society was passed, by which certain offices were abolished, and it was determined that in case of a vacancy occurring in the office of secretary, it was not to be filled up, without the expediency of so doing being first considered. At the annual election in 1842 it was allowed to remain unfilled.

On the 21st April, 1843, His Royal Highness the Duke of Sussex died; he had been president of the Society from 1817. On the 24th February, 1844, Miss Cockings, who then acted as housekeeper, and of whom it is recorded that she assisted her father for several years previous to 1802, died. Her father was registrar for thirty years. Thus, in the short space of five years all who had assisted in carrying on the work of the Society were removed. And in November, 1844, on the first occasion of my being present at a meeting of the Society, the only remaining stock in the Society's possession was ordered to be sold out to pay some of its debts; and with its sale the Society of the past may be said to have ceased to exist.

First Period.—Before Incorporation.

I will now proceed to the consideration of the early history of the Society; and in order to a proper understanding of the importance of the object its founders had in view, the state of things in England at the time of its establishment should be kept in mind. The country had been for a long period consuming its forest trees in constructing its navy and mercantile marine. Coal was almost unknown as a fuel—agriculture was practised by rule of thumb, with but few mechanical appliances to aid it; the land was undrained, and vast tracts were covered with bog, or remained uncultivated swamps; the hills and mountains were unplanted;—the manufactures of the country were dependent for their supply of yarn upon the hand spinning of peasants and the poor of towns;—machinery had not been called in in aid of manual or brute force;—education was neglected;—art was discouraged;—and the poor, even in the city of London, were all—old and young, honest and dishonest—herded together, where they were received into workhouses at all. Food also was scarce;—bread dear and bad;—the fish supply a monopoly;—and many of the staple manufactures—which were then declining—dependent upon foreign countries for their supply of raw material.

Internal communication between one place and another was carried on partly by circuitous coasting voyages, partly by rivers, obstructed by shoals during the summer season, and swelled into formidable torrents by the winter rains, and partly by roads, so ill-constructed and in such a state of neglect that the cheapest and most expeditious way of transporting commodities along them was on the back of packhorses.

When the civil commotions and foreign wars, which for sixty years had agitated the whole British nation, were finally settled by the results of the insurrection of 1745, and the present Royal family, after an arduous struggle, was at length firmly established on the throne, the minds of men naturally began to turn themselves to those arts of peace which the uncertainty of public affairs, and the more exciting interest of political party, had consigned to a long neglect.

The attention of the country with respect to the Arts, the Manufactures, and all those things in which the public wealth of the community consists, was at that time considerably inferior to that of Holland, the Netherlands, France, and some of the Italian states. A large proportion of our manufactures were literally so, being made by hand; the prime movers of the common machinery which we possessed were the elements of water and wind, and the living strength of men and animals, except in a few places, where the steam-engine of Savery and Newcombe, a machine of rude and imperfect construction, and of little power, was employed in raising water. The smelting and conversion of ores of iron and of other metals were performed almost wholly by means of charcoal, by which not only was their cost enhanced, but the quantity produced was very limited, in consequence of the diminished extent and impoverish-

ment of our woods and forests. No manufactories of pottery but of the very coarsest kind existed. Vessels of wood, of pewter, and even of leather, formed the principal part of the household and table utensils of genteel and opulent families; our porcelain was imported from China and Japan, from Dresden and Paris, and was an article rather of luxury than of convenience. The principal part of our linen was from the looms of Germany and Holland, and of our silks from those of Italy and France. A few of the coarser articles of cotton, such as fustians, had begun to be manufactured in the neighbourhood of Manchester; but chintz, muslins, and all the other articles of finer fabric were brought hither from India. It is unnecessary to particularise objects of inferior importance, as the same general observations hold good with regard to them.

From a desire to alter this state of things our Society owes its foundation; and to William Shipley, a landscape painter, "who from a well-grounded persuasion of the extensive utility of the art of drawing, to this nation, erected the Academy in the Strand, opposite Exeter Change," is due the credit of having proposed it.

In 1753 William Shipley proposed, and in 1754 a meeting was held to consider the propriety of establishing the Society for the Encouragement of Arts, Manufactures, and Commerce. At that meeting, which took place at Rawthmell's coffee-house, William Shipley acting as secretary, it was the opinion of those present that drawing is absolutely necessary in many employments, trades, and manufactures, and that the encouragement thereof may prove of great utility to the public. It was resolved to bestow premiums on a certain number of boys and girls; and on the 29th of March, 1754, an advertisement was ordered to be issued. The first prizes were awarded in 1755, five gentlemen being named as a committee to judge the works sent in in competition. Of this committee, Mr. Henry Cheer, to whom I shall have to allude hereafter, was a member. Other premiums were advertised at the same time for the discovery of cobalt in England, the growth of madder, and the manufacture of buff leather. Among those who received prizes for drawings by boys and girls on the occasion of the first awards, was Richard Cosway, who afterwards became a Royal Academician and portrait painter of repute. The Society posseses an example of his work in the portrait of Dr. Templeman, who was secretary of the Society from 1760 to 1769.

On the 6th of February, 1755, William Shipley, as the proposer of the Society, was elected a perpetual member, and Mr. Baker was similarly elected, for the pains he had taken in drawing up the plan and promoting the welfare of the Society.

The Encouragement of Art was the first object sought by the Society; its proposer, William Shipley, sought encouragement for his pupils, and four or five of those candidates who first took prizes had been under his instruction, and were rewarded for drawings from his collection of prints, pictures, drawings, models, &c.

The premiums offered under the head of Polite Arts appear to have been ultimately grouped into 196 classes, and it was soon found necessary to refer to examples in the offer of premiums. This was difficult, owing to the fact that the nation did not possess any public museum, nor did the National Gallery then exist. The Society, therefore, under the circumstances, sought the support and assistance of the Duke of Richmond, who, between 1750 and 1756, had formed a gallery of statues, busts, and models, the examples in which were selected by John Wilton, sculptor to the King. In 1759, prizes were awarded to candidates under 21 years of age for drawings from the Duke of Richmond's collection. In March, 1759, premiums were also awarded to candidates under 20 years of age for drawings at the Academy in St. Martin's-lane. Thus we see private individuals and patrons of Art co-operating with the Society prior to the existence of the British Museum. It has appeared to me not improbable that the Society and those about it may have had some weight with the government in inducing it to purchase that collection for the nation. It is evident that from the foundation of the Society those in power were joined with the Society and the patrons of Art; for on the day on which the Duke of Richmond consented to allow his collection to be used by the Society, the Duke of Newcastle, the Right Hon. William Pitt, the Right Hon. Henry Bilson Legg, Lord George Sackville, the Earl of Thomond, and Viscount Fitzwilliam were elected members.

"Sir Hans Sloane, Bart. (who died in 1753), may not improperly be called the founder of the British Museum; for its being established by Parliament was only in consequence of his leaving by will his noble collection of natural history, his large library, and his numerous curiosities (which, it is said, cost him £50,000) to the use of the public, on condition that Parliament would pay £20,000 to his executors. Accordingly, Montague-house was purchased, with an extensive garden of nearly eight acres, by the British Parliament, for £10,500, as were also Sir Hans Sloane's curiosities, for £20,000, in the year 1753, and the money was raised by a guinea lottery the same year. And in 1756 the valuable legacy of Egyptian antiquities of the late Colonel Letheullier, and the antiquities of his nephew were joined to it; and in the year 1771, Sir William Hamilton's antiquities were purchased, with certain other additions, for £9,000. To this collection were added the Cottonian Library, the Harleian Manuscripts, collected by the Oxford family, and purchased by Parliament for £10,000. There was also a collection of books given, and £7,000 in cash left, by the late Major Edwardes; and as an addition to the Cottonian Library, Mrs. Maddox, relict of the late Mr. Maddox, Historiographer Royal, left by her will her husband's large and valuable collection of manuscripts, which had engaged his attention for many years, affording materials for a complete history of tenures, which is much wanted. His late Majesty, George II., in the year 1757, in consideration of its great utility, was graciously pleased to add thereto the royal libraries of books, about ten thousand, and manuscripts, to about eighteen hundred, all collected by the different kings of England." *

The British Museum was first opened to the public in 1759. It is certain that there were those about the Society who were connected with its progress and management, for on the 6th April, 1757, Mr. Nicholas Crisp presented the Society with a copy of the seal of the British Museum. The objects of the Museum, and the attention of those connected with its management, were also in accord with the objects of the Society, for in 1764 (at which date the Society was doing much to improve agriculture) I find that Dr. Watson, of the British Museum, sent a letter to the Society, which letter he had received from Mr. W. Brownrigg, in which the following paragraph occurs:—

"Whitehaven, February 4th, 1764.

"In my hurry in London I had not an opportunity of searching for some of the *spelt* which I brought from Germany, and which you were pleased to say you would sow in the garden of the British Museum among the many curious plants you cultivate there. I herewith send some of the grain."

When the collection was purchased and opened to the public it was arranged in 38 rooms, 14 of which were filled with objects of art of various kinds. I mention these facts to show that soon after the Society was instituted the nation acquired a gallery of art, in which students of art sought to pursue their studies. But, while the nation was acquiring its museum, the Society was occupied in considering a plan for establishing an academy of art. I have long felt that William Shipley, when he proposed the establishment of a society for the encouragement of Arts, Manufactures, and Commerce, meant thereby a society mainly for the encouragement of

* See "Museum Britannicum," by John and Andrew Van Rymsdyk, 1778.

Art; and this opinion appears to be borne out by the fact that on the 19th February, 1755, Mr. Henry Cheer, one of the adjudicators at the first art competition, delivered to the Society a communication, entitled "A Plan for an Academy of Sculpture and Painting," which was read over and a copy presented to the Society. This communication was accompanied with a draught copy of a proposed charter of incorporation, and on the 26th November, 1757, Dr. Madden, when writing to the secretary, says:—"Pray let me know when the charter is in any way of forwardness, for without that (as I formerly ventured to tell you) your Society is but a rope of sand."

Mr. Cheer's plan appears to have been finally disposed of in 1758, and one month afterwards the rules of the Society were published, at which time Mr. Box was acting as secretary at the Society's offices, opposite the Exchange-buildings, in the Strand; and in March, 1760, Dr. Templeman was elected to the office of principal secretary. The artists of London having applied, in February of the same year, for permission to hold an exhibition in the Society's rooms, the permission sought was granted, and exhibitions continued to be held there for several years. The origin of these exhibitions and their results are thus referred to in the first volume of the Society's Transactions.

"The reputation acquired by candidates in consequence of their performances remaining for some time under the inspection of the Society, before and after adjudication, occasioned the artists in general to apply for an exhibition of their works in the Society's great room, which request was accordingly complied with and repeated for several years. Hence arose the annual exhibition of the rival artists, who formed themselves into separate bodies. The emulation by which each body was excited helped greatly to promote the rapid improvement of the arts, and to attract the general attention of the public towards their performances, and hence the royal patronage and protection they have since had the honour of obtaining, and under which they so eminently and deservedly flourished, may in some measure be derived. The Society having been thus far fortunately successful in rearing the infant arts in this kingdom, to such maturity as qualified them for royal favour, next confined the award of their premiums to those who may intend to be professors of the arts, or such young persons of rank and eminence, who may probably become hereafter the patrons and patronesses of the fine arts. Encouragement has also been given to those branches of the polite arts which will more immediately tend to improve the manufactures and consequently promote the commerce of the country."

The Society took possession of the building it now occupies in 1774. Its site was proposed by Mr. C. W. Pinchback in 1759, and in 1777 Mr. James Barry, at that time a member of the Royal Academy, proposed to decorate the Society's great room with paintings "analogous to the views of the institution."

It is not my intention on this occasion to relate the history of Barry's pictures which surround this room, but as the Society, in 1864, added two pictures to the series, viz., that of Her Majesty the Queen and His Royal Highness the Prince Consort, I have thought it might be interesting to point out how entirely its act has been in accord with Barry's views.

I may state that Barry's pictures, as they now appear, are not in all respects as he originally painted them. Many additions were subsequently made by him. He added the naval pillar in the picture of Father Thames, and in that of the Society he placed on record his views as to what the method of arrangement should be in the construction of medals and coins; and by placing an urn in the opposite corner of the same picture, he endeavoured to point attention to some of the faults and want of taste which surrounded almost every manufactured article of utility.

The portrait of Barry himself, in the large picture, represents him in the character of Timanthes (an excellent painter, recorded by Pliny), sitting on the base of the statue of Hercules, holding in his hand the famous picture of the Cyclops and Satyrs. This portrait was intended by the artist as a record of his age, and to express his character and energy as an artist at the time the pictures were undertaken.

On October 1st, 1798, Barry, when writing to the Society, from 36, Castle-street, Oxford-market, upon some other matters, takes occasion to make the following remark, in reference to the pictures in the great room:—

"But not to wander from ye concerns of your great room, or rather (as your views extend to everything of high publick concern) not to wander from my work in your great room, I shall close this letter by observing that perhaps those pictures in your room may in some few places seem to want a varnish to unite and bring together ye parts more out; but on second thoughts, it may perhaps appear otherwise; it may be that ye publick eye is a good deal corrupted by ye glitter of coach pannels and Birmingham tea boards. This glitter would be horridly meretricious and out of its place in large works of a serious and generally unostentatious nature; and besides, ye pictures are yet fresh, and if any little matter of varnishing may be thought of use in certain parts, it will be better some time hence."

In a second letter to the Society, dated 31st March, 1801, I find the following paragraph:—

"With the publick reputation of these pictures I have every reason to be gratified and flattered, and there remains nothing further for me to wish than that the Society would have the goodness to favour their work on the cultivation of the human faculties, and me, with their protection and countenance in the circulation (when occasion offers) of those large and small prints, upon which so much labour and time have been expended, more especially as this protection and countenance of the Society might now help to support me under the heavy oppressions of the malignity and envy which have followed the reputation of that undertaking, beginning with the second week of the exhibition of the pictures, and going on, in one shape or other, with a steady continuance ever since. However, as this has been so notoriously apparent, I shall take no further notice of it, but proceed to an observation which is, I think, worthy to employ the attention and consideration of the Society, viz., that although individuals are short-lived and transitory, yet societies may be eternal, or at least of long duration. This being the case, it still remains to be considered by the Society that some arrangement ought necessarily to take place with respect to the pictures of the presidents, as the example already set in the two noble personages whose pictures are placed over the two chimneys of the great room (which cannot be followed any further), makes some other arrangement absolutely necessary. There being no other situations in that room, these two portraits, unconnected with everything else, stand like ominous obstructions to the further progression of the Society, besides being an unlooky (*sic*) interruption and breach of the continuity of the work round the room. By the removal of these two portraits to the committee, or to some other room, where the example can be followed by similar portraits of the most noble or other great personages who shall succeed each other in the presidency, that matter would be promptly disposed of. When the Society, many years since, placed these two portraits over the chimneys in their great room, no idea was then entertained of anything further than continuing the same arrangement, by placing portraits of their presidents near each other, on the same wall, according to their succession, in conformity with the general usage, as is seen in town halls and other places of general resort. But since that time, having (if I may use the expression) consecrated these walls of their great room to a more intellectual destination, and of a much more extensive publicity, which might comprehend whatever should have a tendency to the improvement of useful arts, and the consequent melioration of society,

and might at the same time serve as a mausoleum of those benefactors of mankind who have been the true ornaments of their several ages and countries, and whose exemplary memorial it is so much our interest to preserve. All these reasons taken together will surely induce the Society to adopt another arrangement by which these two portraits over the chimneys may be removed to some other place. The two noblemen whom they represent would be the first to advise it, could they be consulted on the occasion. One of these noblemen I had the honour of knowing sufficiently to affirm that his delicate sense of propriety, and his zeal for the Society, would exclude all doubt on this occasion, or otherwise my sincere veneration for his amiable memory would never suffer me to propose it; and, by all accounts, Lord Folkstone (whom I did not know) was a man of similar character to his relation, the late Lord Romney. Under the idea, then, that these two portraits will be removed, and as it is, of all things, my earnest wish to leave that work in the great room, in the most perfect state to which my abilities can attain, I am (if it should meet the wishes of the Society) ready to execute such designs for those spaces over the chimneys as may not only correspond with the ethical and patriotic views of the rest of the work that goes round the room, but which, from their important central situations, may become very principal, and, as it were, sources of vitality to the other parts. The space over that chimney between the two national subjects of the Thames and the Society may be filled up with matter the most pertinent, patriotic, and moral, which could not fail of being exceedingly popular, as it is, in a great measure, called for by the circumstances of the time, and most perfectly congenial with the views of the Society; and for the other space between the Orpheus and the Harvest Home, I have made a design, than which nothing can be more apposite and illustrative of one of the most classical and important matters respecting the manufactures of the ancient world, and which is, indeed, wanting in that place. These two pictures, in those central and important situations, would crown the work with all necessary propriety and interest, and would cost but little, as, I believe, the materials, canvass and all, would not exceed £10, and the meetings of the Society need not be interrupted.

"But, whether or not, the Society may choose to accede to this proposal of substituting these two co-operating designs in lieu of the two portraits over the chimnies of their great room; yet I must request leave to mention to them that as certain parts of the Olympian victor, the Elysium, and the other pictures which had been re-touched when I was last at work in the room could not then with prudence be varnished, and now stand much in need of it, it would oblige me very much to have permission for doing this justice to those parts during the summer recess of the Society, if Almighty God, my good and indulgent Patron, shall afford me health for it; if not, I request, and most earnestly entreat the Society that they will have the goodness never to permit anyone else to touch those pictures under the pretext of varnishing, or under whatever pretext whatever. In the midst of so much mistaken pursuit of art, either so slow and inconsequential, or so alien and uninteresting to the national reputation, and so utterly inadequate to its true dignity, and to what ought to have been expected; in such times it will be well to have at least the discretion of preserving unsullied for posterity whatever we may have of a contrary character."

Permission was at once given to Barry to carry out the plan proposed, but as the removal of the portraits of Lords Romney and Folkstone appears to have been subsequently opposed, another letter was written by Mr. Barry, under date 6th May, 1801, as follows:—

"It gave me great satisfaction on last Wednesday to find, by the almost unanimous vote of the Society for the removal of the two portraits from the spaces over the chimnies, that I was not mistaken in the high opinion I had conceived of their rectitude, good sense, and patriotism, which could so well distinguish between appearances and realities, between the arguments of mere barren, fruitless appearance of respect and veneration which were offered for continuing those portraits in their present situation; and those arguments of contrary character which, grounded upon utility and realities, were adduced for the prudent removal of those portraits to some other situation more consistent with the idea of the progression and continuance of the Society; they would be no longer individual and insulated, but, on the contrary, where the virtuous and amiable example of the personages represented in those portraits would stimulate and fructify, standing, as they would then do, at the head of a long list of those illustrious personages, their successors who were to follow them in their office and in their worthy example.

"But as this matter has been opposed at its outset by the president, his Grace the Duke of Norfolk, and at its termination by two of the vice-presidents, although this opposition seemed to have made no impression on the Society, and had no other effect at either time than the concern of differing in opinion with those worthy personages whom the Society esteemed so much; and as I have since been informed that several of the nobility are also disinclined to the removal of those portraits, and that by some strange fatality or mysterious proceedure (for which 'tis difficult to account) that this matter is (however absurdly) yet likely to be considered out of the Society as one of those pestilential political contests between different orders or ranks of the community, into which everything (for some time past) has been shamefully and diabolically converted; and as I have no wish to offend anybody, and should be, indeed, exceedingly sorry to be concerned in anything which could be in the least disagreeable to my Lords Romney and Radnor, for whom I have the most sincere respect and esteem; and as there is now hanging up in the Society's rooms a letter from his Grace the Duke of Norfolk, our worthy president, notifying his intention of moving for rescinding the resolution of the Society respecting the removal of those portraits, the publick and the Society will, I hope, excuse me if I should withdraw my intention of supplying anything for those spaces over the chimnies. To say the truth, I feel a little hurt, and cannot see the reasons or motives which might induce those or any other noblemen to offer any opposition to what I had proposed, and to what the Society had almost so unanimously adopted; and as I have no respect for insolvable mysteries when they are out of place, and employed in any other concerns than those of religion, this opposition is not edifying, tho' it be astonishing. Had the portraits been immovable, been painted on the wall, the place might then be well considered sacred, and I should hear with horror any proposal for blotting, for putting them out of existence, to make room for any performance, tho' painted by Apelles himself, particularly that of my good Lord Romney, for whom I feel a reverence and an affection almost filial, there is nothing of picture that could be brought into existence that could console me for the effacing any memorial of him, but the case was quite other ways; there was no necessity for putting anything out of existence by embracing the opportunity that happily offered of creating something new."

Thus the plan proposed by Barry was withdrawn, and it was left for the members of the Society, at a later date, to adopt the plan then suggested by him.

Barry died on the 26th February, 1805, in the 65th year of his age. His corpse was placed in the Society's great room, on the 7th March, with appropriate solemnity, and the following morning was conveyed to St. Paul's Cathedral, attended by several vice-presidents and many members, and deposited between the remains of Sir Christopher Wren and Sir Joshua Reynolds.

While speaking of James Barry and his works, I cannot resist a wish to mention that about the year

1820—just one year after the Society had rewarded Alois Senefelder for the invention and introduction of lithography—a lithographic circular, with a portrait of Redmond Barry, brother of the late James Barry, at its head, was issued by the Society, asking for subscriptions for the relief of the brother of the late James Barry, historical painter, and formerly Professor of Painting at the Royal Academy.

Thus the Society continued its grateful memory of Barry and his great works, and aided his brother in the hour of his distress and severe affliction.

The polite arts were also largely promoted by endeavours on the part of the Society to improve the materials employed by artists, by investigating processes lost or used in foreign countries, or such as aimed at the production of commercial art products by new or improved processes. Thus aquatint, mezzotint, wood and other engraving processes were sought to be improved; while the pigments—oils and varnishes used by the painter—were modified, or new agents introduced.

The arts of bronze casting and chasing, iron casting, artistic metal and other works, were also encouraged.

Taking casts or impressions of intaglios or cameos in paste or glass of various colours in imitation of the originals was carried to a high degree of perfection, and was looked upon as a means of preventing many of those monuments of the antique taste from being lost to the modern world. Of the production by one artist it is said:—"He has attained also to the art of using an opake dark glass for the ground and a white one for the relief, by which they are made to imitate very closely the antique cameos cut on laminated onyxes."

New arts were encouraged, as in the case of lithography. In 1795 Alois Senefelder, an actor of Munich, having discovered the art of lithography, first attempted to apply it to print music, but it was not till some years later, and after many failures with his printing presses, that he succeeded in working the process to his satisfaction. The works of Senefelder at length became known in this country through Mr. Rudolph Ackerman, who brought the discovery before the Society, and about the same period Mr. C. Hulmandel began working the process, and greatly improved the practical part of the art. The Society, in 1819, awarded its gold medal to Senefelder as the inventor of the process, and in acknowledgment of its receipt, Senefelder sent to the Society, through Mr. Ackerman, one of his lithographic presses. The Society, in the year 1819, also awarded its silver medal to Mr. Hulmandel, and published an account of his improved processes of lithography in its Transactions.

Another art, and one which gave a fashion to the public taste for many years, was also due to the Society. I refer to engraving on steel. It is said that Albert Durer etched on steel, and that there are four plates etched by this artist, impressions of which exist in the British Museum, which, in all books of art are recorded as having been executed in steel. Of these one has the date 1510 inscribed on it. Pieces of saw blades were the material upon which nearly all the first attempts to revive this art were made, but with little success. Mr. Raimbach attempted to introduce the practice of engraving on blocks of steel, but without any material success; and it was not till the Chairman of the Committee of Fine Arts of this Society, Mr. Charles Warren, who, in his youth, was much employed in engraving on metals for the use of calico printers and gunsmiths, turned his attention, at the suggestion of Mr. Gill, one of the Chairmen of the Committee of Mechanics of this Society, to the method employed by the artists of Birmingham in the manufacture of ornamental snuffers and other articles of cast steel, that the art was brought to perfection. The process employed at Birmingham was "to subject the steel, after having been rolled into sheets, to the process of decarbonisation, by means of which it is converted to a very pure, soft iron, being then made into the required instrument or other article. The ornamental work is engraved or impressed on the soft metallic surface, after which, by cementation with proper materials, it is again converted superficially into steel. Mr. Warren modified this process, and obtained thin plates of steel capable of being acted upon with acids, and cut with the graver without destroying the cutting edge of the tool, as was the case with the saw blades, the resulting plate yielding a greatly increased number of impressions." Here we see the practice of a comparatively unimportant art and trade brought to bear upon an art industry of a much higher order, and ultimately leading to the production of one of the largest and most successful fashions of the times—an art process, which by yielding ten or twelve times the number of impressions yielded by copper plates, enabled capital to be invested in the production of works of a high class, and gave rise to the publication of the "Annuals," by Ackerman and others, and the works of Heath, Finden, Lekeux, and their fellows.

This process of conversion and re-conversion was soon afterwards applied by Perkins in the production of steel rollers, by pressing the faces of soft steel rollers into the engraved surface of a hardened, engraved block, such rollers so obtained being in their turn hardened and employed in multiplying the original engraving for commercial purposes, as in the case of postage, receipt, and other stamps at the present day.

I must not, however, linger upon this branch of my subject, but proceed at once to another field of the Society's operations.

Agriculture.

The subject next in importance to art was agriculture. The promotion of agriculture was not embraced in the plan proposed by the founders of the Society. One of the first letters written by William Shipley, and dated 11th April, 1754, was in reply to a communication received from Mr. Charles Powell, in which he had suggested that agriculture is a proper article to be added to the Society's premiums; and Mr. Shipley says, in reply, "They think it a proper article, but it will require caution, otherwise those parts of the kingdom which have already made great improvements will obtain all the premiums."

The introduction to the first book of rules and orders, however, shows that it was at once included in the Society's system of action, for it is there stated, "When every country in Europe is attempting manufactures, and striving to gain a superiority in commerce, it must be the desire of every well-wisher of his country to excite a spirit of emulation, and encourage and reward ingenuity and industry. The readiest way perhaps of reforming habits of vice is to remove those of idleness—itself the greatest political vice.

"The profits due to invention and labour are sometimes remote, often uncertain, and, consequently, to the multitude insufficient.

"Therefore, to add a spur to industry, to promote agriculture, increase and improve manufactures, and extend trade, no method seems so well adapted as that of bestowing premiums or rewards which may excite men to undertake and accomplish useful designs. Rewards, skilfully appointed and impartially distributed, have at all times been thought to operate powerfully on the minds of men. The difficulty has rather consisted in the application than in the effect—rather in selecting the proper subjects of rewards than in finding persons who would endeavour to merit them.

"It is not sufficient merely to fix upon proper subjects; for unless labour be assisted by art—unless the knowledge of the learned be communicated to direct the hand of the industrious, the labourer may waste his time and strength in vain, and study degenerate into amusement."

It is impossible on this occasion to trace, step by step, the course pursued by the Society. I must, therefore, confine my statement to a few facts indicative of the importance of the Society's action in this field of opera-

tion. It at once set about attaining the following objects:—The reclamation of waste land, the planting of timber, the improvement of agricultural produce; and Robert Dossie, a member of the Society, in commenting upon this branch of the Society's work, says in 1768:—"The improvement of agriculture is ever a matter of consequence, as well to each particular country as to mankind in general. It is particularly important to a commercial nation—the support of trade depending on manufactures, manufactures on the rate of labour and wages, and labour and wages in a great degree on the price of the necessaries of life."

The introduction of grasses, herbs, and roots as food for cattle occupied much of the Society's attention. Mr. Peter Wyche, writing to the Society in reference to grasses, says:—"We have found the means of supporting our cattle for two-thirds of the year by a perennial fresh vegetating pabulum. . . . . Can it be imagined that such vast tracts of land as North Russia, Lapland, and all the countries north of Canada, Chinese Tartary, and all populous countries, have not some seeds, some grasses among them quite different from those of ours, and which, if transplanted here, in a less rigid and severe climate, might possibly answer. It ought to be the policy of all nations in the world to encourage the improvement of their lands to the highest degree they can.

"It is from the sanfoin, clover, lucern, and the turnip, natives of the southern countries, that Great Britain has been so greatly improved; and, if so, why may it not receive further improvement by the admission of the northern class, for such there must be.....The pleasure that arises in the naturalist's mind must be from the speculations he makes on what he investigates, and the greatest reward he can possibly propose to himself is to communicate his knowledge for the good of mankind; to conceal it is possessing a monopoly of the worst kind."

It may fairly be said that the pastures and root crops, as they at present exist in this country, resulted in a great degree from the Society's investigations. Turnips, carrots, and other root crops, as food for cattle, occupied much attention; and communications were carried on with many societies throughout Europe, with foreign countries, and America, with a view of finding substitutes for hay, and which would either resist more thoroughly the frosts and wet of our climate, or afford more abundant crops capable of being stored for winter consumption. Grass seeds were collected from all parts, and premiums were offered for the careful collection by hand of such as were known to grow freely in this country.

At the time of the offer of these prizes, grasses were sown indiscriminately—no care being taken to separate one sort from another, the sweepings of the hay loft were used as seed on the newly-sown meadow land, and the resulting crop was most unsatisfactory, but this state of things was soon altered to the great advantage of the grazier, farmer, and others requiring fodder for their cattle.

As a root-crop, the potato was an especial object of the Society's attention, notwithstanding the fact that the Royal Society had in 1662-3 appointed a committee to urge upon the fellows of that Society who possessed land to plant potatoes, and to persuade their friends to do the same, in order to alleviate the distress that would accompany a scarcity of food. To talk in the present day of the cultivation of the potato as an object deserving of the Society's attention and encouragement seems futile. We are too apt to consider that what we possess and obtain so readily our fathers and grandfathers necessarily obtained with equal facility, but such was undoubtedly not the case with many of the articles now in common use as food. A century ago, carrots, turnips, potatoes, rhubarb, and similar roots, were either unknown or uncultivated, and it is owing to the Society of Arts that we now possess many of them. The potato and the true rhubarb were both objects of its attention as root crops, one as food the other as medicine, and though but small quantities of the last mentioned are now produced in this country for the latter use, still all know how large an article of consumption that plant forms throughout the country in early spring. The Society's Gold Medal was especially given to Mr. W. Greenhill, in 1784, for his cultivation of 84 acres of potatoes for the table. The potato was however looked upon by the Society as likely to be a staple article of food for cattle, as one acre of land produced only 260 stone of hay, while of potatoes 1,400 stone could be obtained from the same area. It is not at all times easy to trace the origin of machines in common use, but while speaking of the potato I may remark that in order to their being used as food for cattle, it was necessary to wash off the earth from their surface; and in Vol. XXII. of the Society's Transactions it is recorded that Mr. J. C. Curwen received the thanks of the Society for a model of a machine for cleaning potatoes, which is also applicable for washing linen. I do not put this forward as the origin of our domestic washing machines, but merely say that the necessity for washing potatoes was possibly one of the steps which led to the production of those appliances which are now so extensively used, both in connection with our manufactories and in private families.

It is, moreover, recorded in Vol. IV. of the Transactions, that the poor of Suffolk, in 1780, at which date potatoes were sold at 9d. per bushel, generally rejected the use of them, and it is not because in this country we now know how to cultivate and use them, that we are at once to conclude that all Europe is in the same position. Such is not the case. I may here relate what occurred so recently as 1855, within the Society of Arts. During the Crimean war a gentleman, a Prussian, called and asked to see the secretary. He stated that he had come to this country to endeavour to get into communication with the government, for he had made a discovery which he wished to dispose of, and which if employed in connection with the feeding of the army would save the country many thousand pounds yearly. Upon inquiry as to the nature of the discovery, he informed Mr. Foster that he had found that potatoes when baked were an exceedingly wholesome and savoury food, and that it was a much less wasteful way of cooking them. I need not add that Mr. Foster did not send him to the government, but I may say that he had great difficulty in making him believe that baked potatoes were to be had at all the street corners in the metropolis.

Drill ploughs, drain ploughs, the drainage of land, root-slicers, chaff-cutters, scarifyers, reaping machines, threshing machines, and means of harvesting hay and corn in wet seasons, were all subjects of premiums; and in all these cases it may be said the premiums offered were awarded, and, to a great extent, effected the object the Society had in view in offering them. But it was not sufficient that the product sought should be obtained; it was necessary to preserve it from injury, due either to the ignorance of the farmer or grazier, or to the ravages of the vermin, which then overran the country; thus it was estimated, that of the whole of the wool produced by the sheep of the country at that time, at least one-eighth part was spoilt by the practice of marking the sheep with tar, a substance which not only injured the wool upon which it was used, but also all that came in contact with it, as it was found impossible to remove the tar marks from the wool by any amount of washing; thus a loss was inflicted upon the country in that article alone amounting to a sum that has been variously estimated at from £40,000 to £200,000 per annum. The Society therefore sought to modify and improve the method of marking sheep.

Another serious loss to the farmer resulted from the destruction of grain, either consumed or spoilt by rats. The Norway rat, described as larger in size than the ordinary rat, more voracious, and more difficult to be

destroyed, had recently got into and overrun the country. The damage which the public sustained by the loss of corn from rats only was computed at some hundred thousand pounds a-year. But this was not merely an agricultural question, for Viscount Folktone, who had been trying some experiments with a view to the destruction of Norway rats, when writing from Longford on the 30th August, 1755, says:—"I assure you we have the true sort, of the colour of wild rabbits, with several red hairs on their backs, and white upon their bellies. As to quantity, we have in two months destroyed an hundred and twelve in steel spring traps baited with raw meat, and we can learn of no other method to destroy them without shooting them, which we do sometimes. Though we have killed so many, the number that remains must be very large, as we continually hear them behind the wainscoat, and over our heads at top of the house. The cats kill a few of the rats, but they are rather afraid of the old ones."

Timber.

It is almost impossible for us, who live in an age of coal, iron, and petroleum, to realise the anxiety and necessity which formerly existed for preserving and cultivating timber. In order to do so, we must bear in mind how intimately it entered into every requirement of life.

A correspondent, signing himself "Pro Patria," under date May, 1760, says:—"The opinion of the ancients in regard to the importance of timber, was, that it ought to be one of the first objects of the attention of all Governments. To a commercial nation it is especially important in arts, manufactures, and commerce; house furniture, fuel, utensils, carriages, and all shipping from a yawl to a first-rate, with all minerals, which includes that universally necessary one of iron, and whatever articles of commerce which require building utensils and fuel, besides shelter for land and cattle; all these depend upon it. * * * Some means should and might be contrived and enforced to animate the nobility and gentry to increase the woods and forests of the country.

"It is said to be at least a custom, if not a law, in Franconia, that no farmer is permitted to marry until he bring proof of his having planted a fixed number of oak and walnut trees, these being esteemed essential to the commerce and good of the country. And Evelyn makes mention of an Italian nobleman who, at the birth of each child, planted 100,000 trees, which paid its fortune at marriage, without hurt or incumbrance to the family estate. Many Greek writers inform us of the solicitude in Egypt, Greece, and all ancient states, the most noted for wisdom, to propagate and preserve the wood, for or towards which their worship and sacred regard for groves were probably promoted, and many eminent Roman writers are at equal pains upon the same subject. Thus all ages and countries have put a high estimate upon this article. Let us emulate their virtue."

It was therefore proposed to promote the planting of timber trees as a means of providing for our navy, but also of converting the barren mountain and the swamp alike into productive areas, thereby rendering them a source of shelter in some cases to cattle, and in others conducing to the production of pasturage, thereby increasing our food supply, as well as our home comforts. The extent to which the Society was successful in promoting the planting of timber and improving agriculture is indicated by the following statement in the Society's Transactions, in reference to the estate of Mr. Thomas Johnes, of Hafod, in Cardiganshire—"The improvement of the farms and fertilising the waste grounds takes place every year. The number of trees planted on Hafod estate between October 1795 and April 1801, amounted to 2,065,000 of which 1,200,000 were larches; that besides the above trees, 55 acres of land have been sown with acorns or planted with oaks, and Mr. Johnes was still extending his plantations." And I find it subsequently stated that he had raised 922,000 oaks; and, again, "in addition to timber land, Mr. Johnes, of Hafod, improved the breed of cows, by importing above forty from Holland. He has refuted the erroneous notion that varieties of cheeses could not be produced on the same land. His dairy furnishes him with the kinds so nearly resembling Parmesan, Stilton, Gloucester, Lancashire, Cheshire, and so excellent in quality, as not to be distinguished in form or taste from those his are intended to imitate. He has cultivated upon an extensive scale wheat, barley, rye, potatoes, and yams, and his crops have been equal to those of the southern counties of England. When we consider his exertions, we reflect with pleasure on what may be done by individuals for the general service of mankind."

The production of the oak was an especial object of the Society's attention, and the planting of acorns was carried to a great extent, many gold medals having been awarded to noblemen and gentlemen for raising that timber, among whom were the Earl of Wilton, Lord Paget, the Marquis of Tichfield, J. Morse, Esq., J. C. Curwen, Esq., and others. The ash, for planting which the Bishop of Landaff received the gold medal, Scotch fir, larch, horse chestnut, and many quick growing trees for domestic use were also cultivated. John Hutton, Esq., of Marske, in the county of York, between 1st October, 1799, and 1st April, 1801, planted on fourteen acres of land the following number of trees:—Oak, 5,400; larch, 7,300; Scotch firs, 5,700; spruce firs, 4,500: beech, 5,200; sycamore, 3,500; elms, 4,500; ashes, 5,800; birches, 1,600; alders, 2,000; mountain ash, 2,000; silver fir, 800.

Fruit Trees.

Fruit trees, their culture and treatment, with a view to improving the fruit harvest of the country, and the subsequent utilisation of some of the products, occupied much attention, and there are many interesting records in the Transactions; but probably none will be of more general interest to members at the present time than the accounts which may be found in vols. xvii. and xx., relative to the planting and culture of the celebrated grape vine at Hampton-court, from which account you will find that in "1798 it occupied a house of 72 feet long by 18 feet over, making an area of 1,300 feet superficial of glass, under which there are more than 1,800 bunches of grapes, all from one stem. The vine was planted in 1770, and a new and larger house was built for it in 1802."

It was estimated in 1796 that the orchards of Great Britain covered an area of 300,000 acres, and the gold medal was awarded to Mr. T. S. D. Bucknall, by whose extension of observations on orcharding it was estimated the country had been benefited to the extent of £300,000 per annum.

Reclamation of Land.

Land was also reclaimed to a vast extent throughout the country, but this in most cases was the result of a combination of capital, enterprise, and skill, although many instances of individual exertion in this direction might be pointed out. In 1804 the Society awarded to William Pearce, of Turf-house, in the parish of Landewedwack, near Helston, in Cornwall, the silver medal and £15; and in reference to this award Lieutenant Thomas Humphries, R.N., says:—"I yesterday took a walk of about two miles from this station, to satisfy myself respecting a remarkable instance of persevering and indefatigable industry which I had heard of, and found as follows. Twelve acres of barren downs had been taken from the common, seven or eight of which were in a high state of cultivation, and the remainder in a very forward state of improvement. In order to vary, as needful, the different kinds of produce, this space was divided into eight different fields, which required seventeen fences; the greater part was made with stone, and put together in a masterly manner; but a great part of this industry is

hid, for most of the downs being swampy ground, and some very shallow, in order to remove the first inconvenience, the different fields were obliged to be intersected with various drains, which empty themselves into the ditches that have been obliged to be dug round the margin of each field; both for this purpose and in order to give greater height to the fences on each side of every bank, ditches are dug, and in the gateway bridges are made, able to support a loaded cart, that the water may freely run off. The land produced, in 1803, ten Cornish bushels of barley, nine trusses of hay, two hogsheads of oats, and ten bushels of wheat, besides pasture for cattle. This has been the work of eighteen years' time, by one indefatigable man, who began it in the fiftieth year of his age. I have to add that his dwelling-house and outbuildings, including the turf walls, of which they are composed, the laying of the rafters, and the thatching, are all executed by himself, though he was only bred to husbandry. His industry is surpassing, as, independent of his great labour in procuring manure from a distance, which has required his travelling 200 miles, he brings coals for different persons, of whom I am one. The distance from me is eleven miles. He has brought coals so far on my account eight times since last July, which adds 176 miles more. The ground he is improving is the property of Sir Christopher Hawkins; and, though labouring under a natural infirmity in the hand, which obliges him to conduct the plough with one hand only, yet he continues indefatigable in his exertions."

So recently as the year 1838, the Society published a full account of the result of Mr. Joseph Glynn's efforts in applying steam power to the drainage of fens, chiefly in Lincolnshire and Cambridgeshire, where, by twelve engines of the aggregate power of 580 horses, he removed the surface water of 90,000 acres; and, it is stated, "the time is probably not far distant when all the fen lands in the kingdom shall be enabled to exert their native exuberant fertility, and thus add another triumph to the many already gained on land and on sea by the matchless product of mechanical genius."

Nor did the Society's efforts cease when it had improved agriculture, induced the planting of timber, and the reclamation of waste lands. It sought to improve the condition of the agricultural labourer, and with this object encouraged bee keeping, and the construction of hives, as affording profitable occupation, at little cost, to the farm labourer and cottager, as well as increasing the supply of wax for the use of those more fortunately situated in towns and cities.

The importance of agricultural statistics occupied the attention of the Society as early as 1759. A correspondent proposed it as a means of "regulating the export, and preventing the poor of this country suffering the miserable calamities from the want of corn, which have been so great that the most obdurate heart must melt at the bare recital of woes too shocking to see."

Veterinary colleges, for the treatment of the diseases of cattle, were also suggested; and in the preface to Vol. VII. of the Transactions it is stated, "Schools have been established in different parts of Europe, wherein the disorders of sheep, cattle, and horses are particularly attended to; and perhaps few things would be of more public advantage than the ascertaining with precision the nature of the diseases to which animals, so useful to man, are liable, and thereby deducing a rational method of cure."

The best means of fattening fowls, ducks, and geese, as a substitute for butchers' meat—"the foundation of disorders"—was another subject attended to.

In reference to the machinery of agriculture we find the Society inviting the production of reaping and threshing machines; and at a later period it is stated the introduction of the latter has been the means of saving many crops of valuable corn in Great Britain, by affording quicker despatch to the separation of the corn from the wet sheaf in bad seasons.

It is stated, in the minutes of the Agricultural Committee, 26th December, 1764, that a machine for reaping corn, by Robert Ainslie, of Welnage, was worked last harvest.

The harvesting of hay, and, at a later date, corn, in unpropitious seasons, were subjects for which premiums were offered, as objects peculiarly interesting to mankind in general, and more particularly so to this kingdom:—

"The advantages that would arise to the public by the discovery of a method of making hay in wet seasons, and the benefit of such a discovery is universally allowed (see preface to Vol. X. of the Transactions), and, however difficult it may appear, yet in an age of improvement, such as the present, it seems remarkably strange that the means of gathering in the produce of the earth in unfavourable weather, however necessary and important it may be in this climate, has hardly been attended to. It is therefore hoped that the hint here given will stimulate ingenious persons to attempt the discovery of what, when known, would be of universal benefit to all countries subject to such variations of climate as we live in."

It is curious that this subject, which has just been so well treated in the able essay of Mr. Gibbs, for which the Society awarded its gold medal last session, had occupied its attention at so early a period.

Nor did the Society cease its action here; it attempted to induce the production of other crops, as a means of supplying raw materials to our manufacturers. The growth of madder was encouraged. It is thus referred to in the first report, read by Mr. Shipley to the Society:—"Madder, for the use of dyers, was formerly cultivated in England, but for many years past has been totally neglected here, and purchased abroad at the expense of £150,000 per annum. It is now again, by the encouragement of this Society, planted by some persons in this kingdom, and, by the most skilful judges, has been reported to be as good and as well cured as any foreign madder. And as thereby much advantage may accrue, both to the public and the planter, if due assistance be given, it is hoped that all who shall have occasion for madder will prefer that of their own country if they find it equally good; and by such encouragement great numbers of people will soon be induced to plant enough to supply your home consumption."

It was sought to increase the production in this country of hemp, as an indispensable material for sails or cordage both on ships of war and trading vessels, as it was absolutely requisite both for our defence and trade.

The culture of silk had been attempted in this country on many occasions, and in 1786 the Society was evidently anxious to promote the growth of the mulberry tree, and to encourage the production of silk here.

"The silkworm,* says the Hon. Daines Barrington, seems to have come originally from Asia, but not the most southern or even tropical climates of that part of the globe. The greatest quantity of Chinese silk is made in the neighbourhood of Nanquin. Both extreme heat and thunderstorms are said to be very prejudicial to this insect. It was first introduced into Sicily and Calabria in the 13th century, and into France by Henry IV., who began the trial in Languedoc, which answered so well that James I. made the same laudable attempt in England. This king therefore issued a proclamation, in the sixth year of his reign, for the encouragement of planting mulberries, which held forth the example of France, and was directed to be read at the quarter sessions. As the introduction of such new culture must necessarily require every sort of protection for a considerable number of years, it is not extraordinary that it should not have been established, on account of the turbulency in the latter part of James's reign, and the greater troubles in that of his successor, Charles the First, who did not entirely neglect the project, but, in 1628, appointed

* Vol. II., Transactions, p. 173.

Walter Lord Aston to be keeper of the garden, mulberry trees, and silkworms near St. James's. The proposal having, therefore, not at this time succeeded, by no means furnishes a conclusive proof against its practicability; but, on the contrary, it is evident, by the before said proclamation, that both the king and his privy council conceived that it might be carried into execution."

Chelsea, so famous for her pottery and other industries, was the spot selected for trying the experiment of silk production in England, in the reign of George I.; and that monarch having granted a patent for its encouragement, two thousand mulberry trees were there planted. Miss Henrietta Rhodes, of Carne Hall, Bridgnorth, and the Rev. Mr. Swaine, of Pucklechurch, near Bristol were actively pursuing experiments in this direction about 1785-6; while so recently as 1835, Mrs. Whitby, of Newlands, Lymington, Hampshire, imported from Turin 100 standard trees and 1,000 dwarf mulberry plants.

In drawing this section of my paper to a close, I must refer to a letter, dated 7th August, 1755, received from Mr. Charles Powell, (he having previously proposed to the Society the establishment of branch societies throughout the country), which says—"A branch Society of Arts has been established in Brecknockshire; it already consists of 52 members." . . . "Such a society formed in every county, I may venture to affirm, would make this, not excepting China, one of the most flourishing kingdoms in the world, as it would draw the attention of the nobility and gentry, now too much dissipated in idle and expensive diversions, such as cocking, horse-racing, and gaming, &c., to objects truly worthy of it, the encouraging and establishing manufactures, and the promoting improvements in husbandry, and consequently exciting an honest spirit of industry and laudable emulation among the lower class of our fellow creatures, and at the same time extirpating those banes of society, idleness, party rage, and narrow-mindedness, and, in lieu thereof, cultivate a true public spirit—a spirit of universal benevolence. Such a scheme well formed and carried steadily into execution, would not only improve our estates, but open our hearts and enlarge our understandings; in short, make us good Christians, good subjects and good citizens."

"If such an undertaking was once formed, and if each county was to transmit yearly an abstract of their principal transactions to the National Society, in Craig's-court, in order to be digested and published, it would create a great spirit of emulation, and might be the means of carrying the whole into greater perfection; and every obscure, uncivilised, and uncultivated corner in the kingdom, and many there are such, would soon feel the good effects of it."

"Mr. Addison justly observes 'that zeal for the public good is the characteristic of a man of honour and a gentleman, and must take place of pleasures, profits, and all other private gratifications, that whoever wants this motive is an open enemy or an inglorious neuter to mankind, in porportion to the mis-applied advantages with which nature and fortune have blessed him.'"

I may add that many of the county agricultural societies now existing grew out of the proposition here given; many of them, no doubt, have been modified, others died and were re-created, but the work begun by the Society in the field of agriculture is still bearing fruit and adding daily to the comforts and happiness of the people of this country. The Society's efforts in reference to agriculture were watched by all classes, and some years after the date of Mr. Powell's letter, I find a long and interesting communication printed in vol. xvii. of the "Transactions, in which it is stated that—"In 1798 the thanks of the Society were voted to Nathaniel Kent, Esq., for his communication on farms in the Great Park at Windsor, and he was desired to make the due acknowledgments of the Society to His Majesty for having been graciously pleased to permit so full an account of the improvements on the farm in the Great Park at Windsor to be sent to the Society, whereby so much benefit is likely to accrue to the public."

Mr. Kent's statement, in reference to the farms, is as follows:—

"In 1791 the Great Park at Windsor, about 4,000 acres, fell into His Majesty's possession. About 1,000 acres were separated from the rest at one extremity, and formed what is called the Norfolk Farm; about 400 acres more, at the other extremity, of a good loamy soil, were separated, and called the Flemish Farm; both being named from the nature of the husbandry meant to be adopted upon them. The rest, about 2,400 acres, remains still a plantation and park. The objects his Majesty had in view in adopting the farming system on so large a scale, I conceive, were chiefly to create labour for the industrious poor in the neighbourhood, and for trying experiments in agriculture to excite imitation where success might encourage it."

About the same date as the King's farms were established at Windsor, the Society offered, in 1799, their "gold medal to those persons of rank and opulence who shall contribute to the comfort of such the labouring poor by the erection of cottages for their dwellings, and allotting a quantity of land for their accommodation."

We will now proceed to look at what the Society did for the trade and commerce of the country.

Trade and Commerce.

The Society, at its formation, limited competition for its premiums to residents in England, the colonies, and British possessions. Its reason for so doing was that, both in Ireland and Scotland, societies were established with objects analogous to its own, and though for a time each Society worked within its own field, after a few years the Society's premiums were thrown open to the United Kingdom.

The importance of the colonies to England early invited attention, and Dr. Gardener, of South Carolina, in a letter addressed to the Society, under date 20th April, 1755, urged the introduction of machinery into the colonies. "The land is entirely tilled by the hoe, and the rice planted by the hands of slaves; but the worst comes last, for, after the rice is thrashed they beat it all in the hand in large wooden mortars, to so clear it from the husk, which is a very hard and severe operation, as each slave is tasked at seven mortars for one day, and each mortar contains three pecks of rice."

Sir Charles Whitworth, to whom Dr. Gardener's letter was sent by the secretary, remarks in reply:—"I entirely agree with him that many articles may be produced in our colonies beneficial to them as well as Great Britain, and dare say we may procure from their climate and situation what we have from China, Italy, and Spain—I mean as to wine, silk, and cochineal—which would enable us to trade with our own people to mutual advantage, and certain balance of coin with the rest of the world. Neither need we be so solicitous as to war or peace, nor so careful as to articles of commerce; and, from their distance, it may be a nursery for seamen as well as employment for our shipping. For my own part I shall not be wanting in the winter to set forth the proper matters your friend has mentioned, and dare say premiums will be readily given."

It is gratifying to be able to state that the first rice machinery was suggested and introduced into the Island of Ceylon by a vice-president of this Society, Thomas Hobbyn, Esq., for whom the late Mr. Henry Maudslay, of Lambeth, constructed a mill for the decortication of rice. The machine was introduced and used in the Island of Ceylon in 1815. His machinery for hulling rice was soon extensively adopted. Mr. Hobbyn, the same year, received the thanks of the Society for his communication respecting a hydro-mechanical press for extracting oil from cocoa nuts, and to that gentleman this country is indebted for the addition of that article to the list of commercial products brought into this country for daily consumption.

Attention was soon directed to the British possessions in America, and a proposal made by that truly great man, Benjamin Franklin, bearing date Philadelphia, 14th May, 1753, was among the earliest of the communications received. I feel sure that it will interest you. It is headed—

"A Proposal for Promoting Useful Knowledge among the British Plantations in America.

"The English are possessed of a long tract of continent, from Nova Scotia to Georgia, extending north and south through different climates, having different soils, producing different forest plants, mines, and minerals, and capable of different improvements, manufactures, &c.

"The first drudgery of settling new colonies, which confines the attention of peoples to mere necessaries, is now pretty well over, and there are many in every province in circumstances that set them at ease, and afford leisure to cultivate the finer arts, and improve the common stock of knowledge. To such of these who are men of speculation, many hints must from time to time arise, many observations occur which, if well examined, pursued, and improved, might produce discoveries to the advantage of some or all of the British plantations, or to the benefit of mankind in general."

The Society readily entertained the views advanced by Franklin, and, in 1755, elected him a corresponding member of the Society; and, in acknowledging the letter containing the announcement of that fact, he says:—

"But though you do not require your correspondents to bear any part of your expense, you will, I hope, permit me to throw my mite into your fund, and accept of twenty guineas I purpose to send you shortly, to be applied in premiums for some improvements in Britain, as a grateful, though small, return for your most kind and generous intention of encouraging improvements in America.

"I flatter myself, from that part of your plan, that those jealousies of her colonies which were formerly entertained by the mother country begin to subside. I once wrote a little paper, tending to show that such jealousies, with regard to manufactures, were ill founded. * * * Never be discouraged by any apprehension that arts are come to such perfection in England as to be incapable of further improvement. As yet, the quantity of human knowledge bears no proportion to the quantity of human ignorance.

"The improvements made within these 2,000 years, considerable as they are, would have been much more so if the ancients had possessed one or two arts now in common use. I mean those of copper plates and letter printing. Whatever is now exactly delineated and described by these can scarcely (from the multitude of copies) be lost to posterity. And the knowledge of small matters gives the hint, and is sometimes the occasion of great discoveries, perhaps ages after."

The Society entered into correspondence with residents in Pennsylvania, Georgia, South Carolina, Canada, &c., and offered large and numerous premiums for the introduction and culture of the vine, the mulberry tree, and culture of silk, the growth and preparation of hemp and flax, the make of potash, the importation of sturgeon, and many other matters. The government of the colonies in some instances took up the Society's suggestions and supported it in its works, and votes of thanks were passed to the Society for its endeavours to promote the interests of the colonies and the mother country. The value of the hemp imported into England in 1766 amounted to £1,300,000 per annum, in addition to the foreign manufactured linen, which, notwithstanding the heavy duty, amounted to 32,000,000 yards yearly. The price of the raw material in England had risen at the same date 50 per cent., owing to a combination on the part of merchants in Russia, Poland, Prussia, and Holland. It was hoped to destroy the efficiency of the English navy and cripple our trade by limiting our supply of so important an article. To meet this difficulty, it was sought to produce our necessary supplies in America. The Society voted many hundreds of pounds for its encouragement, and the Government passed a Bill granting bounties for its importation. These bounties extended over a period of 21 years, and were at the rate of £8 per ton for the first seven years, £6 per ton for the second seven, and £4 per ton for the last period. The seed of a large species of hemp was obtained from China, and reported upon by the Society, and the East India Company sent Mr. Sinclair out to India to establish the culture of it there; the cost of this experiment was between 10,000 and 20,000 rupees. Dr. Roxburgh also proposed many substitutes for hemp.

The Society also directed much attention to the encouragement and culture of spices in the British possessions. The cinnamon tree was introduced into Jamaica, the nutmeg plant into St. Vincent, the clove tree into Trinidad, the bread-fruit tree was introduced into the West Indies, and the culture of the mango tree into the island of Barbadoes.

In 1821 the Society directed attention to the wool-producing capabilities of New South Wales, at which date 40,000 persons had settled in that colony, and 16,000,000 lbs. of wool were imported yearly from Spain and Saxony. Nor was the trade of this country improved merely by encouraging production in our colonies and possessions abroad. The Society directed attention to such imports as were capable of discovery, manufacture, and culture at home. Thus cobalt was discovered in Cornwall, buff leather and its manufacture improved, copper and brass vessels were tinned, and hemp, flax, and madder were cultivated for the use of our manufacturers. Saw mills were erected, our fish supply improved, and the curing of fish for our own markets encouraged. Upon the fish trade the Society expended many thousands of pounds, and succeeded in establishing a regular supply to the London markets.

Manufactures.

In manufacturing machines and tools the Society induced great and repeated improvements. Among the earliest were spinning-wheels and machines for winding, doubling, and twisting linen, cotton, and worsted yarn, and also a very extraordinary improvement in the loom itself, the general intention in all these machines being to shorten labour, increase produce, and save expense.

"It is no improbable conjecture," says the editor of the Society's 'Transactions,' "that the great improvements in spinning which have taken place within twenty years in these kingdoms, particularly in the cotton works in Lancashire, Derbyshire, Nottinghamshire, &c., are to be assigned to the premiums offered and paid by this Society.

"In the year 1760 premiums were first offered for the best invention of a machine for spinning six threads of wool, cotton, flax, or silk at one time, and that will require but one person to work and attend it, and in 1764 some premiums were paid for attempts at obtaining that desirable object. At the time, therefore, of the first offering of rewards on this subject, there seems reason to believe the thought had not occurred to manufacturers in general; for from the best information hitherto obtained, it appears that about the year 1764 a poor man of the name of Hargreaves, employed in the cotton manufactory, near Blackburn, in Lancashire, first made one in that county, which spun eleven threads, and in the year 1770 he obtained a patent for the invention. The construction of this kind of machine, called a spinning jenny, has since been much improved, and is now at so high a degree of perfection that one woman is thereby enabled with ease to spin a hundred threads of cotton at a time; nor did the spirit and ingenuity of the manufacturers in this extensive branch stop here, for since that period those stupendous works, the cotton mills at Crumford, in Derbyshire, and several other places, have been erected, where, by the

motion of a large water-wheel, the cotton is carded, roved, and spun into threads infinitely more expeditiously and with greater truth than can possibly be done by hand, and better adapted to the general purposes of the manufacturers."

"Of how great advantages these contrivances have been to the trade at Manchester, and the country many miles round it, and, by laying the foundation of a very extended commerce, to the kingdom in general, is so well known, as to render a further detail unnecessary.

"The art of calico-printing was, for many years after the foundation of the Society, in an exceedingly imperfect and rude state, and the Society attempted to improve both the colours used and the mode of using them, as well as to obtain more perfect means of dyeing cotton of a permanent red colour.

"The mode of printing and dyeing in the East was fully detailed by Cœur Doux, M. Poivre and others, in a communication received from Mr. Alexander Anderson, of the Botanic Gardens, St. Vincent, and published in vols. xxi. and xxiii. of the "Transactions," where it is stated that the dyeing was better done at Madras. The printing of calicos was there effected by means of blocks, or types of burnt clay or porcelain.

"The greatest improvement in the loom, prior to the introduction of the French loom, by M. Jacquard, was the substitution of mechanical action for the drawboy, by Mr. Duff, in 1807 (rewarded by the Society), but this invention was brought to its greatest perfection about 1822-3, about the time when, owing to the continuance of peace, intercourse between France and England enabled the manufacturers of the two countries to become acquainted with the machinery and processes employed by each other. It was soon discovered that the French had been for some years in possession of a loom by M. Jacquard, which was almost as superior to the English drawboy as that was better than the living agent which it had superseded. The first person in England who took advantage of this discovery was Mr. Stephen Wilson, an eminent manufacturer of London, to whose disinterested enterprise and exertions the country is much indebted, from the circumstance that the greater height of the French loom, as compared with the English, required new and lofty buildings to be erected for its introduction.

"The requisite expense to make the experiment was, nevertheless, hazarded by Mr. Wilson, and the result, as regards the general benefit of the trade, fully justified his expectations; so complete, indeed, has been its success, that in a few years the old drawboy will probably be unknown.

"The objection to the height of the Jacquard loom was soon overcome by improvements introduced by Mr. Jennings, who reduced its height so as to admit of its being placed in the ordinary English work-rooms."

It is not generally known, but it nevertheless appears to be a fact, that the idea of printing fabrics by machinery originated with Dr. Charles Taylor, who was for sixteen years secretary of this Society. Dr. Taylor, in early life, was engaged in the business of calico printing, at a time when, by the concurrent application of chemical and mechanical knowledge to the manufacture of cotton goods, the first impulse was given which has since carried this branch of our national industry to its present almost incredible magnitude. So active was Dr. Taylor in the application of the discoveries of Berthollet, that he also was the first person who produced for sale in the Manchester market an entire piece of calico bleached by oxymuriatic acid.

The straw plait trade is another of the industries which the Society may be said to have created in this country for the benefit of the working classes. Mr. Corston taught the art in his school at Fincham, in Norfolk, and was rewarded by the Society. Similar action was induced at Luton, and a knowledge of the art soon spread to other towns; those who may desire to read the history and progress of the straw plait trade will find it ably given in a paper read before the Society, by Mr. Tansley, in 1860.*

On May 20, 1800, a complete and valuable communication was forwarded by Mr. John Taylor, of Leipzig, to his father, Dr. Charles Taylor, the secretary of the Society, and by him communicated to the Society, on the culture of the beet plant, the application of its leaves as food for cattle, of its root for making sugar, of its syrup as yielding molasses and ardent spirit, and of its residue for other useful purposes. The communication was accompanied with samples.

I need hardly remind you how important a manufacture this has since become on the Continent, or that last year the subject was again brought before the Society, and discussed in this room with a view to promoting the establishment of a similar manufacture in this country.

Chickoree, now so largely used in this country, was introduced from Germany, as a substitute for coffee, in 1800. For the knowledge of its uses there, and the methods employed in preparing its roots, we are indebted to the same gentleman.†

Whale, seal, and fish oils were sought to be obtained in larger quantities, for home consumption, and many rewards were given, but the oil obtained was for a long time so fœtid, that a reward of £100 was offered for a means of edulcerating fish oil.

With reference to the award of this prize, Mr. Robert Dossie corresponded, for some length of time, through friends; and it was not till after the award of £100 for the edulceration of fish oils had been made that the Society became aware who was the inventor of the process. The process consisted in mixing powdered chalk with the oil, then adding water, and afterwards throwing in a small quantity of salt or pearl ash, after which more water was added, which carried the chalk with it to the bottom of the vessel, leaving the oil bright and sweet.

At a later date, on 13th March, 1810, Mr. B. Cook supplied the Society with specimens of asphaltum and substitutes for oil of turpentine, made from pit coal, also varnish prepared from these articles. Now we have petroleum. A full account of Mr. Cook's method of distilling the coal, and the products obtained, is published in the 28th vol. of the Society's "Transactions."

The making of point lace was encouraged as an employment for young English women of very small fortunes as suited to the industry and genius of that class during the low interest of money. Dorothy Holt, who proposed its introduction, says:—"The desired success has, as far as can be expected, crowned my endeavours in my promotion of the English point lace, for his Majesty (George III.) had the goodness to wear the first pair of ruffles made of it at his coronation, and more also to express that it is the natural inclination of his heart to set a high value on every endeavour to improve any English manufactures. The price paid was 25 guineas."

With regard to clocks and watches, it is impossible for me to attempt to point out what the Society did in the way of rewarding and inducing improvements in the construction of horological instruments; but this I may say, that any person who would attempt to write the history of invention in relation to clocks and watches within the past 100 years would omit much original information if he failed to search the Society's records.

Millstones, and the invention of hand-mills for grinding corn, formed an important item in the Society's early action; and the hand-mills which were constructed and sent in in competition for premiums constituted the first mechanical exhibition held by this Society.

The cranes used on our public quays were of so rude and imperfect a construction, and accidents were so constantly occurring, that the Society offered premiums for their improvement, and ultimately set up, in 1785, a crane, invented by Mr. Pinchbeck, on one of the quays

* See vol. ix., page 69, of the Society's *Journal*.
† See *Transactions*, vol. xix., page 242.

below London-bridge, of which it is recorded, "that although it answered well the purpose it was designed for, yet, from that unaccountable inattention to their safety which is daily seen among labouring people, it has been suffered totally to fall into ruin." Many rewards were subsequently given for improvements in this important mechanical aid to manual labour.

Crucibles and melting-pots were successfully made of plumbago in England, at the suggestion and under the fostering care of the Society.

The screw-jack, by Abram Staghall, now so universally in use, under a patent of modern date, was rewarded and published in 1777.

The pile-driving machine was brought from Austria by Mr. John Nepomuc Blanck, of the town of Waldsee, in Upper Austria. It is thus described:—"The method of driving piles for bridges and several other purposes, whereby eight men can do the work of 80 by any other method hitherto practised. The rammer may be twelve or, in some cases, twenty cwt., and is set going by two hooks, one of which draws up and the other lets down of itself, or also in another manner, by which the rammer claps and loosens itself without altering the motion of the main wheel." Four such machines were successfully employed in the year 1769, by order of the Emperor of Germany, and two in the year 1770, by order of the King of France, and the inventor was rewarded by both.

In 1800, the Duke of Bridgwater, as the father of inland navigation, received the gold medal for his past exertions in the construction of an underground inclined plane at Walkden Moor, in Lancashire, and his immense extent of navigation without a lock. At the same date his Grace communicated, through the Rev. Francis H. Egerton, an account of the erection of a steam-house for forcing vegetables; and in the year following the thanks of the Society were voted to him for his model of a drain plough.

In an early prospectus of the Society its object is thus set forward:—It is to be remembered that the establishment of this Society is not on narrow views or selfish interests; the grand object of the Society is the public good. The view it held in reference to mechanical inventions was that it is not sufficient that they will succeed with care; it it also necessary that no additional trouble shall arise to the servants about them, otherwise the best inventions will be liable to miscarry.

In 1798, Mr. Sievers, a corresponding member, resident at Bauenhoff, in Livonia, writing upon the rearing and treatment of silkworms in the northern parts of Europe, referring to the influence of the Society out of England, says—"that the late Empress of Russia, whose greatness of mind was apparent in all her conduct, having seen one of the Books of Premiums annually published, established a society similar to this in her dominions, which still exists, and has been attended with great advantage."

While, however, the Society had been directing attention to such matters as I have named, both at home and abroad, other great agencies for the improvement of the condition of the people, and the industries and commerce of the country, had been at work; and foremost in time, and probably not inferior to any in the degree in which they have contributed to the national prosperity, may be placed those introduced by the Duke of Bridgwater. A brook which falls into the Mersey between Warrington and Liverpool had been rendered navigable for a few miles by deepening the channel, by cutting across the most excursive of its windings, and by erecting at its mouth a flood-gate, for the purpose of retaining the tide water. The hint thus afforded was soon appropriated by his Grace, who in the year 1757 commenced the execution of a canal for the purpose of conveying coals from his estate at Worsley to the town of Manchester. The subterranean termination of this work, in the very heart of the colliery, affords the first example of tunneling as applied to navigable canals. Its success soon led to the construction of the Bridgwater-canal, under Brindley; this opened up an easy communication between Manchester and Liverpool, and gave rise to a system of internal navigation all over the country.

The mineral treasures of coal and limestone now began to lend their aid in affording to the people the indispensable comforts of life; the manufactures which occasioned the greatest consumption of fuel, and required the cheapest carriage, those namely of iron, glass, and pottery, soon established themselves on this island. The same district which had been the first to benefit by canals was also destined to be the seat of our cotton manufactures. Early in the 17th century, the muslins, chintzes, and delicate cotton fabrics of the East Indies had begun in some degree to be superseded by the fine linens of Flanders and the silks of Italy. The cultivation of the cotton plant had been introduced into our American and West Indian colonies. The port of Liverpool, by means of its connection with America and the West Indies, received a large proportion of the produce, and it was disposed of chiefly at Manchester.

To the discovery by Dr. Black, of the theory of latent heat, in 1764, we are indebted for the abstract principle, and to Mr. Watt for the particular application of this principle to the construction of an engine, capable of acting in any situation and of condensing in one spot the greatest possible quantity of momentum. The force of wind is irregular and intermittent; that produced by the fall of water restricted from its nature to comparatively few places; that originating in the live power of man or animals cannot be accumulated beyond a certain amount in a single effort, or be continued without rest. Following the introduction of the steam engine, the next great stride in the path of progress, was the reduction of iron ore by means of coal.

"In the year 1619, Dud Dudley, then a youth 20 years old, was fetched home from Balliol College, Oxford, to manage three iron works of his father's, in Worcestershire; but wood and charcoal growing very scanty, and pit coals abounding, he was induced to alter his furnaces and attempt the making of iron with pit coal, in which he obtained such success, that at two trials he found the quality to be good and profitable, and a patent for the invention was granted by King James I., in the nineteenth year of his reign, for the term of thirty-one years. Rival manufacturers sought to deprive Dudley of the benefit of the invention, by maintaining that the patent amounted to a monopoly, but through the influence of Edward Lord Dudley, a clause was inserted in the statute against monopolies, passed in the twenty-first year of that King, saving to Lord Dudley, for 14 years, the benefit of the patent for smelting and refining iron, and all mines and metals, by means of pit-coal, sea-coal, peat and turf.

"To those who regard with sympathy and reverence the struggles of ingenious and energetic men to overcome the hindrances by which inventive genius is so often obstructed, the 'Metallum Martis' of Dud Dudley, published in 1665, and dedicated to King Charles II., will well reward the trouble of a careful perusal. The overthrow of his works by a great flood; the opposition of rivals who disparaged his inventions, because, as he averred, he sold good iron cheaper than they could afford it; harassing attempts to induce the legislature to annul the patent as a monopoly; the destruction of his works by riotous persons; his own imprisonment on occasion of law-suits and losses; rival patentees, who wrongfully laid claim to Dudley's invention; the seizure and sale of his estate during the civil wars for his loyalty to the King; the refusal of the Privy Council to renew the patent after the Restoration—these successive misfortunes compelled Dudley to desist from the prosecution of his inventions, although he asserted that he had accomplished an eminent triplicity in making iron—first, more sufficient; secondly, more cheap; thirdly, more excellent."*

* See address of Sir Thomas Phillips, vol. IX., page 10, of the *Journal*.

Experiments in the use of pit coal were resumed at Coalbrookdale in the early part of the last century, when a furnace constructed for that purpose was erected by Mr. Abraham Darby at that place. His discoveries led the way to the extensive use of iron which is the characteristic feature of the present age. Mr. Darby was also the inventor of iron railways, many miles of which were laid down to facilitate the communication between his collieries, quarries, mines, and smelting works. He also constructed the first iron bridge, viz., that at Coalbrookdale.

Of the importance of these discoveries the Society was by no means ignorant; but as, in connection with the majority of the industries which grew out of these piscoveries, patents were obtained, the Society refused to take cognisance of them, having effectually closed its doors against all patented inventions; the necessary result, as coal, iron, and the steam engine extended their influence, was that the Society lost power and position till at length it practically died out.

It is well, perhaps, that I should state that for many years after the Society was established, it was without any official organ of publication of its own. I am, therefore, unable to refer to many of the articles quoted; but, I may add, so anxious were those in power to co-operate with the Society in making known throughout the country the premiums offered by it, that the following notice was printed and issued by the Post-master General:—

"General Post-office, May 1st, 1775.

"His Majesty's Post-master General, being desirous of promoting the views of the Society constituted in London for the Encouragement of Arts, Manufactures, and Commerce, I send you herewith a book of their premiums, that all persons coming to your office may have an opportunity of reading it.

"I am, your assured friend,

"Anthony Todd, Secretary."

The main object the Society sought to attain was to incite the inhabitants of the country to excel in the arts and sciences, the surest method by which nations emerge from poverty and ignorance to esteem, wealth and grandeur. By well-timed endeavours to increase the products of our soil, and also of the soil of other countries, it was hoped not only to give bread to the poor and indigent, but to increase the affluence of the great and the stability of the kingdom.

Second Period—After Incorporation.

Having lingered thus long upon the past, time warns me to say but little about the present period, nor is it necessary that what is known to many present should be referred to in detail. I will therefore only state that, in 1846, the bye-laws of the Society were altered, and the management of the business of the Society was vested in the Council then first established—that a Charter of Incorporation was obtained in 1847—that the Society's position and objects were reviewed, and prizes were instituted to promote the production of art manufactures. The prizes awarded led to exhibitions being established, which in their turn were developed into the Great Exhibition of 1851. While the Society promoted industrial exhibitions it encouraged a knowledge and love for art, by holding exhibitions of the works of British artists. It introduced new industrial reproductive art processes; it suggested to and obtained from the Government an improved Patent Law, in aid of the industries and inventive genius of the country; it advanced education by means of the union which it established in connection with the literary, scientific, and mechanics' institutions throughout the country; it promoted amendments in the law of copyright, assisted to remove the paper duty, to improve the dwellings of the working classes, and the laws affecting their health, and to obtain an amendment of our postal system. Its exhibitions, more especially the exhibition of 1851, were the means of securing for the nation a sum of money, with which an estate has been purchased, upon which has risen, and is rising, one of the most splendid collections of art industries the world has ever seen. In connection with that, the schools of design throughout the country are being aided and advanced by the Government, and the Society is promoting a knowledge of many industrial arts, and the creation of new art industries, by the award of art workmanship prizes, the examples for which are to be found in the South Kensington Museum. A second museum is also now in course of erection at the east end of London, towards purchasing the site for which the Society contributed £100.

I must not pass by unnoticed the fact that the exhibition of educational apparatus, the first of its kind ever held in this country, was due to the energy of that friend so recently lost to the Society, Mr. Harry Chester; nor must I omit to refer to the exhibitions of patented inventions held for several years after the institution of the new Patent Laws, which have given to the country a complete record of the patented inventions from the time of King James to the present day, with a Patent Library and Patent Museum for consultation and reference by all who seek information in relation to the inventive industries of the country. The Society, moreover, created the Exhibition of 1862, by obtaining a guarantee fund of upwards of £400,000; it nominated the Royal Commissioners who conducted the Exhibition, and applied to and obtained from the Government the Charter under which they were incorporated.

The result of that second International Exhibition was to make known the great advances which the workmen of England had made in art since 1851, and to show them the importance of a fuller and more perfect scientific and technical training, in order to enable them to keep pace with their foreign competitors for the future. Industrial instruction and technical education have occupied the Society's attention on several occasions, and during the past session the Council appointed a committee to consider and report as to the best means of promoting the technical education of the artizan; the Society will doubtless continue the work thus begun.

But it is not alone the artizan who needs that his knowledge should keep pace with the requirements of the times; it is even more necessary that the knowledge of the capitalist, manufacturer, and employer of skilled labour should do so; but before proceeding to the consideration of how this may best be promoted by the Society in the future, there are one or two observations which I desire to introduce here.

Firstly, the Society, as a voluntary body, is established for the promotion of such matters as may in any way be calculated to increase the welfare of the people of this country. Its funds are derived from the voluntary payments of its members, but from time to time those funds have been added to by bequests on the part of individuals who, not being members, have watched the Society's action from without, and, approving of the results obtained, have thought fit to leave certain property in trust for the future carrying on of its work. Such bequests, in times past, were made by Mr. John Stock, Mr. Fothergill, and others; and it is a fact to be noted, that at the moment at which the Society seemed to be expiring, a bequest, by Dr. Swiney of £5,000 was made to it. The terms of his bequest have been faithfully carried out ever since 1849, when the first prize was awarded, and it will be the duty of the Society to make another award in January, 1869.

Dr. Cantor also, in 1859, bequeathed to the Society the sum of £4,500, to be held in trust for such purposes as the Council may think best calculated to promote Arts, Manufactures, and Commerce. In discharge of this trust, the Council established what are now known as the Cantor Lectures, as a means of making known the relations of science and art to industry.

But the Society is not alone indebted to benefactors

of money. To the Noblemen and Gentlemen who have presided over it, to the Chairmen of its Council, since its Incorporation, the Society owes a deep debt of gratitude for the time they have bestowed, and the labour they have incurred in carrying on its work.

It would be invidious on my part to point to any one in particular, but I feel that a list should not be omitted from this record. I append it accordingly:—

PRESIDENTS.

	Elected.
Right Hon. Jacob Viscount Folkestone	1755
Right Hon. Robert Lord Romney, LL.D., F.R.S.	1761
Charles Duke of Norfolk, F.R.S.	1794
H.R.H. The Duke of Sussex	1816
H.R.H. Prince Albert, K.G., LL.D., F.R.S.	1843
William Tooke, Esq., F.R.S.	1862
H.R.H. The Prince of Wales	1863

Charter dated June 10, 1847.

First Council elected under the Charter, April 5, 1848.

George Bailey, Edward Speer	Chairmen of the Council,	April,	1848
Edward Speer	Chairman	„	1849
Francis Fuller, Henry Cole	Chairman, Deputy	„	1850
Henry Cole	Chairman	Dec.	1850
W. W. Saunders, F.R.S., E. Solly, F.R.S.	Chairman, Deputy	„	1851
Henry Cole, Capt. Owen, R.E.	Chairman, Deputy	July	1852
Capt. Owen, R.E. (Resigned Nov. 1853.)	Chairman	„	1853
Harry Chester	Chairman	Nov.	1853
Viscount Ebrington	„	July	1854
Rev. James Booth, LL.D., F.RS.,	„	„	1855
Col. W. H. Sykes, F.R.S.	„	„	1856
Rev. James Booth, LL.D., F.R.S.	„	„	1857
C. Wentworth Dilke	„	Nov.	1857
„ „	„	July	1858
Sir Thomas Phillips	„	„	1859
„ „	„	„	1860
„ „	„	„	1861
„ „	„	„	1862
W. Hawes	„	„	1863
„	„	„	1864
„	„	„	1865
Sir Thomas Phillips	„	„	1866
W. Hawes	„	„	1867

What has resulted from the joint labours of those gentlemen I have endeavoured to indicate; and, so far as the Society itself is concerned, I may add, it has never, throughout its career, added to its funds by Government grants; neither has it stored funds as a means of providing for officers who may be either wanting in energy, or disposed to fall into a false position, by talking of the dignity of societies, and waiting to be sought out by, instead of seeking out, objects deserving of promotion by the society. What has been subscribed has been spent at the time in the promotion of the objects in aid of which it was received; and in proportion to the funds placed at the disposal of the Council, will be its means of usefulness in the future.

The Future.

I will now proceed to the third portion of this paper —the future of the Society of Arts.

The Society of Arts is now presided over by His Royal Highness the Prince of Wales. Let us hope that under his presidency the Society may prosper as fully, and the work done be of as generally beneficial a character, as that performed by it during the period it was presided over by his Royal Father. In order, then, to see what our future must be, let us look back at what the Society was, and what it now is, as, by a comparison of the two, we may be enabled to judge what it ought to be.

I have endeavoured to show what was the condition of the people, and also of the country, both in relation to its natural and manufacturing capabilities, at the period at which the Society was established; and in reference to art, I have pointed to some of the steps which led to the establishment of a Royal Academy; to others, which led to the improvement of our means of reproducing art, for the improvement of the taste of the people, and extending our means of production as a commercial nation—and this in reference to the first period of the Society's existence.

Since the incorporation of the Society, I have endeavoured to indicate a few of the many acts done by it, and to show that its action, from first to last, has been in accord with the intention of its founders; and it is somewhat remarkable that the two sets of actions should have, in many cases, run so exactly parallel, and have produced results so similar.

If the first action promoted education and art, and the establishment of exhibitions of art, the second, in like manner, promoted industrial art and industrial art exhibitions, and the creation of an industrial art museum at South Kensington. The food and the education of the people have, in both alike, been looked after; while the resources of our colonies, their products, and capabilities of supplying the mother-country, have, in each case, commanded a large amount of attention, with mutual advantage both to them and to us.

At the foundation of the Society all was enthusiasm—everybody worked, and everybody thought how he could promote the good of all and the prosperity of the country. Suggestions came in from all quarters, correspondence was entered into with all parts of the world, and for a time all went well; voluntary aid was not over-taxed. The Society consisted in the first instance of a small number of members, and means of communication with distant parts and with each other, were slow and difficult, but those founders and energetic workers gradually paid the debt of nature, which all must pay, and the work of the Society was then left in less zealous hands. The members at large managed the affairs of the Society, but gradually they ceased to move with the times, or, if they did attend to the business of the Society, only proved the truth of the old adage, that what is everybody's business is nobody's business, The Society did not expand as the resources of the country did, but it kept on in one prescribed and beaten track, till it ultimately lost the position and good name which its founders had made for it.

When the second period was entered upon, the barriers to progress were thrown down; the restrictions which had kept patented inventions and their inventors from its doors were removed; the steam-engine and its appliances—which are not once mentioned as inventions of their times, and in reference to which you may search the "Transactions" of the Society in vain, if you want information upon them, were admitted; and protection was sought and obtained for all who endeavoured to carry out improvements of any kind. By a cheaper and better Patent Law, the inventions and patents of past times were unsealed for the benefit of the public by their immediate publication; and a Museum of Patents was instituted by the Commissioners of Patents, in whom the power was vested, under what I may here call the Society's Act.

Having, so to speak, set free invention, while so doing the Society developed art in its relation to manufactures, and promoted a knowledge of high art by the exhibitions which it held. It fostered a love for art in the minds of the people, by giving an artistic character to the things which were to surround them in every-day life.

It improved the education of the people, and extended the knowledge of the industries and products of the world, by establishing exhibitions in which all were permitted to appear as friendly rivals, instead of being looked upon with jealousy, and dreaded as antagonists, in the commerce and battle of every-day

life. Each country exhibiting became, in its turn, a student of the products of its competitors, and each competitor became better acquainted with the means and appliances resorted to for the production of the articles exhibited. The example thus set was soon copied by other countries, and the whole civilised world has now proclaimed, as with one voice, that all progress in the future will be due to increased knowledge, and that to attain it a sound primary and greatly extended and improved scientific education must be afforded, both to the employer and the employed, upon art, manufactures, and commerce.

What, then, I ask, should the action of the Society of Arts be in reference to the future? I feel that I am treading on delicate ground, and I desire it to be understood that what I am about to say are my own views, expressed in my own way, and for which I alone am responsible. They are in no way to be taken as a reflex of the opinions and views of the Council and my brother officers. I merely throw out certain ideas, and if worthy of a moment's consideration, I have no doubt they will receive it; all I desire is, if possible, to advance the objects of the Society and the interests which it is established to promote.

It appears, then, to me that we have, as a nation, learnt first how to produce; secondly, what others produce, and how they produce it; and thirdly, what is necessary, if we as a nation are to continue to produce and compete successfully with the other nations of the world. Our field of knowledge is greatly enlarged; and if we are to advance in the future and develop our industries to the greatest possible extent, it can only be accomplished by the application of exact knowledge in relation to every new appliance rendered available by science, art, and mechanical invention.

How can the Society best promote this more extended and more exact knowledge? By enlisting the hearty co-operation of its members in the work. This, in my opinion, would be more successfully obtained, if some system of grouping could be adopted, which, I need hardly say, would not involve any change in the present system of management. I would venture to suggest, in the first instance, some such division as the following, each group being placed under the special care of an expert:—

Chemistry in its relation to manufactures and the arts.
Manufacturing machines and tools.
Trade and commerce, especially including colonial produce.
Education, domestic, social, and economic appliances.

Under some such divisions, an expansion of our present action might be begun; an expansion which could be elaborated from time to time as additional funds were provided; and under these divisions I believe members would naturally group themselves, and papers might be read periodically in each section.

With industry, acording to a list formerly prepared for the Society, applied to nearly 1,000 trades, and the discoveries of science daily brought to bear more and more upon them, how is it possible, under our present system to watch and record progress in this country alone?

I think, also, that it would be a good and profitable investment of money to appoint gentlemen to watch and report on the progress of science and industry abroad, and to translate the records of the published discoveries made in foreign countries for the Society's *Journal* and the information of its members.

I believe that, with some such organisation as I have indicated, the Society's weekly meetings might be made of infinitely greater importance and interest to the members in general, because they would have persons constantly on the look-out for information for them—information which might be submitted in the form of reports, or as papers, as might be deemed most desirable. Again, with experts, if I may use the term, over each section, and supplying special information for the *Journal*, that work would naturally become greatly improved in character and in the amount of information it would contain. Articles, in the nature of reviews, might be prepared in reference to the patents taken out during each prescribed period, without giving opinions as to which was best; and a railway to knowledge would thus be laid down for the use of members. Nor is this all that might be done. The information resulting from the discussions of the 57 Chambers of Commerce and the 36 Boards of Agriculture, which are established and at work in this country, might then be made available, and more detailed information in reference to our 41 colonies, and the works which are going on there, might be obtained.

Have none of the exhibitions which have been held pointed out anything worth inquiring into, or left us without knowledge as to who can afford us information for their own benefit and the country's advantage? Are there no Secretaries of Legation supplying reports to our Government, and are there no consular reports, no blue books published and possessing information of value to the Arts, Manufactures, and Commerce of this country? Is there no scientific literature? Are there no works of a technical nature ever published in our own country which ought to be read? Yes, gentlemen, there are many; and if the Society of Arts is to do its work efficiently in the future all these and more must be watched and worked.

There are, however, other things which the Society should still continue to do, and which it would then be able to do with increased effect as compared with its past action. It should watch for and record the wants of industry and art, and offer such honorary rewards for them as their importance demands. Are there no wants in the present day not yet supplied? Do we know all there is to know about metals? Can we puddle iron without a large amount of manual labour? Have we succeeded in constructing a locomotive fit to be worked, and capable of being used in underground railways without creating a nuisance or injury to health? Have we yet ascertained how to bring the surplus food supply of other countries to our own shores? Have chemists exhausted all the sources from which motive power may be supplied without nuisance, and in so safe and portable a form that horses might be dispensed with on our streets and roads, thereby adding an enormous food-producing area for the benefit of the people of this country? Have manufacturers combined with electricians to apply electricity as it is capable of being applied to increase and extend the artistic powers of the loom? Are there no new oils, gums, fibres and spices, &c., in India, Africa, and throughout Australia? Do we know how to use petroleum as it is capable of being used? Surely with experts in charge of sections, wants such as these and many others I could name might be recorded and put forward for solution; and though we may not live to see them all realized, still, when our successors shall come before the members of the Society of Arts 115 years hence, they may then have to record of them as we do now, that the reaping machine asked for one hundred years ago has been obtained and is regularly at work, and that the hay and the corn that used to be spoiled in wet seasons is now capable of being preserved and harvested for the use of man.

The Society has thrown open its doors to patents; it has explored the world by means of exhibitions; it has found that increased and increasing knowledge is needed; help the Society of Arts to help the world of industry to obtain it.

According to my view, the best mode in which the Society could do this, would be (as I said before) to divide itself into sections or groups, and for some gentleman, specially conversant with the subjects to be investigated by each section, to be appointed to work it. It would perhaps not be necessary, at all events at first, that his whole time should be occupied; but if it were made one

man's business, for instance, to obtain the best information in reference to the first division I have named (chemistry in relation to manufactures), and to bring that information before his section for discussion, much more efficient action would be the result.

We have ever been a body of volunteers, working for the good of our fellow-men. We wish to continue to be so. With an extended means of action, there will be a proportionately increasing field for volunteers to work in. Committees of investigation would crop up in each section, and members would find it to their own interest to serve on them. We started our present Society twenty-five years ago, with 300 members. We had to borrow money to pay debts, and members subscribed funds for special purposes. We did work which was appreciated by the public; the public supported us, and we are now a body of 3,000. Let us still endeavour to extend our influence; and I have no doubt that, as in times past, the seed which was sown in good ground took root, and has brought forth tenfold, those who are spared, if they work vigorously, will, in years to come be able to say it has brought forth an hundredfold.

We have passed through two periods of the Society's existence, in each of which exhibitions have formed an important feature, and museums for public instruction have been permanently established by the Government. I can foresee that if you will now enter upon the enlarged action I have endeavoured to indicate, you will not be long before you enter upon a third exhibition period. When science and art have both been brought more fully to bear upon industry, then will rise up a series of exhibitions, not one whit less important than those which have gone before; less gigantic, perhaps, in proportions, but more honest as representing the commerce, art, and industry of the country. And out of such exhibitions should grow a national museum of commercial products, such as the industries of the world are based upon, and where the traveller coming from foreign parts will be able to compare his new found product with those already known. Such a museum is now a want. The want will then have made itself felt; we shall then see Arts, Manufactures, and Commerce aided and promoted by the Government; and the technical, scientific, and artistic education of the people will thereby be advanced.

There are other ways also in which the Society can be made of greater value to the community at large. In times past, members travelling abroad watched the habits, manners, customs, and food of the people they visited; they made notes and sent suggestions to the Society. Such suggestions were at times accompanied with sums of money to be awarded as premiums for a particular line of investigation. In this way our Food Committee of the present day arose—and great good may be expected to result from its labours. Originally, however, the Trevelyan Prize was offered for the best treatise on marine algæ as an article of food. Samples were obtained from China, where they are largely used. The Society received an exceedingly valuable communication on the subject to which the prize was awarded, but the communication for a time was withdrawn, to admit of new manufacturing industries being established in this country, and which are now being carried on. The communication was subsequently submitted to the Society, and the prize was again offered in another form. Our members can, if they will, help the Society to do more of this kind of work, and while helping the Society to benefit the public, they will in many cases indirectly be benefiting themselves.

The thought will naturally arise in the minds of many, how can the Society thus expand and extend its action? How can it hold these meetings and do all these things in its present house? Gentlemen, do not refuse to do something because you do not see at once how we can do everything. The Great Exhibition of 1851 could not have been held in this building, but the Society did not therefore refuse to hold smaller exhibitions; and if by the enlarged action I have proposed, it shall hereafter become evident that the Society requires more accommodation, I have no doubt at the proper time it will obtain it. I have already said that I believe industrial exhibitions would again grow out of such an enlarged action, and if the Society were thus expanded, it would then be able to conduct them itself, and retain them as part of its system of action, instead of handing them over to other bodies.

The Society of Arts ought to be the great industrial institution of the country, and it may become so if members will give it a full measure of support.

Allow me, in drawing this paper to a close, to say that having been permitted, by the kind consideration of the Society, to hold office now for just a quarter of a century, and having been associated since the Society's incorporation with every Council and officer that has been elected to manage its affairs, I feel confident that there never has been a period in the Society's history at which greater anxiety has been felt by all to uphold and maintain the honour of the Society and its usefulness as one of the oldest societies in this great metropolis; and, further, that so far as my present brother officers are concerned, I have never, at any period, met with greater kindness or more earnest endeavour on the part of any than I have experienced at the hands of my friends Mr. Foster and Mr. Critchett, with whom I have long had the pleasure of being associated (the former having served the Society for fifteen and the latter for twelve years); and I feel sure that the Council and members, should they think the enlarged action I have endeavoured to shadow forth worthy of being taken up, may rely, not on a lukewarm and half-hearted co-operation on the part of my colleagues, but a zealous, honest, and vigorous aid; and if my humble services can in any way aid the good cause in ever so slight a degree, I need scarcely say how glad I shall be to render them.

DISCUSSION.

Mr. Varley wished to add to the interesting information contained in the paper they had heard, the fact that a reward had been bestowed by the Society on Captain Manby for his most valuable invention of a mode of communicating with ships in distress from the shore, this invention being an improvement on one by Lieut. Bell for communicating from the ship to the land.

Mr. Botly said they were much indebted to Mr. Davenport for the elaborate history of the Society which he had placed before them, and also for the suggestions with which the paper concluded. Before referring more particularly to them, he wished to remark on one important feature in the past working of the Society, which was, that it had never accumulated funds, but had always spent them in the promotion of its objects. He was acquainted with one society which had now about £20,000 invested, but this was not the case with the Society of Arts, for whatever subscriptions it received were laid out at the time for the benefit of the public at large. With regard to the important suggestions which had been thrown out in the paper, he rather doubted whether the members at large were competent to discuss them, and he thought they had not better come before the Council, who would report upon them to the Society. He was very pleased to notice the great respect in which their Society was held at the meeting of the British Association at Norwich, and no one could travel on the Continent without becoming aware of the high estimation in which it was there held.

Mr. Thomas Webster, Q.C., F.R.S., said that all the members must feel indebted to Mr. Davenport for bringing before them such an interesting history of the Society (for the preparation of which he had facilities possessed by but few), and not less so for the valuable suggestions in the concluding part of the paper. It was

very remarkable to observe that at a very early period the Society had drawn a distinction between inventions which were the subjects of patents, and those which were not so protected, the latter alone being then considered eligible for its notice. The principle upon which this distinction was drawn was that, inasmuch as there was a special property in a patented invention, it was thought that the owner might look to that for his reward, and that the Society had better apply its influence in rewarding those inventions which had not that advantage. Experience, however, had shown that however excellent this might be in theory, the Society had done very wisely in opening its doors and recognising every useful invention, whether patented or not. It was a consideration not to be overlooked, that in proportion to the importance of any new invention was the opposition which it had to encounter, because in many cases it necessarily led to the utter removal and abandonment of existing machinery, which represented so much capital embarked in the business to which the invention referred. Capitalists therefore were generally averse to the introduction of new inventions. The recognition of patented inventions, therefore, by the Society he looked upon as a very important event in its history, and this was not accomplished without a great deal of discussion. There was a period, from about 1837 to 1844, when the very existence of the Society was only preserved by a few resolute individuals who insisted upon keeping its doors open, and upon not selling its property, and many and serious were the discussions which occurred at this time. Passing by these things, which were rather matters of history, he wished to offer a remark or two as to the suggestions made at the conclusion of the paper. He thought that some such system of grouping as had been proposed would be advantageous, and probably the three first divisions put forward were strictly within the province of the Society. The first division was chemistry in relation to arts and manufactures. Chemistry here included all those influences or operations of nature of which nothing was known except by their results; and in the next head machinery included all the combinations of existing elements of which the result could be definitely foretold from past experience. He did not think that a more comprehensive division could be made of the various applications of science to the products of industry than this. The third division, commerce, was one which had always occupied a prominent place in the Society's operations, and under this head would be considered all those restrictions, whether economic or legislative, which interfered with improvement and progress in industry. As to the fourth head or division mentioned by Mr. Davenport—education, domestic, social, and economic matters—he should hesitate a little before admitting it to a place in the scheme of the Society of Arts, as it involved some danger of turning the Society into a political union. It was very desirable that such questions should be discussed, but in his opinion they were better left to an association which had before now met in that room, the Social Science Association. The Society of Arts might fairly hold out the hand of fellowship to such societies, and assist them by any means in its power, but he thought it would be beyond its province to discuss such matters. In the course which Mr. Davenport had suggested of assigning various departments to persons specially qualified to conduct them, lay, he believed, the great future of the Society. The history of inventions was as yet very imperfect, but if in such a large body they had a number of sectional departments, each under the charge of a gentleman to experience and thorough practical knowledge, there would arise a complete record of the progress of mankind with regard to useful arts and inventions, and out of that record would spring many valuable suggestions as to the cognate subject of commerce. He, therefore, thought Mr. Davenport's suggestion highly worthy of consideration, and if the system were adopted he had no doubt but that the Society had a great future before it.

Mr. Antonio Brady desired to endorse all that had fallen from the last speaker. He thought the Society owed a debt of gratitude to Mr. Davenport for the care with which he had brought the subject before them. Probably few persons in the room were previously aware of the magnitude of the influence which, during the preceding century, the Society had exercised upon the arts and manufactures of the country. There was no doubt that if they properly fulfilled their mission they had a great future before them. He thought the proposed division which had so happily been sketched out by Mr. Davenport was an excellent proposal. It would be most valuable to inventors if all their discoveries, as they were made, instead of passing unheeded, as was now often the case, were made the subject of discussion and investigation. As a member of the Council he felt deeply indebted to Mr. Davenport for his paper. He therefore begged leave to move a cordial vote of thanks to Mr. Davenport, whom he congratulated most heartily on the success of his paper; at the same time he congratulated the Society on possessing so able an officer.

Dr. Ellis had much pleasure in seconding the motion. As one who had long been connected with the Society, he could not help acknowledging that his feelings had been quite stirred by the interesting records he had listened to, and the important suggestions which had been thrown out for consideration. He felt that Mr. Davenport had only suggested an expansion of the original intention of the Society. When its members were but few, but few things could be done, though their minds might be large enough to embrace a wide sphere of action; but now was come the time when there seemed a possibility of carrying into effect the great ideas of their founders. He hoped there would be an immediate practical result, and that gentlemen would at once begin to consider how they could best serve the Society in the manner now suggested. He believed that many members who now knew scarcely anything of the Society's operations would be stimulated to take part in promoting the great work in which it was engaged. It was very cheering to hear that out of such small beginnings had arisen such great results; and he should impress upon all his friends throughout the kingdom the duty they owed to the Society, and he hoped all the members would not only do what they could themselves, but endeavour to enlist others in the good work.

Mr. P. L. Simmonds, heartily concurring in all that had been said, wished to draw attention to a subject which he had long advocated, viz., the establishment of a commercial museum in London. From a long connection with different international exhibitions, his conviction was, that it was all important to our manufactures and commerce that there should be a museum of raw materials, open to the inspection of merchants and manufacturers; and the necessity for this was now being shown in one or two special instances. The liberation of the serfs in Russia had led to the abandonment in a considerable measure of agricultural operations, and there was now a great deficiency in the supply of linseed, and, consequently, of linseed oil. It was therefore of great importance to manufacturers to know what oil could be used in its stead for various purposes, where a drying oil was required. Again, there were one or two hard resins used in making varnishes, for which substitutes were much wanted, and many other instances might be mentioned if time permitted. If a museum of raw materials were once established it would be rapidly added to from year to year by the contributions of brokers, merchants, and importers, as well as of correspondents in all parts of the world.

The Chairman, before putting the motion, in which he heartily concurred, remarked that he should have been pleased to hear the suggestions made in the

paper more freely discussed, but probably the reason this had not been the case was that most of the members present concurred, more or less, in the proposal. If they did not go quite to the full extent there suggested, he thought they might very well begin by endeavouring to secure persons capable of preparing papers which might be published, containing the cream of the various scientific articles appearing from time to time. The result would be on the one hand an immense saving of time to the readers, and on the other hand it would bring before inventors considerable amount of information which was now scattered over numerous publications in Europe and America. He agreed with the remarks of Mr. Botly, that this was a matter for the Council to take up, and as a member of that body he naturally felt some difficulty in pronouncing an opinion upon it, but he might say this, that high as was the position which the Society had of late years attained, and great as was the amount of good which it had been instrumental in performing, there was no reason why its usefulness should not be increased, and its position become still more exalted. He cordially concurred in the vote of thanks, and begged to assure the members that the suggestions thrown out would be carefully considered by the Council, when due weight would be given to all that had passed on that occasion.

The vote of thanks was then passed, and duly acknowledged by Mr. Davenport.

Proceedings of Institutions.

Yorkshire Union of Mechanics' Institutes.—*Castleford Mechanics' Institute.*—The annual *soirée* was held on Monday evening, under the presidency of the Right Hon. Lord Houghton. The secretary, Mr. G. Masterman, read the report, from which it appeared that the Institute is not in so prosperous a condition as might be wished. Lord Houghton remarked that people seldom got tired of singing, but often of speeches, however good and important the subject. He should like to see in the people of the town an increasing interest in the progress of education; he compared the present and future positions of two working men, one of whom neglected the opportunities of improvement so bountifully spread around; the other eagerly grasping and making use of them. An interval of a few years found the one occupying a higher and more honourable position in society; whereas the other remained the same. Not only that, but in case the trade he followed got bad, there was nothing but the relieving-officer and the union workhouse before him. He briefly alluded to a large meeting held in Birmingham, at which he had been present, where the principal subject was the question of compulsory education. He believed that the great mass of the working classes are in favour of it. He saw that Castleford was a great town in its infancy; and he saw no reason why it might not before long occupy an important place in this noted West Riding, if the people who inhabited it would only attend to the question of education. Addresses were also given by Mr. Austin, president, Dr. Carr, Mr. Henry H. Sales, Revs. W. J. M. Sylvester, J. Holling, J. D. Balmer, and Mr. John Cass. *Holywell-green Mechanics' Institute.*—The annual distribution of certificates, awarded by the Society of Arts, took place in the hall of the Institute, on Saturday, November 21st. Mr. J. Fisher, of Halifax, occupied the chair, and presented the certificates, accompanying each certificate with congratulation and advice to the successful candidate. An address on the past history and future work of Mechanics' Institutes was given by Mr. Henry H. Sales, who was followed by the Rev. Professor Newth, of Manchester. Short addresses were also given by Messrs. Ormerod, of Brighouse, Bateman, of Greetland, and others. It may be noted that in this small village Institute, one of the certificates distributed was for success in Italian, and another a first class in music. A chemistry class has been established this year, and is doing well.

Correspondence.

Harvesting Prize.—Sir,—As I was debarred on Monday, by custom and etiquette, from giving any adequate expression to my acknowledgments for the Gold Medal and prize, I ask the publicity of your *Journal* to convey my own thanks to the Council of the Society of Arts for the honour they have thus conferred upon me, and the thanks which I believe are due to them from the public at large, for having stimulated inquiry into one of the most important problems of the age. We are now in the excitement of a contested election, and party cries are still ringing in our ears; but there is one cry that will outlast all others—a cry that neither governments nor statesmen can ignore with impunity—the "cry of the hungry for bread." Whatever may be promised on the hustings or performed in St. Stephen's, the Parliament of Arts and Sciences has not disregarded that cry. It is on record that the late Sir Robert Peel founded his chief claim to the gratitude of his countrymen upon the means which he had adopted for cheapening the poor man's loaf. The Society of Arts has used its influence in the same good cause, and has thereby earned a tribute of lasting gratitude from those classes of the community who most want a helping hand. The losses that a country sustains from unseasonable weather at harvest-time are enormous; the imperfect statistics on the subject show them to be so immense as to be well nigh incredible, and yet I believe those statistics are rather under than over the mark; for the farmers, notwithstanding the traditional propensity for grumbling, are a tolerably patient, and much-enduring set of men. They have come to look upon such losses as inevitable, and as the subject is a somewhat painful one, they do not care to say much about it. Now, patient endurance of losses, so long as they are inevitable, is undoubtedly a great virtue; but I much mistake the shrewd and enterprising character of the agriculturists of our day, if they will long endure to see their hay spoiled, and their corn damaged, when a means of escape from such disasters is once fairly before them. The Society of Arts has contributed largely to bring this means to their notice, and has called the attention, not alone of this country, but of Europe, to the subject; it has aroused much interest in France, Belgium, and Holland, and I am now in negotiation with men of high position in Russia and Sweden who desire to apply the new system of harvesting in those countries. The results of further experiments during this season have been eminently satisfactory, but as they will shortly be published in a third edition of my Essay, I need only state that where a steam-engine is not obtainable, horse-power may be successfully substituted for it. In Ireland, Scotland, and Wales (parts of the kingdom that stand most in need of artificial help in drying their grain and grass crops), the steam-engine is, as yet, seldom to be had, but horse-power is in very general use. The farmers of those districts will therefore be able to dry their wheat as easily as they now thresh it. To a society which takes cognisance of, and encourages manufacture, as well as art and science, it may not be uninteresting to state that the extended use of machinery in agriculture gives a new source of industry to this country. The number of farmers in the United Kingdom may be roughly estimated at 200,000; hence, if only one in twenty of that number availed themselves of this new power of dealing with their harvests, it would give a large impulse to the trade of engineering and all its

correlative branches. Thus the action that the Society has taken in this matter will have the twofold advantage of securing more food for the country, and giving more work to the town.—I am, &c., William Alfred Gibbs.

Gillwell-park, Sewardstone, Essex,
24th Nov., 1868.

MEETINGS FOR THE ENSUING WEEK.

Mon.....British Architects, 8.
Actuaries, 7. Mr. T. B. Sprague, "On the Value of Reversionary Life Interests."
Medical, 8.
Asiatic, 3.
London Inst., 6.
Social Science Assoc., 8. Dr. W. B. Richardson, "On Poor Law Reform."

Tues ...Civil Engineers, 8. Mr. W. H. Wheeler, "Description of the River Witham, and of its Estuary, and of the Works upon it."
Pathological, 8.
Anthropological, 8.
Syro-Egyptian, 7½.

Wed ...Society of Arts, 8. Dr. Mann, "Further Notes on the Productive Industries of Natal."
R. Society of Literature, 4½.
Obstetrical, 8.

Thur ...Antiquaries, 8½.
Linnæan, 8. 1. Dr. Moss, "On the Anatomy of the genus *Appendiculariæ*, with the Description of a New Species." 2. Mr. E. Saunders, "On New Species of *Paracupta* and *Conognatha*."
Chemical, 8.

Fri .....Geologists' Assoc., 8.
Philological, 8½.
Archæological Inst., 4.

Sat .....Artists and Amateurs, 7. Annual Meeting.

Patents.

From Commissioners of Patents' Journal, November 20.

Grants of Provisional Protection.

Alcoholic liquors, producing—3323—R. Irvine.
Bobbin spools, &c.—3357—R. Cook.
Bobbins, &c., shaping wood for—3360—J. Clark.
Boilers—3292—T. Mordue.
Boilers—3344—W. R. Lake.
Boilers, &c.—3371—J. Taylor, jun.
Bolts, wrought-iron—3377—M. A. F. Mennons.
Boots and shoes—3211—J. H. Johnson.
Boots and shoes—3317—A. S. Paterson.
Bricks and tiles—3312—J. and W. Adams.
Casks, &c., washing—3284—W. E. Hickling.
Cigars—3367—C. Archer.
Cloth, &c., ironing and pressing—3338—L. Berenger.
Cotton, &c., preparing—3306—B. Dobson and J. Clough.
Dredgers—3354—T. Burt.
Electricity, generating static—3329—S. A. Varley.
Electro-physiological battery for application to the human body—3359—B. Hunt.
Engine pumps, &c.—3363—A. L. Bricknell.
Fabrics, embroidering—2938—J. F. Wanner.
Fabrics, woven—3337—J. Moore.
Fabrics, &c., furred—3349—E. T. Hughes.
Fibrous materials, spinning and doubling—3350—I., W., and J. Holt and J. Maude.
Fire alarm—3304—J. G. Tongue.
Fire-arms, &c., breech-loading—3286—J. B. O'Hea and W. Bullen.
Fœcal matters, treating and utilising—3341—S. Schuman.
Fuel economisers, &c.—3358—R. Needham.
Game, cases for packing—3343—G. F. Morant.
Garments for saving life at sea, &c —3334—J. Dannatt and T. S. Turnbull.
Gas lights, shades for—3324—J. Brönner.
Gun barrels, &c.—3192—W. E. Newton.
Indicators for showing a rise or fall of temperature, &c.—3270—C. Harrison and R. Wilson.
Iron and steel—3313—J. Heaton.
Iron and steel—3356—T. Robinson.
Iron sheds—3339—J. A. R. Main.
Iron, &c., tiles or plates of—3288—W. D. Young.
Kitchen ranges—3379—W. Broughton.
Lace—3336—J. H. Bertie.
Lamp-posts—3321—S. Sharrock.
Lanterns—3180—A. Desbonnet.
Liquids, regulating the flow of—3294—H. J. Sanders.
Locomotive engines—3290—E. T. V. Hecke.
Looms—3310—Q. and J. Whyte.
Looms—3332—J. Lodge.
Looms—3353—S. Ward, W. Hurst, and J. Tuer.
Metallic moulds for casting metals—3298—A. Wilson.
Metals, rolling—3316—W. Brown.
Mineral substances, breaking, &c.—3123—T. B. Jordan.
Mourning hats—3322—W. E. Dando.
Nut crackers—3325—W. E. Bates and T. Dodd.
Ordnance, apparatus for discharging—3335—J. Vavasseur.
Ores and minerals, treating—3315—R. Oxland.
Pistons, &c., packing—3300—G. E. Donisthorpe.
Plastering trowels—3331—S. Ault.
Pottery—3274—W. Boulton.
Printing or embossing presses—3319—J. Wright.
Pumps and fire-engines—3373—F. C. Philippson.
Railway carriages—3362—J. Corbett.
Railways—3296—M. A. Soul.
Railways, &c.—3234—C. D. Abel.
Reels or bobbins—3221—J. H. Johnson.
Scarves or neckties—3340—E. Barton.
Sewing machines—3326—A. M. Clark.
Ships' boats, raising, &c.—3320—G. Allix.
Ships, propelling, &c.—3328—B. Dickinson.
Silk, &c., treating waste—3093—J. and S. W. Varley.
Steam engines, &c.—3169—W. C. Church.
Taps or valves—3314—H. Wallwork.
Teapots, &c., non-conductors of heat for the handles of—3327—J. Langford.
Tobacco, rolling—3361—A. Reid.
Tops—3308—F. A. Blanchon.
Toy houses, &c.—3355—H. Jewitt.
Type cases, &c.—3163—R. M. Wood.
Umbrellas, &c., holders for—3351—J. B. Houghton.
War turrets, &c., working—3074—J. M. Gray.
Water-elevating engines, atmospheric—3348—A. V. Newton.
Wool-combing machines—3276—T. Speight, sen., and W. H. France.
Wool, scouring—3280—A. M. Clark.
Wool, &c., preparing—3347—E. Holden.

Inventions with Complete Specifications Filed.

Bayonets—3495—W. R. Lake.
Meteorological apparatus—3489—H. A. Bonneville.
Missiles, shape and casting of—3475—H. A. Bonneville.
River boats—3485—R. M. Boniwell.
Velocipedes—3469—C. K. Bradford.

Patents Sealed.

1665. C. Chapman and J. Lilley.
1676. J. Revill.
1693. C. Delafield.
1695. E. Jones.
1696. J. J. Harrop & W. Corbett.
1697. J. Higgins.
1698. J. Fletcher.
1699. E. W. De Rusett.
1704. C. Windhausen and H. Büssing.
1705. T. J. Baker.
1707. E. Hunt.
1709. P. Cameron.
1715. W. H. Kent.
1717. J. Scoffern.
1733. W. Buttery.
1734. I. B. Miller.
1744. H. A. Bonneville.
1748. H. and G. Kearsley.
1762. J. and J. B. Palmer.
1768. F. N. Gisborne.
1781. R. Lüthy.
1886. G. Davies.
2600. H. C. Ensell.
2706. H. A. Bonneville.

From Commissioners of Patents' Journal, November 24.

Patents Sealed.

1710. F. Hargreaves and J. R. Collins.
1711. S. A. Smith.
1718. J. E. Holmes.
1723. H. J. Bakewell.
1726. J. A. Joyner and J. H. Jenkins.
1731. T. Smedley.
1738. W. B. Lord.
1742. J. Dixon.
1745. W. Cooper.
1746. J. Morris.
1747. J. Vidie.
1751. J. Scholl.
1753. H. and F. Bailey.
1754. R. Fell and R. Barlow.
1766. T. S. Horn.
1769. W. Maclean.
1770. J. Turnbull.
1772. H. Griffiths and F. A Wishart.
1777. G. T. Bousfield.
1835. J. Ashton.
1838. N. Salamon.
1844. C. D. Abel.
1861. G. Maw.
1862. A. V. Newton.
1865. H. Riviere and F. T. Baker.
1902. W. H. Westwood.
2012. M. Gray and L. Gibson.
2017. J. H. Johnson.
2064. A. H. Brandon.
2330. R. Young.
2392. G. Davies.
2505. M. Gray and F. Hawkins.
2520. H., J. W., & R. E. Dewhurst.
2565. J. Palmer.
2779. E. Wood.

Patents on which the Stamp Duty of £50 has been paid.

3117. P. A. Muntz.
2992. W., E., and J. Gray.
2985. G. Smith and C. Ritchie.
3012. W. R Mulley.
3018. J. Whitworth.
3084. T. W. Dodds.
3079. I. M. Singer.
3090. I. M. Singer.
3000. C. P. Coles.
2991. F. Pope.
3004. S. Hunter.
3021. R. Mallet.
3033. J. H. Johnson.
3066. G. T. Bousfield.
3076. J., E. R., and T. Hollands.

Patents on which the Stamp Duty of £100 has been Paid.

2896. R. A. Brooman.
3124. W. Bell.
3179. C. Pontifex.
3096. T. Higgins.
2958. J. Wilcox.
2960. J. H. Johnson.

Journal of the Society of Arts.

FRIDAY, DECEMBER 4, 1868.

Announcements by the Council.

Ordinary Meetings.

Wednesday Evenings at eight o'clock :—

December 9.—"On the Drying Properties of various kinds of House Paint." By Chas. Tomlinson, Esq., F.R.S., F.C.S. On this evening Professor Wm. Allen Miller, F.R.S., will preside.

December 16.—"On Artificial Freezing." By Dr. B. H. Paul.

December 23.—"Description of the Electric Organ." By Henry Bryceson, Esq.

Cantor Lectures.

The first Course of Cantor Lectures for the ensuing Session will be "On the Aniline or Coal Tar Colours," by W. H. Perkin, Esq., F.R.S., and will consist of three Lectures, to be delivered on Monday evenings, as follows :—

Lecture I.—Monday, December 7th.

Coal Tar, Benzol, Nitrobenzol, Aniline, and Aniline Purple or Mauve.

Coal-tar: its formation and constitution—Aniline a constituent of coal-tar—History of aniline—Discovery of aniline purple—Benzol: its properties, and separation from coal-tar—Nitrobenzol—Manufacture of nitrobenzol and aniline—Preparation of aniline purple, or mauve.

Lecture II.—Monday, December 14th.

Mauve, Magenta, and some of their Derivatives.

Chemical nature of mauve—Runge's blue—Magenta: its discovery and manufacture—Phosphine—Bleu de Lyon—Bleu de Paris—Violet Imperial—Hofmann's violets—Britannia violets.

Lecture III.—Monday, December 21st.

Various Aniline, Phenol, and Naphthalin Colours—Application of the Coal Tar Colours to the Arts.

Aldehyd green—Iodine green—Perkin's green—Aniline pink—Black, browns, &c.—Phenol—Picric and isopurpuric acids—Aurine, coralline, and azuline—Naphthalin yellow—Chloroxynaphthalic acid, &c.—Application of the coal-tar colours to the arts of dyeing and printing—Paper staining and colouring—Lithographic and other printing.—Conclusion.

Each lecture will begin at eight o'clock. These Lectures are open to Members, each of whom has the privilege of introducing two friends to each Lecture. Tickets for this purpose are forwarded with this week's *Journal*.

Other courses are being arranged, particulars of which will be announced.

Subscriptions.

The Michaelmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Food Committee.

The Committee met, after the summer recess, on Wednesday, 11th November; present—Mr. Benj. Shaw (in the chair), Mr. Tufnell, Rev. J. E. Hall, Mr. G. F. Wilson, F.R.S., Mr. J. T. Ware, and Mr. E. Wilson.

Dr. Estor attended the Committee as the Inventor of a Process for the Preservation of Meat. Dr. Pearce and Senor Maximo Terrero were also present.

Dr. Estor stated that the process he had adopted consisted simply in using two gases, *i.e.*, sulphurous acid and chlorine. These gases are not applied simultaneously but in succession. The apparatus for producing these gases may vary according to circumstances, provided this principle is maintained. For general purposes, and when comparatively small quantities of meat require to be treated, the most convenient form of applying these gases is that of a pastille, consisting of a clay bowl resembling that of a tobacco-pipe of large size, coated on the outside with sulphur, the interior of the bowl being filled with a paste containing chlorine. [Specimens of the pastilles above described were produced and inspected by the Committee.] The action is this—the sulphur of the pastille, being set fire to, burns, giving off sulphurous acid gas, and by the time the sulphur is nearly burnt out sufficient heat has been generated to cause the chlorine gas to be evolved, thus effecting the object of the inventor—the subjecting the meat to the influence of the two gases in succession. Dr. Estor went on to state that, when required for use, the following plan had been found most efficacious :—The joints or carcases required to be treated are hung in a safe or other air-tight receptacle, lined with tiles or other non-absorbent substances. The gas evolved from the pastille is of greater specific gravity than the atmosphere, and descends, the pastille is therefore placed at the top of the safe, under a dome of glass or earthenware. A lighted match is applied to the bottom of the pastille; the door of the safe is closed immediately the pastille begins to burn, and the meat is left in that condition till required for use. It is better to keep the meat in the safe till it is to be used; but it may be taken out half-an-hour after burning the pastille, and hung in the open air, without fear of it suddenly going bad, even in the hottest weather. In cases where large quantities are required for preservation for a length of time, he had found from experience that with the gases he was able to keep meat in a perfectly good condition for eight weeks in the hot weather, which he said was the longest period to which his experiments extended. At the end of that time the meat was cut up and dressed in various ways for the table. There was not the slightest taint of decomposition, and the only difference between that and fresh butcher's meat was that the former was excessively tender eating. He had no experience as to the results of this process in the case of meat sent from a long distance in ships. When it is desirable to keep meat for a month, or two months, the fumigation should be repeated, but how often depends upon circumstances, such as the state of the weather, the nature of the meat, &c. The theory of his process was this :—When the pastille is burning, sulphurous acid gas is produced, of which a considerable portion is absorbed by the meat. As the bowl becomes hot, chlorine gas is given off from the interior. These gases, separately, have the power of decomposing water slowly, but in con-

junction with each other their action in this respect is very rapid, the sulphurous acid taking the oxygen, and the chlorine combining with the hydrogen. Thus the original gases disappear, and two new substances are formed, namely, sulphuric acid and hydrochloric acid. The two powerful gases having done their work, are transformed into two others, which are harmless, and, it may be said, wholesome. Sulphurous acid alone will preserve meat for a time, so will also chlorine, but the meat thus preserved is nauseous; whereas, when the gases are used conjointly, in the manner above-described, and in due proportions, no trace of either remains. It was, he said, beyond all doubt that the cause of destruction or putrefaction in meat was the existence of minute vegetable and animal organisms. It is a well-known fact, that sulphur exercises a greater power over vegetable matter than anything else. There are places in Spain where sulphur is burnt in large quantities, and there is no vegetation for miles round. On the other hand, chlorine has the power of destroying animal life. If the theory were correct that the destruction of meat is due to minute animal and vegetable organisms, he did not know anything better to be applied for its protection than these two gases. It has been proved that when meat is surrounded by a perfectly pure atmosphere it does not putrefy. The object, then, is to remove from the atmosphere the causes of putrefaction. Recent experiments show that in the atmosphere there exist minute forms of vegetable and animal life, capable of rapid propagation. Furthermore, these minute organisms have been discovered on the body and in the body of animals in abundance. If these fungi and animalculæ are the cause of decay in animal and vegetable substances, all we have to do is to destroy them; but the question is how shall we destroy or poison them without poisoning the meat or food on which they live, for that which is poison to animals and vegetables is also poison to us? Sulphurous acid, as before stated, destroys all vegetable substances; chlorine destroys animal life; but the meat treated with these gases conjointly suffers no change, for reasons already stated. It is not "preserved meat" in the ordinary acceptance of the term, but "protected" meat. If the animal were in perfect health, and were killed so skilfully as to cause the least possible pain, and dressed or cleaned immediately after death as quickly as possible, no water being used, the meat would keep longer, and with fewer fumigations. As these fumigations do not in the least degree injure the meat, it is better, when any uncertainty exists, to repeat the process every second or third day. The receptacle for the meat should not be opened for the addition of a fresh joint without burning a fresh pastille.

The Chairman having directed attention to Medlock and Bailey's system of preserving meat by steeping or dressing it with bisulphite of lime,

Dr. Estor remarked that he had no practical experience of that process, but he considered any contact of water with meat intended to be preserved was injurious, and water was an important element in Dr. Medlock's process, and he did not think it was efficacious for preserving meat for a long time. Chlorine has a powerful influence in absorbing all loose hydrogen compounds, which sulphurous acid has not.

[The experiment of burning a pastille in the presence of the committee was then made, in which the evolution of the two separate gases was distinctly observable.]

Mr. E. Wilson inquired the extent to which those gases penetrated into the meat?

Dr. Estor replied in the case of an aitch bone of beef weighing 13 lbs., which he kept for eight weeks, the gases had evidently penetrated to the bone, as was proved by the test paper. They went entirely through the meat; he could not say whether they had entered through the marrow. The action of sulphurous acid alone darkens the colour of the meat, which with butchers is a matter of importance, whereas chlorine alone has a bleaching tendency, and makes the colour of the meat too light. By the use of both these gases in conjunction, the natural colour of the meat is preserved. The protection of meat in its natural state is an important element as regards the nutritive qualities of food. As far as his own experiments had gone, he believed that with the burning of one pastille and the safe kept closed, joints of meat would remain perfectly good for six or eight weeks. He expressed a strong desire that the experiment should be tried under the supervision of the Committee.

Mr. E. Wilson asked Dr. Estor whether he had made any calculation as to the expense of protecting meat in the way described, brought in large quantities from a long distance, and involving a lengthened sea passage?

Dr. Estor apprehended the expense of the process would be merely nominal. The way in which he would bring meat over—say from Holland—would be simply burning a few of the pastilles under the tarpaulin with which the meat was covered. From long distances the meat might be hung closely together in a portion of the ship prepared for the purpose, and he believed occasional fumigations during the voyage would preserve it, or it might be brought in cases kept from the air, and fumigated with the pastilles. Under such conditions he believed meat could be brought from foreign countries in a perfectly good state.

Mr. E. Wilson remarked that the great object which the Committee looked to was the importation of meat from abroad in large quantities, and he apprehended the packages would constitute an important item in the cost.

Dr. Estor thought suitable provision could be made on board ship for hanging the meat and protecting it by fumigation, and if one piece of meat went wrong, it could be at once removed, so as to prevent injury to the remainder; and space would be economised as much by hanging the meat as by packing it in cases. He did not think, under the circumstances described, the meat would be prejudicially affected by the heat of tropical climates, because the action of the gases was such as to preserve the meat from the attacks of vegetable and animal organisms, which were the great causes of putrefaction. He had been informed of instances in which the process had acted most beneficially in the protection of meat in butchers' shops during the hot weather of the last summer.

A conversation ensued relative to the Australian process of freezing meat, in which Dr. Estor concurred in the testimony already given before the Committee, that the prejudicial effect upon the meat so treated arose from the contact of moisture from the ice. He, however, considered that the meat was deprived of its flavour by the freezing, and very quickly deteriorated after it was thawed.

Dr. Pearce, who had been present during the proceedings, expressed a favourable opinion of the theory stated by Dr. Estor on which the process is founded. He remarked that if the air in which the meat was kept were dry and free from the germs of fungi and animal organisms, temperature, he believed, had little or nothing to do with decomposition. He concurred in the opinion given with regard to the prejudicial effect of external moisture upon fresh meat; water had an extremely injurious effect upon meat intended to be kept for a length of time. The dead meat trade from Scotland had now assumed such dimensions that it was of the utmost importance that proper railway cars or waggons should be constructed specially for the conveyance of the meat from Scotland. The London and North-Western Company have had trains nightly—one from Aberdeen, which arrives about half-past one, and the other from the West of Scotland, which reaches London at about three o'clock. Those trains sometimes consist of as many as twenty-five trucks, each laden with meat for the London market. In the heat of last summer this transit had to be discontinued, as the meat became de-

composed before it reached London. It would be easy, he said, to have railway waggons so constructed that by the use of Dr. Estor's process, meat might be transported from Scotland in the hottest weather in a perfectly good condition.

Mr. E. Wilson remarked that the testimony of practical men had been given, that while it was necessary that air should be admitted to the meat in the transit, yet that the dust which was created by travelling at a high speed had an injurious effect upon the meat. The question was how far these gases would supersede air?

Dr. Pearce suggested that the meat should be subjected to the fumigating process before being packed for conveyance. He added, that the moment vitality ceased in an animal, organic chemistry began to operate and develop the germs of future mischief in meat. As soon as the animal was slaughtered and dressed, if this process were brought to bear upon it, the danger was obviated of vegetable and animal organisms setting in in hot weather. For the last twenty-five years sulphur had been used for the cure of skin diseases and parasitical growths, which in a deranged state of health occur in youth as well as in advanced age. Dr. Pearce exhibited to the Committee a small vessel, of a cup form, composed of pure sulphur, in which form he employed that substance in the treatment of skin diseases, &c. A similar action took place with regard to dead meat. Sulphurous acid not only prevented the germination of deposits from the air, but prevented the development of deposits in the meat itself after death, which development takes place at a high temperature.

The Chairman inquired how it was that the sulphurous acid did not affect the meat prejudicially.

Dr. Pearce replied, it would do so if the meat were saturated with the acid; but these organisms were destroyed by an amount of sulphurous acid which did not affect the meat itself.

In reply to further questions by the Committee,

Dr. Estor stated that his experiments in this direction extended over about twelve months. He was not prepared to state what were the effects of his process with regard to poultry, but he believed it would be as successful with that description of food as it had been with meat. In the latter case he said there was no trace of unpleasant flavour from the treatment. He thought in the case of poultry a modified treatment might be desirable.

A conversation then took place relative to the revival by Mr. Latham of the proposition to import live cattle to this country from South America, and other large cattle-producing countries. The plan proposed by Captain Atkin, and brought before the attention of the Committee by that gentleman last year for effecting that object, was also adverted to, when Senor Terrero, who had an extensive acquaintance with South America, stated that in his opinion all attempts to add to the food supplies of this country by the importation of live cattle from the sources mentioned would result in failure. The native cattle, in their wild state, were, he said, quite unfit for the purpose; and to depasture them, and bring them into a condition fit for export, would involve a cost which, with the expenses, and great risk of transport, would bring up the price of the animals to that at which they could now be obtained in this country. He had no hopes of any plan for the importation of live cattle to this country, on the extensive scale which was demanded, ever succeeding.

The Chairman said a letter on the subject had been received from Mr. Edward Hight, which he thought it would interest the Committee to have read.

The letter was as follows:—

Bankside, Spring-grove,
Isleworth, October 3rd, 1868.

Sir,—I have examined the detail of Mr. Robert Atkin's project for the transport of live cattle from the river Plate to this country, as reported in the *Journal of the Society of Arts* of the 3rd of January, 1868, which you were kind enough to submit to me for my remarks upon. It is proposed to have a vessel of 6,000 tons to carry 1,500 head of cattle on three decks, and to accomplish the passage in 21 days, at a cost of £80,000, which would in my opinion represent less than the half of what it would really be, for with the amount of power that is required (say 2,000 horse) to propel such a body at the high rate of speed necessary to accomplish a passage of 6,000 miles in 21 days, the engines alone would cost more than the £80,000, which has been assumed for the first cost of the whole ship. This requirement amounts to a mean speed of 12 knots per hour, to be kept up the whole time, 750 knots at least of which would have to be done in the teeth of the N.E. trade wind (dead ahead), and judging from the time that the river Plate mails are delivered, about thirty days, I do not think that the passage could be depended upon for occupying less than thirty days, the half of which would have to be made in the tropics, and would be very prejudical to the condition of the cattle. I once took out valuable bulls between decks to Calcutta for the East India Company, in a ship of 1,000 tons, when great expense was incurred and nothing neglected to ensure their safe passage; each bull had a stall built and padded, with room to lie down, and a veterinary surgeon to accompany them, but notwithstanding all our care we lost nine out of nineteen that were shipped, and I have at times brought down oxen from the Cape to St. Helena, occupying time from ten to fifteen days, but only having six to twelve at a time on the upper deck, and fine weather all the way (with the exception of the ship rolling considerably at times), and where they have been well attended to, but I have never found them improve in condition; on the contrary, they have lost substance and often landed in a feeble condition. The proposal to sling them would, I think, be impracticable, looking at the number you would have to sling, and the difficulty that would be found in keeping the slings in the right position to be of any use to them. I believe that the practice would be more injurious than otherwise, causing an irritable uneasy feeling in the animal, which would cause the constant displacing of the slings, and be thus more dangerous to the life of the animals, in my opinion, than letting them take their chance without the slings. Viewing it as a paying commercial enterprise, I do not see the elements of success in it (even if it is practicable of accomplishment, which I very much doubt). I believe all the working expenses are put too low, nor is there any charge for management put down in the statement. Admitting the approximation in the price, feeding, and some of the other items, the comparison stands thus:—

Statement.

		£.
Cost of ship		80,000
Insurance, five per cent.		4,000
Depreciation on value, ten per cent.		8,000
Wages		6,000
Wages, £500 per month.		
Provisions, 20 men at 6s. each, fifty-two weeks		1,872
Wear and tear, and other items		3,000
Coals, 12,000 tons per annum, at 12s.		7,200
Cattle, £2 per head; 6 trips, 1,500 each		18,000
Food, at £1		9,000
		57,072
Receipts.		
9,000 cattle, at £10	90,000	
Deduct 20 per cent. loss	18,000	
		72,000
Leaves profit		14,928

My own Belief.

		£.
Cost of hull	£84,000	
Cost of engines	80,000	
		164,000
Insurance, at five per cent.		8,200
Depreciation on value, at ten per cent.		16,000
Wages		6,000
Provisions, 20 men at 6s. each, 52 weeks		1,872
Wear and tear, and other items		3,000
Coals, 12,000 tons at 15s.		9,000
Cattle, £2 per head; 6 trips, 1,500 each		18,000
Food, £1		9,000
		71,072
Receipts (as above)		72,000
Profit		928

I am, &c., Edward Hight.

To Benjamin Shaw, Esq.

Dr. Pearce remarked that it was a frightfully cruel proposition. Any one who had seen cattle landed here from Hamburgh would say it was better to import dead meat than live cattle. The great desideratum was to import dead meat, not "preserved" but "protected" from decomposition, and he was not aware of any process by which that would be so well effected as by that of Dr. Estor.

The Committee directed that some experiments should be made in this process, under the superintendence of Dr. Estor and the Secretary, and gave their thanks to Dr. Estor and Dr. Pearce for the information they had given.

Third Ordinary Meeting.

Wednesday, December 2nd, 1868; the Earl of Caithness in the chair.

The following candidates were proposed for election as members of the Society:—

Crellin, Philip, jun., 87, Regent-street, W.
Peters, Major James, Junior Carlton Club, S.W.

The following candidates were balloted for, and duly elected members in the Society:—

Arkwright, John H., Hampton-court, Leominster.
Ashby, John, Staines, Middlesex.
Aubert, William, 96, Strand, W.C.
Baily, Farmer, Hall-place, Tunbridge.
Botfield, W. B. Garnett, Windham Club, St. James's-square, S.W., and Decker Hill, Shiffnal.
Briscoe, John Ivatt, Fox-hills, near Chertsey.
Burr, Daniel Higford Davall, Aldermaston-court, Reading.
Clarke, Henry, 6, Regent's-park-villas, N.W.
Coleman, Alfred, 13, St. Mary-at-hill, E.C.
Courthorpe, George C., Whiligh, Hurst-green, Sussex.
Davidson, Ellis A., 29, Clarendon-gardens, Maida-hill, W.
Davis, William, 208, Euston-road, N.W.
Day, John B., Savoy Steam Press, 3, Savoy-street, Strand, W.C.
Denison, Colonel Sir William, K.C.B., F.R.S., Observatory, East Sheen.
Drummond, George James, 11, Wilton-crescent, S.W.
Dunmore, Edward, 81, Malden-road, N.W.
Ellis, Benjamin Trapp, 17, London-road, Croydon.
Erle, Rt. Hon. Sir William, Bramshott-grange, Liphook, Hants, and 12, Princes-gardens, W.
Fernie, Kirwin J., Chaise-lodge, Hendon, and Union Club, S.W.
Fielder, C. H., 30, Moorgate-street, E.C.
Frost, Meadows, St. John's-house, Chester.
Gibson, William, Percy-villas, Maple-road, Penge.
Harrison, Charles, J.P., Stourport, Worcestershire.
Hollis, Alfred Henry, 14, Highbury-place, N.
Hopkinson, William Lander, M.D., St. Martin's, Stamford.
Horner, Rev. John S. H., Mells Rectory, Frome.
Jesse, John Fairfax, Llanbedr Hall, Ruthin, N. Wales.
Johnston, Thomas, 12, Camden-place, Bath.
Kearns, H. W., 4, Granville-terrace, Jeffries-road, Clapham, S.W.
King-Harman, Hon. Laurence Harman, New Castle, Ballymahon, Ireland.
Mast, Christian, Belgrave College, Pimlico, S.W.
Murdoch, George B., 14, Walbrook, E.C.
Nevile, Ralph Henry Christopher, Walcot, Northampton, and 20, Jesus-lane, Cambridge.
Oakes, Thomas Haden, Riddings, Alfreton.
Pearce, Charles Thomas, M.D., 28 Maddox-street, W.
Perkin, W. H., Seymour-villa, Sudbury, N.W.
Peter, John Thomas Henry, Chyverton, near Truro.
Rait, George, 238 Kingsland-road, N.E.
Reeve, William, 40, Cambridge-terrace, W.
Rodd, Francis, Trebartha-hall, Launceston, Cornwall.
Rowley, Rev. W. W., M.A., Coombe-lodge, Weston-super-Mare.
Simms, William Hawes, 21, Thurloe-place, S.W.
Stephens, John, Leytonstone, Essex.
Tayler, Henry Joseph, Collegiate School, Glastonbury.
Taylor, James, J.P., Culverlands, near Reading.
Thomas, W., Cwmaman Collieries, Aberdare
Wade, Thomas, Stonehouse, Plymouth.
Weston, Rev. Henry Austin, Long Preston, Leeds.
Windle, Hattam, 5, Princes-street, E.C.
Wheatley, John Hewitt, Abbey-view, Sligo, Ireland.
Wood, F. C., 483, Oxford-street, W.C.
Woodd, Basil George, Hillfield, Hampstead, N.W.

The Paper read was—

FURTHER NOTES ON THE INDUSTRIES AND PROSPECTS OF NATAL.

By Dr. Mann, Superintendent of Education, and Special Commissioner of the Colony.

On the 29th of January last, the author of this paper had occasion, and the pleasant opportunity, to bring before the Society of Arts some facts and considerations concerning the industries and commercial prospects of the young colony of Natal. The discussion which followed upon that occasion took so general and interesting a turn that it proved impracticable then to meet the many appeals which were made for extended information in the few brief minutes which were at command. The author accordingly postponed the chief part of what should have been then said, if there had been time, until a new session of the Society allowed more convenient and more adequate return to the subject, and now, at the opening of this new session, takes up the thread again, with the addition of some strands which have been furnished by the experience of the months that have passed since the last meeting. And in the first place a simple act of justice has to be done to an unfairly and undeservedly aspersed element, which goes very far indeed towards being the good guardian and beneficent sprite of this colony. A question was asked in the course of the discussion of last January, which seemed to imply that the water of Natal was not altogether as good as it should be. The implied charge of ill-repute was, in some measure, answered at the time by a very competent authority, a gentleman, namely, who was some years Colonial Secretary in Natal, Mr. W. C. Sargeaunt, who stated that it had been his fate, on more occasions than one, to get nothing else to drink for considerable periods at a time than the natural beverage of the running streams of the land, and that he had always found that beverage to be both eminently pleasant and salubrious. The simple fact is that the running water of Natal is scarcely rivalled, and certainly not excelled, by the waters of any country in the world. This is a natural consequence of three conditions which here com-

bine to bring about the most beneficent result, namely, the frequency and abundance of the rainfall, the steep and rapid inclination of the surface of the land which fills all the streams with never-failing sparkle and life, and the hard, clean material, chiefly granite sand-stone and trap, in which most of the water channels are carved. It is a direct result of these conditions that the water so bountifully scattered over the entire face of this South African land is literally distilled water. The photographer who travels through the wild districts of Natal can almost anywhere make his nitrate of silver baths and developing solutions, of water taken from the nearest stream, with as much safety and surety as he can with water distilled for his use by Mr. Rouch, of Norfolk-street, or any other chemist. After the first days of his own experience the author, at Maritzburg, fell back entirely upon water drawn from the open channels cut through the streets of the city by the old Dutch pioneers of the colony, as was their wont. The running water generally becomes turbid after heavy rains, but the turpidity is of a character which tends to the purification rather than noxious contamination of the liquid. It is almost entirely composed of aluminous matter held in mechanical suspension, which falls as a sediment directly the water is allowed to remain at rest, and in falling carries with it to the bottom all other accidental impurities existing in smaller qualities. There are, of course, low-lying situations in Natal, as there are everywhere, where, from want of natural out-fall the water stagnates, and becomes unwholesome and impure. The Port of Durban stands, unavoidably, upon a site of this character. It is built upon a flat of blown sand, raised only a few feet above the high-water level of the ocean, with three of its sides trenched upon by water, either fresh or salt. A considerable portion of it is impregnated by brackish infiltration from the water of the sea, or inner tidal bay. This, indeed, is the chief reason for the false impression that has got abroad concerning Natal water. People speak and write of their early and brief experiences while in the neighbourhood of the port, and their narrative is taken as applying to the land generally. But the truth is that these low-lying, badly-drained, and therefore naturally unsalubrious districts are of very much narrower extent, and of very much more rare occurrence than in most countries on the earth. Even the flat-lying port, to which illustrative allusion has been made, has two magnificent streams of purely crystal water, lying within easy reach, and only requiring a comparatively moderate outlay to bring them into every street and every house in the town in unrestricted abundance—a result which is most certainly destined to be enjoyed by the inhabitants of the sea-port town of Durban before long.

The abundance of rainfall and the absence of absolute drought, is, perhaps, one of the most remarkable features of this land. There are, as have been already stated, well marked wet seasons and dry seasons of the year. But in the dry seasons the rivers and streams never actually dry up, as they do in many parts of this hot African continent. In the course of a close and exact observation of the climate during a period of 96 months, there were only 31 months in which the rainfall did not amount to one inch. Of these dry months there were only thirteen in which the fall was under one-tenth of an inch. During only four months of the series, namely, once in May, once in July, and twice in June, there was no rain at all.

During this period of 96 months, the water which fell at Maritzburg, at a height of 2,095 feet above the sea, would have amounted to a depth of 20 feet and 2 inches if it had remained where it fell. Of this quantity 16 feet and 8 inches belonged properly to the six months of October, November, December, January, February, and March. Three feet and 2 inches belonged to the months of April, May, August, and September; and 4 inches belonged to the months of June and July.

It has been said that the water of Natal goes very far indeed towards being absolutely the good guardian and beneficent sprite of the land. The one point in which it fails of being the good sprite entirely is, however, a quantitative and not a qualitative consideration. It never fails altogether. Even in the rare months of no rainfall, in consequence of the peculiar conformation of the physical relations of the land, dews and night mists settle upon the hills in sufficient force to make the running streams everlasting; but it does sometimes manifest a too generous bounty for a brief interval; an occasion of this kind has just occurred. On the evening of Friday, the 28th day of August last, rain began to fall on the coast district of Natal, and continued to do so until twelve at noon on the following Monday. Within those sixty-four hours the fall amounted to 16·54 inches; that is to say, in that short period it exceeded one-third of the mean annual rainfall of Maritzburg city, derived from a period of eight years' observation. The rivers of the coast rose rapidly into flood, and damage was effected within the three short days to public works, chiefly roads and bridges, which it is estimated it will cost £40,000 to repair. The most important portion of this is due to the sweeping away of one fine bridge which had been constructed over the lower part of the river Umgeni, to connect the port with the coast county of Victoria, in which the planting of sugar and coffee has received the largest development. This bridge was completed in the month of September, 1864, at a cost of £19,000. It consisted of iron girders, resting on cylindrical iron piers, which were screwed to pile beds driven twelve feet under the bed of the river, and was 900 feet long. The height of the girders above the river was pitched at an elevation, in excess of an excessive flood that occurred in April, 1856, and that was the only previous incident of the kind experienced within the historical period of the colony. On the occasion of this last great rainfall, however, the water of the river Umgeni rose so rapidly through the Saturday and Sunday, that at four o'clock on the afternoon of this day it was within two feet of the girders of the bridge. A little before this time a colonist named Fell, and twenty-two of his native servants, were on the bank of the river at this spot, when they saw the flood in the ordinary channel of the river sweeping down toward them like a wall. They were unable to escape the sudden rush of the stream, and only saved themselves by climbing into a large tree that was near them, from which perilous and precarious refuge they were at last rescued by a boat, and by an act of some courage and daring, after some hours of exposure. At seven o'clock in the evening the water was one foot above the girders of the bridge. At four o'clock on the Monday morning the current was running between ten and twelve knots, and where the bridge had been on the previous day there remained only two shattered girders and three isolated cylinders. The costly bridge was gone.

Six other bridges, besides this large and important one, were destroyed. These were all upon rivers towards the sea. One inexpensive timber bridge was swept away at the city of Maritzburg, which is about forty miles in a direct line from the sea; but all bridges further inland suffered only slight damage. The rainfall at Maritzburg was 12¾ inches during the 64 hours, and the river Umsimduse there rose between 20 and 25 feet.

Only two floods of this destructive character have occurred in the colony of Natal within the period of civilised occupation, and therefore of historical record. The first was in 1856; the last in the present year (1868). An approach towards a similar occurrence was made in 1865, but the rainfall on the coast was then only 8·97 inches, not enough to cause anything beyond temporary inconvenience to travellers. It is, however, well worthy of remark, that all these three instances of excessive rainfall took place in the dry season of the year. The first was in the month of April, the second in the month of June, the third in the month of August. These are all

essentially and properly dry months. The explanation of this is very plain and obvious. These heavy rainfalls are simply caused by the movement of a large body of air fully saturated with moisture from the vast ocean space towards the south-east upon the land in a season when its temperature is at the lowest. If the same thing occurs at a season when the land temperature is comparatively high, the saturation point of the air is not lowered, and the deposition of the large load of water is not caused in the same rapid, energetic, and sustained way. In all these cases the great brunt of the rainfall occurred upon the coast district, where the first contact of the water-laden air with the land was effected. The rain became less and less with advance inland, and the up-country rivers were scarcely swollen; this will always be the case with the Natal floods of this character. It is now obvious that at distant intervals extreme rainfall, capable of flooding the lower portion of the river channels to an inconvenient extent, must be anticipated, and that bridges upon these rivers must be either of a more or less expensive nature to meet the contingency. Until bridges capable of bearing the strain of any flood can be constructed, cheap, although serviceable, timber that does not involve ruinous loss when swept away must be looked to. An estimate has already been made for immediately replacing the Umgeni bridge by a timber structure that will not cost more than £2,000, and that will be calculated to perform all essential duties for several years. It is perhaps worthy of note, that wherever these floods do most immediate damage to the crops, they leave a large measure of compensation behind them by manuring the flooded land with rich alluvial soil. It is, therefore, in the direction of the damage effected upon public works that their injurious influence is most permanently exerted. In the higher districts their baneful power tells chiefly upon the insufficiently protected live-stock of the farmers scattered over the hills. The woolled flocks are of course especially liable to suffer from the visitation, as the flock masters have not yet made any extensive or adequate provision for meeting such emergencies.

Up-country rivers are occasionally swollen into flood; but such floodings in those districts take place in the legitimately wet season after thunderstorms. They are much less extensive and violent than the coast deluges, but generally more sustained. The up-country rivers are usually impracticable for horsemen and ox-waggons at these open fords, or drifts, as they are locally termed, during several weeks of the summer season.

One of the most important considerations in connection with the destruction of this bridge over the Umgeni river is the fact that, if it had not been destroyed, there would have passed over it this season, for shipment at the port, five thousand five hundred tons of sugar, two hundred tons of coffee, and forty thousand muids, or sacks, of Indian corn, all produced by this one coast county of Victoria, to which the bridge was the immediate outlet. As a supplement to what was said and printed last year in regard to the productive industries of this young colony, I may now state that the general increase in the production of the land has been surprisingly and unprecedently large. The value of the exports of the colony of Natal for the first nine months of the year 1867 amounted to £168,701; their value for the first nine months of the year 1868 was £200,023, giving an increase for this period of nine months of £31,322. For the first time in these nine months the exports of the colony have very nearly approached the imports in value. The value of the exports for this period was £200,023, and the value of the imports £212,382; the excess of the value of imports over exports for the period being thus only £12,359. It is also worthy of note, as indicating at last some slight rallying from the severe blow of the commercial crisis and panic, that the value of imports in the first three months of 1858 was £8,838 larger than in the first nine months of 1867, although, from some unascertained and unexplained cause, certainly not very intimately connected with any increased temperance of the community in the matter of strong drink, but much more probably depending upon some phase of the increase of internal production, the value of spirits imported in the nine months of 1868 was only £2,264, against £5,539 for the corresponding nine months of 1867.

In connection with, and in partial explanation of, this very gratifying and healthy sign of rapid increase of exportable produce and value, it may be said that the prospects of the season, irrespective of the influences of the one temporary drawback, the occurrence of the flood, for the three most important staples of the colony were eminently auspicious. The canes were reported to be everywhere in the finest possible condition. Three plantations near Durban, belonging to well-known planters, are spoken of as yielding this season 1,300 tons of sugar between them, the yield on two of the estates being estimated at three tons of sugar per acre. One of the estates is paying £16 per cent. for the year. The coffee crop is rapidly growing into notice and estimation. For the first time, I believe, twenty-five tons of coffee were tendered to a Durban merchant, who himself communicated the fact to the author, by one planter. The crop of the berry was promising well everywhere, and the estimate of produce of the plantations had been in every case exceeded, and in some cases doubled. One grower had had reason to complain that his store buildings had been broken down by the unexpected load he had been called upon to place in them. A sample of coffee sent home by Mr. H. Gillespie, a gentleman who spoke of Natal prospects in the room of the Society in the January meeting, was sold for 76 shillings the cwt., and the brokers who effected the sale stated that it would have commanded a higher price but for the fact that pea-berry and flat-berry coffee were injudiciously mixed together in the consignment. When this sale was made the best Ceylon plantation coffee was selling in the market at 80s. and 84s. per cwt. The Natal coffees are generally held by competent judges to resemble the finest samples of Indian produce. A specimen of Mr. Gillespie's consignment is placed before the meeting.

It will be remembered that in the January meeting Sir Charles Nicholson dwelt pointedly upon the fact that sheep do best in low, flat, dry plains, and that they are not suited to wet and mountainous countries; and from this drew the inference that sheep-farming can hardly be expected to be largely or very successfully prosecuted in Natal. A reference to the clause of the author's January paper relating to Natal sheep, printed on page 213 of Vol. 16, will show that in this remark Sir Charles was very much repeating what had already been advanced. The important part of that clause will be found to be to this effect:—"The inference is obvious, that sheep farming in Natal will ultimately consist of the rearing of comparatively small flocks in connection with the general tillage of the soil, as is done in England, rather than in the possession of unlimited flocks roaming wild over the prairie. There is now no doubt that, where this system is pursued, artificial food provided and due skill and care exercised in the selection of the farm, and in the management of the stock, sheep will prove a most marked and important element in the Natal settlers' prosperity." During the last year this view of the case has received some further remarkable illustration. One typical instance may be adduced:—An old colonist, connected with the Government Civil Service, who is farming within six miles of the capital, and who would have been present in the meeting of this evening but for the fact that he has been compelled to leave London to embark in the steam-ship "Asia," leaving Falmouth for Natal on the morrow, gives as his own personal experience with sheep in that locality, which is among the hills, but only 2,000 feet above the sea, the following statement:—He bought 530 sheep in March, 1867; and his gains and increase up to the present time are—

	£	s.	d.
April, 1867.—320 lbs. of wool sold at 8¼d. per lb.	11	0	0
December, 1867.—943 lbs. of wool at 1s. 1½d. per lb.	53	5	4
March, 1868.—490 lbs. of lambswool, at 10¾d. per lb.	21	18	11
250 lbs. of wool tailings, at 3d. per lb.	3	2	6
74 hamels, worth 10s. each	37	0	0
150 lambs, worth 8s. each	60	0	0
	186	6	9

And the flock when he left the colony, some five months since, consisted of 697 sheep, and 150 lambs were then nearly due. This instance sufficiently justifies the well considered and guarded statement that under due skill and care sheep will prove an important element in the Natal settlers' prosperity. Sir Charles Nicholson dwelt upon the unquestionable fact that the 200,000 sheep of Natal are under the mark of a single Australian flock-master's share. This, however, is only one side of the argument, and goes to prove what no one questions, that Natal is not such a sheep land as Australia. Natal does not profess to be so. What Natal affirms is, that she can profitably add sheep, under a good system of management, to other industries, and that wool, and coffee, and sugar can be grown in Natal with advantage within fifty miles of each other, and within easy reach of the sea; and she then points to the fact that there are now over 200,000 sheep where twelve years ago the Dutch farmer believed sheep could not be reared or fed at all, because the country was "wet and mountainous" and approximately tropical. It is in this point of view that the 200,000 tells.

In January last, it was said that a gentleman, used to the management of the silkworm in China, had just left England for Natal, to give silk an experimental trial in the colony. This gentleman has taken up a tract of land within twenty miles of the port, at a rental of 2s. 6d. an acre, with right to purchase within five years at £1 an acre; and he writes to me under date of the 1st of September, 1868, that he is now only waiting a supply of good Japanese seed that he has made arrangements to get forwarded, and that he has laid himself out for the cultivation of silk, cochineal, coffee, and opium; and he adds that he is quite satisfied that any man who could join him with £700 or £800 could scarcely find a better investment.

Specimens of Natal coal were shown in the January meeting, and it was stated that there were large deposits of this mineral within 180 miles of the Port; that the exact geological character of the deposit had not been determined; and also that no sufficient trial of its quality for raising steam for driving machinery had been made. The author is now able to furnish further evidence on the two practical points. Specimens of organic remains associated with the coal deposit from one spot within 60 miles of the capital, namely, the Channel of the Bushman's River, sent to him by Dr. Sutherland, the Surveyor-General of the colony, are now before the Society. These specimens have been carefully examined, with the author, by Mr. Robert Etheridge, the well-known and highly-qualified palæontologist of the School of Mines, in Jermyn-street, and there is no doubt that these specimens consist mainly of impressions of a *Glossopteris*, in all probability *Glossopteris Browniana;* and that there are traces among the *Glossopteris* impressions of fronds of a *Dictyopteris*, and of seed cases and stems of a *Phyllotheca;* all of these being forms of organisation of Mesozoic rather than of Palæozoic age. The Natal coal of this particular locality is certainly either jurassic or cretaceous. But the consideration, of course, yet remains whether all the coal in Natal is of one age and geological character.

In regard to the question of mechanical usefulness and commercial value, a very important and altogether reliable trial has now been made, and the result of this most interesting experiment has been officially and authoritatively communicated to the author by the Honourable the Colonial Secretary of Natal. Seven tons of the upland coal, identical with the specimens which were exhibited to the Society of Arts in the beginning of the year, were put on board Her Majesty's surveying ship *Hydra*, and carefully tested by Mr. Lodge, the engineer, in comparison with an average sample of north country English coal, and a best-quality sample of Welsh coal. Captain Shortland, of the *Hydra*, reported the result of the trial from Algoa Bay, on the 2nd of June, 1868, and the tenor of his report was to this effect:—

In regard to the number of minutes and quantity of coal required to get up steam with the various samples, the result was:—

Cardiff coal—Steam up in 60 min., with consumption of 26 cwts.

West Hartley coal—Steam up in 50 min., with consumption of 32 cwts.

Natal coal—Steam up in 55 min., with consumption of 30 cwts.

The Natal coal got the steam up more quickly than the Welsh coal, but the consumption was larger. It got steam up less quickly than the Hartley coal, but with slightly less consumption.

In steaming on the third grade, with the same amount of water raised into steam, the consumption of coal per hour for the various samples was:—

	lbs.
Cardiff coal	1,553
West Hartley coal	1,648
Natal coal	1,568

In steaming on the second grade, with the same amount of water raised into steam, the consumption of coal per hour was:—

	lbs.
Cardiff coal	1,624
West Hartley coal	2,293
Natal coal	2,128

The several samples yielded of ashes:—

	per cent.
Cardiff coal	9
West Hartley coal	8
Natal coal	16

They yielded of clinker:—

	per cent.
Cardiff coal	2
West Hartley coal	5
Natal coal	7

The Cardiff coal yielded very little smoke of a light-brown colour. The West Hartley coal yielded a large quantity of black smoke. The Natal coal yielded a moderate amount of light-brown smoke. Upon the whole, Mr. Lodge considered that for easy steaming the Natal coal was very nearly equal in value to the Cardiff coal; that when as much steam as can be generated is required, a larger quantity of Natal coal than of Cardiff coal is required, in consequence of the greater abundance of earthy matter contained in it deadening the fires, and making it impracticable to keep up the full supply without constant use of picker and rake; and that if samples of Natal coal could be found with somewhat smaller proportions of earthy matter than the specimen used in the trial contained, the mineral would be fully equal, for all purposes, to the best qualities of Welsh coal.

It will be remarked that this actual trial of Natal coal fully bears out the presumption established by the examination of the organic impressions from Bushman's river. The main characteristic of the Secondary, or Mesozoic coal, as contrasted with the older Palæozoic coal, is the greater abundance of water and earthy ingredient combined structurally with the combustible elements, carbon and hydrogen. No absolute progress has been yet made in resolving the question how this

valuable coal deposit is to be turned to practical account; how the mineral is to be got down to the port for shipment in large quantity, at reasonable and available cost. The consideration of the possibility of constructing a main line of railway that would answer this purpose has been before the Legislative Council in its recent session; but the time when the public revenue is still suffering severely from the commercial crisis is, unfortunately, one in which the difficulty of construction, as well as the need, is, for the period, increased. A survey has, however, been run from the port through the capital and the coal district up to the northern frontier of the colony, and evidence of all kind has been taken before the House. I believe the entire rise of the gradient up to the coal district, allowing for the frequent undulations of the country which has to be passed, has been estimated at seven thousand feet in a length of 180 miles, or thereabout. It is considered quite practicable to construct a line for slow rates of speed; and for a single line, with three feet six inch guage, and metal stout enough to bear heavy traffic, at twelve miles an hour speed. Two several estimates have been furnished by practical men who have examined the country; the one estimate being for about £3,000 a mile, and the other estimate about £5,000 a mile. In the meeting of January last Sir Charles Nicholson drew attention to the fact that the feeling in British colonies is for, and the experience against, too early railway enterprise; and especially instanced, in warning, the case of colonial governments which had expended three and four millions of money, and encumbered themselves with a debt which it would take years to pay off. There is no doubt whatever that it would be the easiest thing in the world for Natal to do the same thing. But, on the other hand, it is not perhaps altogether clear that Natal may not use the warning in a different sense to that in which it was given. At any rate the author, after still further consideration of this most important subject, continues to believe that it may be so. The true principle, he submits, has been most admirably laid down in connection with Indian affairs. Railways tend everywhere to the development of popular enterprize and wealth, and it is the duty of the government of a young land to use its utmost influence to bring this very energetic engine of amelioration and civilization into play as soon as it can. Of course, it may make the attempt to perform this duty clumsily, inefficiently, and injuriously. The task is one which calls for great prudence, circumspection, and sagacity. But the principle which ought to govern its action is a very clear and plain one. It is simply that a government guarantee for the construction of a railway may always be given with propriety when the increase of prosperity worked by the railway is sufficient to afford such a return through public taxes, as covers the difference between the actual gains of the railway and the amount of the government guarantee. The mere question of whether a railway will pay in the ordinary business sense of the term may not be the most important consideration where the opening out of increased facilities for communication is also a matter of primary and immediate moment to a young and struggling community. A writer in the *Times* recently, very strikingly and truly said that so long as sheer hard labour of man or beast slowly bear through dust and mire whatever has to change its place, a country, as regards its comparison with more advanced and fortunate lands, is like primeval man armed with lances and bows matched against the cannons and rifles of modern Europe. The writer's impression unquestionably is, that with the earliest return of prosperity to the colony of Natal it will be found practicable for the colonial government successfully to perform this duty of developing the means of easy internal communication upon a scale which will fulfil the fundamental principle here enunciated, will supply all that is actually necessary for cheap, easy, and constant transport, and yet not cripple the community with an intolerable burthen. It should never be overlooked that Natal stands in a very peculiar condition, and that while the general position of the influence of a railway upon enterprise and prosperity applies to this colony as to all other lands, there are three especial reasons why the railway is paramountly demanded here. 1. There are large deposits of valuable coal that are entirely useless until the railway has provided means for the transport of the "black diamond." 2. The produce of a large tract of the interior has to be drawn down to Natal by the facile character and recommendations of this outlet. 3. A railway will at once throw open the broad lands of the colony, at present almost locked up from industrial enterprise, to settlement; and carry the market for produce to the doors of those who now scarcely trouble themselves to produce, because when they have produced they do not know what to do with their productions. The author entirely agrees with Sir Charles Nicholson that Natal had far better wait for its railway if it be true that it can only have the boon by contracting debts of millions of pounds sterling; but if this be not true, and if it be possible to construct in this colony a railway of single line and narrow guage, to work at slow speed, for moderate outlay—even, it may be said, at the cost of £5,000 per mile—the sooner the beneficent work is commenced the better for all concerned. Both the construction and the working must, of course, be carried out under most careful and rigid economy. In the first instance, it must be so planned as to satisfy certain primary and essential requirements. It must gather the produce of the most developed settlements; it must connect the capital with the port; it must penetrate the coal-fields; it must bring the inland frontier into communication with the sea; and it must carry new settlers to as yet unoccupied territory. Such is the problem. To this problem it may not be possible to furnish an immediate solution, but if some of the signs that are now rising on the colonial horizon are not false tokens, the solution will be found ere long.

There was one other remark made by the chairman of the January meeting of the gravest importance, and which deserves, not only to be reproduced upon this occasion as a theme for a passing comment, but also to be reproduced continually, and kept ever in prominent view. Sir Charles said his attention was never drawn to the great colonial dependencies of England without his having also aroused the feeling of deep anxiety and regret that the capabilities of these magnificent regions were not more generally known and appreciated in the parent country, seeing that there was in them every material for furnishing happy homes, prosperous lives, and the means of subsistence for countless numbers of our fellow-creatures, who are struggling with want, and pining with discontent in the over-crowded land of their birth. But Sir Charles added that, with all the colonies, there is but one way to enable themselves to become what in this particular they are so obviously intended by nature to be, namely, the organisation of a good system for the ready and easy acquisition of land. This incontrovertible and most pertinent remark was made in allusion to a statement which appears at page 215, vol. xvi. of the Society's *Journal*, "that after a considerable period of entire arrest of all facilities for the acquisition of land in its territory otherwise than by purchase, at artificially fixed prices, the colonial Government had just matured a scheme for granting assisted passages and allotments of Crown land to men who had the double qualification of special training and fitness for agricultural pursuits, and some small means to start with in their work of cultivation and stock-rearing. This system has been so far successful, that although the principle has been rigidly adhered to of endeavouring to select and introduce men who are fairly likely to find prosperity in a land which has a considerable abundance of cheap native labour, and which, therefore, furnishes for the present a very limited sphere of employment to white men, who have to look to wages for their daily bread, and therefore of entirely excluding the classes who alone are

always ready to furnish recruits for emigration, 182 grants of Crown land have been made within a period of eighteen months, comprising in all an area of about 19,000 acres, and 21,000 acres of commonage, supplemented by 33,000 acres of contiguous land, reserved for easy purchase by the settlers within five years. This organisation continues to be in force in the main, and gives ample promise of continued vitality and usefulness, although there has not, of course, yet been opportunity to test the results by the only rule that is of any final and ultimate value, namely, the fortunes and positions of the settlers. But, unfortunately, one correlative and practically important feature of the scheme has had to be for a time so far reduced as to be almost placed in abeyance, in consequence of the temporary limitation of the public revenue, and the present need for the observation of most rigid and scrupulous economy in public expenditure; this is the granting of money-assistance towards defraying the passages of settlers.

During the past eighteen months as much as £2,860 has been expended by the colony in this way, besides various minor charges that have been met to give other incidental help. For the next year the assistance will only be able to be given to a very limited number of applicants, but the land grants will still be made in favour of settlers who are able to defray the cost of their own passages; and with the return of the revenue of the colony to its more normal condition of prosperity and progressive increase, the more liberal proceeding will, in all probability, be renewed.

In the January meeting the chairman remarked, in allusion to this topic, that the administrations of Canada and the American and Australian colonies were competing with each other in furnishing land on the best and cheapest terms. It is, however, worthy of note that there are certain most emphatic figures on record that show that the brunt of this competition issues neither from Canada nor from the American or Australian colonies. In the last year, of 200,000 emigrants who left the British Isles to seek in other fields "happy homes, prosperous lives, and enlarged means of subsistence," 160,000 went not to Canada, nor American or Australian colonies, but to the Western states of the great Transatlantic republic. The reasons for this result will of necessity have to be very carefully scrutinised and weighed wherever the organisation of a successful, as well as of a good and easy system for the acquisition of land is contemplated. Among the reasons will be found the fact that the voyage and journey to these Western states are short and cheap; that there are railways penetrating quite into their recesses; that there are abundant markets everywhere in consequence of the stream of new population that is already established, and that is, therefore, carrying with it the wants and the increased demands for employment that are incident to such a flow. To this must also be added the consideration that in these Western states, namely, in the districts of Nebraska, Illinois, Wisconsin, and Iowa, an alien who will naturalise himself as a citizen of the United States by a declaration, and the payment of a fee of 14 dollars (about £3) may claim a free grant of 160 acres of open agricultural land, with the addition of 50 other acres for every child, male or female, and may purchase a further tract of 360 acres at a dollar and a quarter (about five shillings) per acre.

For various reasons it is exceedingly difficult for lands circumstanced like Natal to compete successfully with lands that have practically boundless territory, still to give away, as is the case with the United States of America, in establishing a successful and healthy immigration of men who have the right qualifications. At the present time the colony of Natal has not much above four millions of acres of Crown land remaining in the hands of the government, and of these some considerable portion is of course unavailable for cultivation, or the formation of small homesteads, from physical reasons, and other portions are quite on the confines of the colony, the more central parts of the land having naturally been first taken up by private proprietors. As, however, much that has been so taken up is necessarily still unoccupied and unused in any industrial sense in a land where the population of a third-rate English town, namely, 17,000 people, hold and are presumed to fill the remaining seven million acres, it becomes a matter of the utmost moment to the present prosperity of the colony that some fair and just means should be found, if possible, to determine gradually the occupation of these wastes. There are various questions and considerations involved in the existing position of this matter that renders the affair as a whole both delicate and perplexing. The old government expedient of imposing a non-occupation tax upon all farms not industrially occupied has not succeeded in bringing this land into cultivation and use. Some of the most liberal and public-spirited proprietors have recently been granting small holdings on their estates upon easy terms of deferred payments; and at the present time the Natal Land and Colonization Company has stepped in to supplement the government action, where the government has for a time broken down, being actuated by the impression that any arrest of the movement of settlers towards the colony, which has now been fairly started, would be a disaster to be deprecated and rued by all classes of the colonial community, and by none more than by large holders of waste land, who look to realise within a reasonable period the money advances they have made in the acquisition of their property. This company owns a very large and very varied tract of land scattered throughout the colony, from the sea to the inland frontier; and it has now determined to supplement the retarded action of the Government by granting freehold allotments of portions of this territory, of 100 acres in extent, to suitable men, of a similar class to those which have been hitherto selected for the land grants of the Government, and to facilitate the transport of these men to, and their settlement upon, their grants, by securing them free passages to the colony, and reception, conveyance, and hutting there upon payment of ten pounds at once, and upon repayment, within a period of twelve or fifteen months, of such further sum as shall have been actually expended in their behalf and for their advantage. This is a very interesting experiment in the direction of that "organization of a good system for the acquisition of colonial land," alluded to by Sir Charles Nicholson as the indispensable condition of successful and healthy immigration. It will, however, require that it shall really be a matter of organization; and that all the details of the movement shall be thoughtfully, considerately, and judiciously carried out; but it certainly is not impossible that the "organization" may be so far perfected and established as to secure both the present advantage of the recipients of the land grants, and the ultimate advantage of the donors. The primary and essential condition of success in such organization is, that men of good special qualifications, but small means, shall be placed in a position where they can certainly extract from their own land returns that will enable them easily to repay the value of the advances that have been made to secure them this advantage, and shall be shown how to set to work to accomplish this first step towards prosperity and independence in the previously untried field. There must also be facilities for the acquisition of extension of their free grants and holdings upon assured and easy terms, as they realise the first fruits of their independence and industry. The freehold grant is simply the foothold of the invader of the new soil, whence he has to plan and conduct his further operations—the fulcrum of the lever by which the new fortunes are to be raised. One most important attribute of the action of this experiment is, that if it does succeed there is no practical limit to the extent to which the operations may be carried. More and more land, now lying hungry and waste, and therefore being now without absolute value, will be taken up from private

proprietors, and placed in the hands of thrifty and industrious settlers.

The limited time at command in a meeting of this character does not permit more than one other theme to be touched upon on this occasion. But that theme is one which can on no account be passed silently just at this period, when the fortunes and prospects of Natal are under discussion. As recently as the 27th of July, 1866, a young German explorer, Carl Mauch, who is bent upon traversing the entire length of the African Continent from south to north, when making an excursion with an old elephant hunter into the high region between the Limpopo and Zambesi rivers, came suddenly upon a spot where there was the clearest indication of gold-bearing quartz in considerable quantity, and where there were numerous artificially made pits, which had obviously been used in some remote period for some rude mining purpose. The rivers Limpopo and Zambesi lie, in this part of their course, respectively upon the 23rd and 16th parallels of south latitute, and, therefore, include a stretch of some 250 miles of country between them. A considerable portion of this district is composed of an elevated table of granite, crossed over with the small rounded eminences which are characteristic of this formation, and intersected with veins of quartz, most certainly auriferous in various portions. Carl Mauch states that he found indications of gold through a line that extends 200 miles from south to north, and that he has no doubt whatever, from the general aspect of the country, that identically the same physical conditions extend far towards the east and the west. Two distinct centres are especially specified as being peculiarly rich in promise—the one near the chief Mosilikatze's principal place on the Umkose river, and at Kumato, on the 19th parallel of south latitude; and the second sixty-five miles further to the north-east, on the rivers Sekwechene, Sepakwe, Umzwerve and Umfuli, near the 18th parallel of south latitude. The southernmost of these fields lies upon streams which flow southwards into the Limpopo, and is about upon the same meridian of longitude as the mouth of the Kei river, but fourteen degrees of latitude further north. The northermost field is on the same meridian as the capital of Natal, and twelve degrees of latitude to the north of it.

Of course, public attention has been very generally attracted to this discovery of Carl Mauch's. He has himself been down into Natal, and given to the authorities there a circumstantial account of his expedition; and various hungry and longing adventurers, drawn by the *sacra fames*, have been already tracking his footsteps. Upon the whole, all the incidental information that has been further gleaned has been confirmatory of Herr Mauch's views and statements. One party, which did not succeed in reaching actually to the first gold tract of Carl Mauch, nevertheless brought back to the Transvaal about one ounce and a half of gold dust, and six hundred weight of auriferous quartz, yielding at the rate of eight ounces per ton. During seven weeks' operations upon the river Tatin this party turned up twenty-five tons of similar quartz, which they estimated would give gold worth at least £1,000.

But the most remarkable part of the matter still remains to be told. This gold region of the Limpopo and Zambesi is in reality no new discovery. In 1858, Mr. T. Baines, when at Tete, on the Zambesi, with Dr. Livingstone, saw six bars of pure gold, six inches long and half-an-inch thick, which had been procured from the Luenza and other tributaries of the Zambesi. At this time Senhor Pito, of that place, had several native goldsmiths at work for him. In an old book, which has recently been brought under my notice by a friend, and which is entitled "A Geographical Historie of Africa, written in Arabicke and Italian, by John Leo, a Moor, borne in Granada and brought up in Barbarie," printed in the year 1600, by George Bishop, of London—there occurs the following passage:—"Throughout all this Emperor's (Monomotapa) dominions is found infinite quantitie of gold, in the earth, in the rockes, and in the rivers. The gold mines of this country nearest unto Sofala, are those of Manica, upon a plaine environed with mountains; and those also in the province of Matuca, which is inhabited by the people called Battonghi, and situate between the equinoctial line and Tropique of Capricorne. These mines are distant from Sofala between the space of 300 and 600 miles; but those of the provinces of the Boro and Quitieni are fifteen hundred miles distant towards the west; so that from hence, or from Sofala, or from some other part of Monomotapa, some are of opinion that Solomon's gold for the adorning of the temple at Jerusalem was brought by sea." In 1861 Dr. Beke drew the attention of the meeting of the British Association for the Advancement of Science, to the reasons for concluding that the entire eastern side of the basin of the Nile is auriferous, and that the gold of Ophir was obtained from this source, although Ophir itself was in Arabia. Dr. Beke holds the very rational and probable opinion that the gold of Ophir, Havilah, and Sheba, was brought to those maritime districts of Arabia by the south-west monsoon, in the ships of "Tarshish," which went, as native vessels trading between the head of the Red Sea and the Persian Gulf still do, in one year, and returned in the next, and so employed "three years" about the voyage. Dr. Beke now believes that the whole of the east coast of Africa, from the all-golden Berenice (Berenice Panchrysos) of the Greeks in the north, to the gold coast (Sofalah-Edh-Dhahab) of the Arabians in the south, is auriferous, and that Herr Mauch's discoveries are the southernmost extreme of this golden region.

At any rate, there can now be no doubt that in the high inland region of South Africa, lying a few hundred miles directly to the north of Natal, there is gold. The only question that now has to be decided in regard to this precious deposit, is whether it exists there in sufficient quantity and under circumstances which will allow the mines to be profitably worked. It is a matter of direct consequence to Natal that this question should be answered as speedily and as fully as possible, because, if the answer is in the affirmative, the other pressing matters, such as immigration, and the settlement of the land, the railways and the coal mines, will certainly arrange themselves without further special interference. In order that the answer may be as full and as complete as possible, a small company of men, principally interested in the fortunes of Natal, has been formed to send out a small but well-equipped exploring expedition, which will sail from Falmouth in the steamship *Asia*, on the morrow of the day on which this paper is read. The geographical leader and explorer of the expedition is Mr. Thomas Baines, who has already crossed the entire breadth of the African continent in these parallels of latitude, with the exception of the small gap which he is now about to fill. The mineralogist of the expedition is Mr. Nelson, a Swede, who has been eleven years in California, and is a thoroughly expert assayist. The expedition has been very carefully equipped with instruments and appliances of every kind, and has been instructed primarily to determine the fact whether there is any gold region in this locality which can be made the seat of large operations, and secondarily, to extend the geographical and mineralogical examination of this most interesting region as far as may be compatible with the efficient attainment of the primary object. It is hoped that at no distant time the facts ascertained by this expedition will be in the hands of the public. In all probability its proceedings will become the subject of some future communication to the Society of Arts.

The only "last word" that can be added to this communication relates to the character of the route to these gold fields. This is naturally a matter in which some difference of opinion and of view is entertained, and every man who has a door in this direction of course hopes that his own threshhold may be worn by the feet

of the gold-seeking and gold-laden pilgrims. As others have said, and will say, all that can be advanced for the routes by Cape Town, for Algoa Bay, for East London, and for the Zambesi, the author will confine his own remarks to the route which brings the subject properly within the scope of the communication now on hand, namely, the "Industries and Prospects of Natal;" and in doing this he will simply produce the evidence of an eye-witness, whose veracity and intelligence are known to him. The following passage is an extract from a letter addressed to the author, within the last four months, by Mr. A. K. Murray, an old and well-known resident in Natal. Mr. Murray writes "When I got to Grahamstown and Port Elizabeth, through Potchefstroom, Kronstadt, Bloemfontein, Colesberg, and Bedford, I found great excitement about the gold-fields, and was quite run after for news, and for an expression of opinion about the routes of access. From my experience now, and about five years ago, when I went north in the Transvaal, as far as Zontpannberg, near the Limpopo, I am bound to say that the route by Natal, Harrysmith (in the Free State), and Potchefstroom (in the Transvaal), is by far the shortest, easiest, cheapest, and best way, for many reasons, amongst which must be named, that at Natal there is now a good harbour, and that the main road from the port Overberg is all a good Government-made road; that all the principal rivers (except the Tugela, and that has an iron punt) are crossed by substantial bridges. The formerly difficult pass across the Drakenberg is now an easy-made road, over which I have myself taken many loads of merchandise, one weighing not less than eight thousand pounds, with fourteen oxen. I have had merchandise conveyed from the port of Durban to Pretoria by this route for twelve and fifteen shillings the cwt. When once over the Berg, and in the Orange River Free State, the country to Potchefstroom is flat, level, and easy, with good grass and water all the way, and in the Free State with plenty of game. In July last year I made a run down to Natal from Pretoria with a loaded waggon in twelve days. Sixteen and eighteen days is the usual time for the distance. Mr. Marras lately drove up in a light cart and two horses in six days. Potchefstroom, the principal town in the Transvaal, and the natural point of departure and supply for the gold region, is about 350 miles from Natal, 660 miles from Capetown, and 540 miles from Port Elizabeth. In passing the great Orange River, there bounding the Free State and Cape Colony, I had to pay threepence per head for my cattle being allowed to wade through at the drift, and five shillings for each waggon that was dragged through. All through this part of the Free State, and the upper part of the Cape Colony, not a blade of grass was to be found. I had to buy oat forage for the animals to keep them alive. I found the first available grass within 150 miles of Capetown. I encountered also plenty of tolls (of which there is not one in Natal) all the way along, and often had to pay high for a drink of water for my oxen at the farmers' large dams. On the Cape route oxen too were expensive and the wages of drivers and foreloopers were two or three times higher than in Natal."

Carl Mauch's report of the distance to the gold-field from the Megaliesberg, close to Pretoria, named by Mr. Murray as being from twelve to eighteen days from the Natal harbour, was 224 hours of actual travel by the ox waggon. The time occupied was 96 hours of travel to Sechomo's kraal, near to the great eastward head of the Limpopo, and 126 hours thence to Mosilikatze's kraal, which is just over the highest point of the water-shed between the Limpopo and Zambesi, on the Zambesi side.

DISCUSSION.

Mr. Gooch said he had only just returned from Natal, where he had been spending some time in observing the condition and prospects of the colony. With regard to the question of water supply, he believed the only place where the water was at all bad, was where it lay in the flat lands, and there the sinking of tube or other wells of sufficient depth would overcome any difficulty. The running water in the upper districts was, according to his experience, exceedingly good. He had a special interest in the question of coffee cultivation, and, as far as he could judge, if it did not promise to be extravagantly lucrative there was every prospect of a very good return for the capital required, which would be from £4,000 to £5,000, and there were many circumstances connected with this pursuit which might render it attractive, even apart from purely business considerations. The sum of money he had named would of course be invested over a period of years, and at the end of six or seven he believed there would be a return of something like twenty per cent. There seemed few difficulties in the way of this branch of agriculture, the only one that occurred to him being whether the seasons were sufficiently regular to ensure a fair annual crop. No doubt last season's crop was very good, but he did not know whether experience had yet been sufficiently extensive to enable cultivators to depend on such a result pretty uniformly. The Natal coal was undoubtedly good, although it differed somewhat in character from English coal. As they had heard, it seemed to belong rather to the Mesozoic than the Palæozoic age, and the prevailing type of fern was *Glossopteris*. At any rate, the coal deposits appeared fully worth investigating and working. The question of railways was no doubt of prime importance, but there were certainly great difficulties in the way. In the first place, the climate was quite tropical in its character, which would be an obstacle in the way of English workmen, and there were also the great and sudden alternations of temperature. Again, the presence of the white ant would necessitate the construction of the line entirely of metal, and, as there was very little alluvial deposit, the greater portion of the work would be in rock; the curves also would be sudden, and the gradients heavy, there being a rise of 7,000 feet in the 180 miles, for which a line had been projected, to the coal-fields. There was also a deficiency of lime, which would be a great drawback to the construction of masonry; and there would be a difficulty in obtaining ballast. Undoubtedly, a railway would be of immense benefit to the colony, which was broken up into districts, and he believed the returns would be so large as to fully warrant the government in undertaking the construction, as, of course, those portions most likely to be remunerative could be made first.

Mr. Hartley had had great pleasure in listening to the able paper which had been read, and, after an experience of nineteen years, could endorse almost all that had been said. He would, therefore, refer rather to certain points not touched upon by Dr. Mann. Natal was a most difficult country to speak about; it was always making a noise in the world, and yet had produced but very poor results, and this all who had been connected with it knew to their cost. This statement, of course, required some explanation. The birth of Natal might be said to date from 1850, and from that time, until 1860, very little was done beyond scratching up the soil in a few places in a most unbusinesslike way, and producing a few samples which were laid before the world as specimens of what could be produced. Almost all those who went out at first were shopkeepers, who all tried to live upon one another, and the consequence was that, in a few years, a vast number of them had to pay their creditors in England with a few shillings in the pound. These difficulties, however, were just what the country wanted, in order to teach it how they were to be avoided in the future. Hence, about 1860, men began moving from the towns in all directions, and trying to cultivate the land, because they found it was absolutely necessary for them to

do so if they were to live at all. During the first eight years of his (Mr. Hartley's) residence there, nearly all the necessaries for the table were imported, even to potatoes, although there was no country in the world where they could be produced more cheaply. When this first impulse was given to agriculture by necessity, vegetables and grain were produced in such abundance that there was no market, and distress consequently ensued from that cause, which led the colonists to turn their attention to such crops as sugar and coffee, and to the growth of wool. In 1864, besides supplying its own wants, the colony exported wool, sugar, ivory, a little cotton, and a small quantity of coffee, in all to the value of £165,000. The imports for the same year were about £450,000, thus leaving a very heavy balance against the colony. The next year not much progress was made, the exports being £164,000; in 1866 they were £163,000; but in 1867 they were £178,000, and in the first half of 1868 they were £138,000, or equal to £276,000 for the year. The imports of wines, spirits, bread stuffs, tobacco, and oilman's stores were in 1864, £165,000; in 1866, £80,000; in 1867, 60,000; and in the first half of 1868, £25,000; thus proving in the first place that the colony was actually beginning to supply itself with these things; and secondly, that the great commercial crisis had made it somewhat more economical in the matter of luxuries. On the present year there would be a balance of exports against imports of about £40,000 in favour of the colony, and this was the first time such a thing had been recorded of any South African colony. This did not result so much from the wonderfully productive nature of the colony, as from the difficulties of the colonists having driven them to produce something which would not only supply them with the necessaries of life, but also with the means of paying their debts. They were only just discovering what they could do, and this year the exports of sugar, including what came to England and what went into the Free State, would be worth about £130,000. It was proved to demonstration that sugar could be produced at the rate of two tons per acre on an average throughout the colony, from land which could be purchased for 20s. an acre, which was quite sufficient to show that it would pay to invest money in its cultivation. He was himself largely interested in the cultivation of coffee. The last speaker had stated the amount of capital required at £4,000, but he had planted 100 acres at a cost of £2,000, and 50 acres of it yielded at least 40 tons per annum. Sales of that very coffee had been made in Mincing-lane at 78s. per cwt., and the last parcel realised 85s., or £85 per ton; and he had now a parcel of eight tons lying there, which was held for 85s. This was pretty plain proof that the cultivation of coffee would be remunerative. Arrowroot used to be the great support of the poor colonists in Natal, but had failed them at last. It could be produced at the rate of about twopence per pound, but they produced so much in two years that they glutted the English market, and it would not fetch what it cost to produce and convey to Europe, and therefore the cultivation had to be abandoned. The production of wool had gone on gradually, there being an increase to the extent of £10,000 per annum, the amount this year exceeding £100,000. It would, therefore, be seen that, during the last few years, the colony had saved about £120,000 in luxuries, or else produced them themselves. Land capable of producing sugar or coffee could be purchased in the best localities at 20s. an acre, the depth of soil varying from eighteen inches to twenty feet. He had himself gone as low as twenty-five feet in depth. The cost of labour was about 10s. per month wages for an ablebodied man, and about 2d. per day for his food. So plentiful had food been of late, that white maize, known here as horse tooth maize, sold at 4s. the bag of three bushels, equal to 196 lbs.; it could be sent into England at a cost not exceeding 10s. per bag. The only difficulty was the want of capital for building kilns to dry the grain, so that it might bear transport across the Equator. What kept Natal back was want of money; energy there was no lack of, though in many instances it had been wrongly directed. This evil was beginning to be remedied, but they could only borrow money at from 12 to 15 per cent. There were companies in London now advancing money at 12 per cent. on the mortgage of estates to the extent of one fourth of their value, and that cultivators could afford to pay such interest in addition to all their other expenses was quite sufficient proof that their business was sound. If only means could be supplied to develop her resources, Natal would become one of the brightest little spots England ever owned. He had made a good deal of money there, and had lost it all, yet he knew of no country, nor had he ever seen or heard of one, so beautiful in climate, where Providence appeared to be so kind to the inhabitants, or where a man could so thoroughly enjoy life. He intended to make it his home, to live and die there. He had brought up a family there, and though they had been educated in England, they were very glad to return to Natal. He could not agree with what had been said by Mr. Gooch with regard to the railways. There were certain districts where there would be difficulties in the way of railway construction, but generally speaking the country was of the character best adapted for such works. After you got a few miles from the port you came upon the same kind of soil as in Yorkshire, with a few feet, or even less, of stones, gravel, and sand, which would make capital ballast. Of course bridges would be required to cross the rivers, and there certainly was a deficiency of lime for masonry, except in the marble mines, and in the Klip River district. No doubt the climate would interpose some difficulties in the way of the English navvy, who would require high wages; but there were no difficulties which could not readily be surmounted, and a railway constructed at a comparatively small cost. Indeed, if the resources of Natal were ever to be developed, railways must be made, for sugar, grain, and wool were all either heavy or bulky commodities, and, being grown in the interior, there were no means of conveying them to the coast but by ox-waggons, a tedious and expensive mode of transit. Thus grain, which was sold in Pietermaritzburg for 4s. a sack, cost 7s. 6d. when delivered at the port, and would cost 8s. 6d. when put on board, although the journey was only one of 50 miles. There was, therefore, a heavy tax on the agriculture of the country, which a railway would relieve; and he had no doubt that if England would only find capital to lay down, if it were only a tramway, the results from the carriage of wool and sugar alone would soon be very satisfactory. All that Natal wanted was money and people. He never saw a starving man there, or was asked for charity during his nineteen years' residence, except by a sailor. He had never known what it was for a man to come to his house without his being able to put before him more than he could eat. There was no necessity for the Government to offer land for nothing. There were hundreds of thousands of acres of land in private hands the owners of which would be glad to sell it at from 6s. to 10s. per acre, and he was prepared to find, within one week, 10,000 acres which could be rented at 1d. an acre for as long as a man liked to take them. Any man, sober, intelligent, and energetic, would be sure to prosper in Natal. He could say, most unhesitatingly, that he preferred Natal to England fifty times over, and he believed it was one of the choicest spots in the world.

Professor Tennant said he should have been able to speak with more freedom had the subject before the meeting been Cape Colony, with which he was better acquainted; and he perhaps might be excused for referrring to some letters which had recently appeared in the *Journal* with reference to the alleged discovery of diamonds at Hope Town, in the latter colony. On the table he had placed a diamond which he had received within the last month from Cape Colony; it had not been

described, but at the last meeting of the Geographical Society he had described two diamonds from there, which had been in London 12 months, and as no notice had been taken of them in any of the scientific periodicals, he had thought it right that their existence should be recorded. Allusion had been made to the substances found in association with these diamonds, and he had also placed upon the table specimens of these substances. In some quarters the whole matter had been characterised as a myth; whether that were so or not, he would leave the colonists to decide, but he had recently sent out certain inquiries, to which he expected a reply in the course of a few months. If it was a myth, he should be among the first to expose it. There was an instance recorded by Sir Roderick Murchison of diamonds being found in Siberia, but it was afterwards pretty plainly proved that they were deposited in the place where they were found by the person who found them. With regard to gold, it must not be supposed that this precious metal was to be found in Natal; it was a considerable way from there; and other states must be traversed in order to reach it. He had been much pleased with Mr. Hartley's straightforward statements, and would impress upon any who had not been successful at home, the desirability of carrying their energies elsewhere. The progress of Australia had been most astonishing during the last twenty years. He possessed the first gold nugget ever brought from that country, which he exhibited in that room in 1852, and since that time they had received one hundred and fifty millions sterling from the Australian gold-fields. The gold in South Africa was only spoken of as yet as occurring in small particles, but Mr. Baines, who had been through the district, had seen gold on the banks of the rivers, and had had a native gold chain given him for painting a portrait of one of the chiefs, so that there was no doubt of its existence, and it was now established that a certain quantity was continually being sent away from the coast by the Portuguese and others.

Mr. Sargeaunt said he was quite prepared to confirm the statements of Dr. Mann and Mr. Hartley with regard to the resources of Natal. He had been intimately connected with the colony from 1852 to 1857 as Colonial Secretary, and might therefore be almost considered one of the nurses of its infancy. In 1854 (he believed it was) he had to consider the tariff, and having left England imbued with free-trade notions, he naturally as one of his first acts struck off the import duty on corn and flour, which, strange as it might appear in a new colony like that, actually produced a considerable revenue. He fully admitted that the interests of Natal were very much involved in the question of railways, and he might add that the reports which had been made on the subject, voluminous as they were, were now under the consideration of Mr. Gregory, President of the Institution of Civil Engineers, and it was expected that in a few days he would make his report as to what he considered the best and most economical means of carrying out railway communication in that colony. Two questions had been incidentally alluded to—the discovery of gold in South Africa, and that of diamonds on the Orange river. On the latter point he might say that he had read a letter from a gentleman holding a high official position at the Cape, and well-informed on such subjects, who stated that he fully believed in the *bona fides* of the discovery. He could not himself presume to offer any opinion upon this point; there was the positive assertion of the person who had found the diamonds, and against that there was the judgment of a person who he believed had visited the place in question. Under these circumstances he could only recommend the public to suspend their judgment until the receipt of more definite information. As to the gold, he understood that the gentleman who disbelieved in its existence had never been near the spot.

Mr. Harry Emanuel said that that Mr. Gregory, who was sitting beside him, had visited the Orange River, and he brought back with him a sample of the stones and gravel from the bed of the river. He should like to ask Professor Tennant if he had ever known diamonds to be found in proximity to such deposits. He was not bold enough to affirm that diamonds were not to be found in South Africa, but if they were found in deposits of that character it would be quite a new fact in geology. With regard to the gold question, Mr. Gregory had not been to the spot, and only gave his opinion, but accompanying the prospectus of a company for working these gold-fields there was an extract from a letter from Mr. Mauch, in which he said:—

"I give you short notice that I have been very successful in finding gold, not in small, scarcely visible specks, but in great veins of quartz, *i.e.*, gold-fields, one of them more than sixty miles long, the other about twenty miles broad, besides numerous small parallel veins."

Afterwards the same gentleman writes:—

"Ivory, ostrich feathers, and gold, have always been considered the main products of Africa; ivory and feathers now form the greatest portion of the remittances made from here, but gold, aye, precious gold, known by all in its coined state as sovereigns, and longed for by all, has hitherto been hid from the eyes of nearly all in South Africa. But I speak of days now past, for Mr. H. Hartley, the well-known elephant hunter, may count amongst the results of his last hunt the discovery of two gold-fields of enormous extent, the first of which has been traced and seen in different latitudes to extend to more than eighty miles in length, by from two to three miles in breadth; the other is twenty-two miles broad, and promises to be most valuable, in fact, rivalling in value the diamonds recently found near Hope Town. I may mention that many smaller and isolated veins containing this precious metal have likewise been discovered. The vast extent and beauty of these gold-fields are such, that at a particular spot I stood as it were transfixed, riveted to the place, struck with amazement and wonder at the sight, and for a few minutes was unable to use the hammer. Thousands of persons might here find ample room to work on this extensive gold-field without interfering with one another. The above I can vouch for as facts, and specimens now in my possession will prove their truth."

The discoverer there spoke in a manner which would lead one to believe that the gold was self-evident to every eye, because there would be nothing particularly remarkable in the appearance of large veins of quartz which would strike him with such astonishment. And if Mr. Mauch abstained from picking up any of the gold, it was very strange that Mr. Hartley, the elephant hunter, did not think it worth while to pick out some. However, it appeared that seven men went up, for three months, and brought back between two and three ounces, which was not a very good return. He did not say there was not gold there, but before ships were advertised to sail for the gold fields of South Africa, and so on, a little more investigation should be made. Mr. Robinson quoted a letter from Dr. Taylor, in which he said, "It is very probable that gold-fields would be discovered equal to any in the world." That surely was not sufficient foundation on which to induce emigrants to set out for these gold-fields. Again, he said, "The quartz contains gold, and, I think, could be worked profitably in the wet season, with a proper crushing machine." Everybody knew that quartz-crushing, though very profitable, required considerable capital, and was not adapted to the capabilities of emigrants. Again, there was a certificate of the assay of a specimen of quartz from South Africa, which weighed 65 grains, or about the size of a walnut. He would ask anybody if it was not possible to go into the Welsh mountains, and pick out a piece of quartz weighing 65 grains exceedingly rich in gold; yet the average produce was not two ounces per ton. The produce from this South African specimen was given as at the rate of 1,185 ounces of gold per ton, and silver 60 ounces, worth something like £5,000. He repeated, he had no doubt of gold being found there, but it was a question whether it existed in such quantities that it could be profitably worked. As

to the diamonds, Mr. Gregory had searched very carefully the whole of the places where they were reported to have been found, and he failed not only to discover a single diamond, but even such a soil as diamonds are usually found in.

Mr. Gregory, being called upon, said he had found at Hope Town the geological character of the country quite different from what might be expected in a locality where diamonds were to be found. The specimens Mr. Emanuel had produced were from the exact locality where the diamond had been discovered which had been described in the Cape newspapers, and a cast of which had been sent to Professor Tennant. Two or three diamonds had since been found in the same spot, but all by the same man—a native, in the employ of a farmer—and it was reported at Hobart Town that this man found one under the stone upon which he ground his coffee.

Mr. Bergtheil would have liked to learn from Mr. Gregory a more detailed account of how long a time he spent in the country, how he reached the spot where his investigations were conducted, and from whom he received his information. He (Mr. Bergtheil) was not a resident in Cape Colony, but in Natal; he knew Mr. Mauch, however, and had received him in his own house, and was ready to vouch for his veracity; he did not think that gentleman would ever say a word which he did not firmly believe to be true, although perhaps from his imperfect knowledge of English he might have rather highly coloured his statement. If there were a fraud in the matter of the diamonds—and it could be nothing else if they were not really found in the place asserted—he would leave the people of Cape Colony to defend themselves, but from his knowledge of the country, he knew no reason which could induce any man to go to the Orange River Free State and there lodge diamonds for the purpose of their being afterwards found and sent to England. Mr. Gregory had probably gone as rapidly as possible through the country, and if he expected Dutch farmers to tell him where there were diamonds he was much mistaken, and knew very little of the character of the people. He ought to have remained there at least six months before he made his first inquiry, and then, knowing with whom he had to deal, he might possibly have come to a right conclusion. This would, in his opinion, have been a much better plan than rushing through the country, and then coming home and contradicting a man whose character stood very high in the colony. He was not aware of any desire on the part of anyone to underrate the difficulties in the way of successful gold-mining; it was undoubtedly a long way from Natal to the gold districts, and the mode of travelling in that part of the world was by ox-waggons, at the rate of about twenty-five miles a day, and if the man who acted as guide happened to be in a bad humour there was no getting on at all. English gentlemen were too apt to form their conclusions on African subjects from the standard they were accustomed to at home, which often led to error. It had been suggested that if gold really existed in any quantity more would have been brought into the colony, but there had not been time yet. If Mr. Mauch or any one else came to Natal and reported that he had found gold, the people would take nearly three months to think about it; then, when they started, they would take six months to reach the spot, and if the brandy had run out, in all probability they would turn back again. He quite believed Mr. Mauch's statement, but it would be a considerable time before gold would be found in sufficient quantities to induce English emigrants to go there in any number. The company to which allusion had been made was not started for the purpose of inducing emigration, but to ascertain the truth, and so lay a foundation for future operations.

Mr. Emanuel desired to state that he did not intend to impute fraud to anybody.

Mr. Robinson, who had recently returned from Natal, desired, in the interests of truth, to give some explanation of Herr Mauch's somewhat glowing description of what he had seen. The same objection which had been taken by Mr. Emanuel was made in Durban by a party of gentlemen before whom Mr. Mauch appeared, and he then said that he used those words, not with any desire to induce persons to seek the colony, or from having any private interests to serve, but simply as an enthusiastic explorer. He said that when he saw these long reefs of quartz glittering in the sun, and knew, as he did know by previous examination, that they did contain gold in a greater or less quantity, he was transfixed with astonishment at the idea which then presented itself to his mind as to the great future which might be opened up to South Africa by that discovery; but, from his limited knowledge of the English language, he used words which might bear an exaggerated interpretation. There was no doubt of the existence of gold there, and the only question was whether in such quantities as to be worth seeking, and with a view to determine this question several parties of colonists, at a considerable sacrifice to themselves, had recently gone on exploring expeditions, and this fact alone was a sufficient proof that there was some foundation for the report; he should much regret if a spirit of incredulity at home should lead to the abandonment of any steps that might have been taken to follow up this discovery. South Africa had been for a long time under a cloud, and it was felt that this would speedily be dispersed if the joint discovery of coal and gold led to a rapid influx of population, and to the advancement of civilisation and commerce in that part of the world. It was not necessary for him to endorse the statements of Dr. Mann and Mr. Hartley, but as a member of the Local Legislature, editor of one of the oldest journals there, and a nineteen years' resident, he might be allowed to say that, although he had gone through many vicissitudes during that period, he regarded Natal as the land of his adoption, his own home, and that of his children, and he believed that, to any man with industry and energy, it afforded a fine field for enterprise. He would, nevertheless, be very sorry if any remarks made on that occasion should lead persons to go out there with exaggerated ideas. If a man wished to succeed he must do it by energy and perseverance, but he believed that no man who went out prepared to face all difficulties would ever have cause to regret it. He had seen the colony emerge from the condition of a wilderness to one of comparative civilization in 19 years. Undoubtedly many men had been disappointed, but that was always the case with pioneers, and those who were now succeeding the first settlers would have the satisfaction not only of inheriting the advantages which others had prepared for them, but of carrying forward the work of civilization. The present time presented a singular juncture of circumstances, for at the same moment that gold was being discovered to the north of the colony and coal in Natal, there were indications, which he would not then go into, leading to the belief that ere long there would be a considerable extension of British rule in that part of the globe.

The Chairman, in proposing a cordial vote of thanks to Dr. Mann for his interesting and instructive paper, said he hoped the advantages which had been laid before them would be appreciated, and that Natal would be benefited by the introduction of railways, capital, and population. But all young colonies had difficulties to contend with, and though it was difficult to get English people to leave their homes, still, if they could not find work at remunerative wages here, and good prospects were held out to them abroad, they must be very foolish not to avail themselves of the opportunity. That there was this indisposition to leave home he had himself seen instances of, particularly in the midland counties, where he had known men refuse a good situation on a railway, and go back to a miserable life at 8s. or 9s. a week, rather than leave their homes. Happily this was not the case with all, and in Caithness the people

seemed glad to leave home, although the average wages there were higher than in the midland counties of England. He had been rather startled on first hearing the amount of rainfall in Natal, and was disposed to recommend it as a good place for umbrella makers, but, on finding how the rain was distributed over the twelve months, he did not see anything to be alarmed at. He did not think the gradients of the proposed railway were so very excessive, as by his calculation they only came out about 38 or 39 feet in a mile. He concluded by moving a hearty vote of thanks to Dr. Mann.

The vote having been carried,

Dr. Mann, in acknowledging it, briefly referred to the gold discoveries, saying that his only desire was to elicit the truth, and pledging himself as an honest man, that whatever might be the results of the present investigations, they should be laid before the world as speedily as possible, and that any information obtained should be common property. At that late hour he felt unable to touch upon the many interesting topics that had been referred to in the discussion, but he hoped to have other opportunities of returning to the subject.

Mr. Hyde Clarke writes:—"As so many gentlemen connected with the colony of Natal spoke last night, and the discussion drifted to the gold question, I abstained from addressing the meeting, although I was induced to do so by Dr. Mann's reference to the introduction of opium among other products. While in Asia Minor, I received frequent applications from relatives and friends in the South African colonies as to Turkish productions, and was able to supply some information, and specimens of tobacco and silkworm eggs. These circumstances led me to entertain the opinion that there are few products and animals of Asia Minor which cannot find a suitable climate in South Africa, but particularly in Natal. In order, however, to carry out most efficiently some of these branches of enterprise, it would be useful that competent natives should be obtained from Asia Minor, and I do not conceive there would be any difficulty in obtaining such by the assistance of the Ottoman Government, and in co-operation with the Mussulman inhabitants of Cape Town and Port Elizabeth, who are under the spiritual patronage of the Sultan. By proper care the products of our South African colonies might thereby be much increased in opium, tobacco, silk, Angora wool, &c. As to the railway question, the gradient of 7,000 feet in 180 miles, which has been put forward as an objection, does not constitute any real difficulty, because the fall is in the direction of the bulky traffic, which is export traffic, the traffic against the gradient being the lighter proportion of imported commodities. If the railway be fairly carried out, experience shows it ought to meet the guarantee by the increase of the taxable value of the country, consequent on the expenditure of capital in the construction, and on the increased facilities for the shipment of produce, and thereby a stimulus given to greater cultivation of land. One important recommendation is omitted by Dr. Mann, and that is, that a trunk line in Natal will give the colony better access to the great back country, and, consequently, a greater amount of exportable produce. The value of Natal depends not solely on its own resources, but on the fact that it is the chief outlet for the vast territory in the interior. The more I have looked into the question of the railway, the more I am convinced that theory and experience equally dictate that the railway system should be brought into operation in Natal at the earliest possible period, as the indispensable step for efficiently promoting the development of the colony.

32, St. George's-square, S.W., 3rd Dec., 1868.

ON THE ALLEGED POISONOUS QUALITY OF BEEF-TEA AND EXTRACT OF MEAT.

By Baron Liebig.

(Extracted from the *Lancet* of November 21st.)

Although it is contrary to common sense to believe that the daily food of men and animals could possibly contain a substance injurious to health, it was nevertheless to be expected that the experiments made by Dr. Kemmerich on the effect of beef-tea and its salts on animals would produce anxiety and fear in some weak minds; and indeed the article which appeared in *Once a Week*, entitled "A Word of Warning to Cooks," is a proof that such fears really existed. I believe, however, that a simple acquaintance with the experiments of Dr. Kemmerich will be sufficient to dispel them completely. The results of these experiments are of a very harmless character. Dr. Kimmerich made most of his experiments, not upon men, but upon graminivorous animals —viz., upon rabbits,—and only one experiment was made by him upon a dog. The broth was made from horseflesh, and injected into the stomach of the animals in progressively augmented quantities, the chief results of which are as follows:—

A rabbit weighing not quite two pounds, which had received the broth from one pound of horseflesh (equivalent to half an ounce of extract) remained perfectly well. It polished itself with its paws, was very lively, and no disturbance in the state of its health was afterwards perceptible.

A second rabbit, of two pounds weight, into the stomach of which the extract of one pound and a quarter of horseflesh had been introduced, deported itself in just the same manner; its pulse became more vigorous, its breathing slower, and it remained lively and healthy.

When, however, the doses were increased, and the extract of two pounds and of two pounds and a quarter of flesh were injected into the stomach of the rabbit, such quantities of concentrated animal food were evidently too much for the little graminivorous creature, which by such doses Dr. Kemmerich succeeded in killing, a result at which nobody will be surprised. It follows that Dr. Kemmerich could likewise have killed stronger animals with beef-tea; and it may be assumed that he would have killed even a man of 140 lb. weight (seventy times heavier than the rabbit) by a dose of beef-tea seventy times as large—namely, by the broth of 140 lb. of flesh, equivalent to about 4 lb. of extract of meat. Less than a couple of pounds of extract would, however, scarcely have been sufficient, for one of the experiments of Dr. Kemmerich on a carnivorous animal contrasted with the experiments on the rabbits; he did not succeed in poisoning that animal with beef-tea.

It was a small but very strong terrier which had taken the broth of four pounds of flesh (equivalent to two ounces of extract), which the animal seemed to enjoy considerably. As however the whole quantity was too much for it, it became necessary to inject the remainder into its stomach. Notwithstanding the enormous quantity of extract of meat which had been introduced by force, the terrier remained very comfortable and lively, and no symptom of any disturbance of its health became manifest. Double the quantity of meat broth which killed the rabbit had not the least injurious effect on the little dog.

These experiments and the above calculations show sufficiently what is to be thought of the poisonous effect of beef-tea; it belongs to the category of cases where people have eaten *pâté de foie gras*, turtle soup, or oysters to such excess as to cause death; but no sensible person will ever think of ascribing, on that ground, poisonous qualities to *pâté de foie gras*, turtle soup, or oysters.

The experiments of Dr. Kemmerich are described in his *Dissertatio inauguralis* for obtaining the degree of doctor from the medical faculty at Bonn; and in connecting with his conclusions the meaning of the word "poison," he in fact succeeded in drawing to his work the attention

of the public, which otherwise would probably have taken little notice of it.

Dr. Kemmerich ascribes the effect of beef-tea not to its aromatic and combustible ingredients, but to the potash salts which it contains, and of which it is well-known that in larger doses they exercise an injurious effect on the organism; nevertheless—and this is a matter of great importance—potash salts are an element of all articles of food; they not only form the chief ingredients of the salts of all sorts of flesh, including the flesh of fish, but likewise of all other food, and of all the food of animals. The alkaline salts of bread, vegetables and hay, consist of potash salts, and with the exception of chloride of sodium (kitchen salt), soda salts are but rarely contained therein; in fact, it may safely be asserted that without the potash salts our food would be quite unfit for nourishment.

It does not follow, therefore, that these salts, when taken in excess, like any other—even the most harmless substance—might not eventually exercise an injurious effect. It is, however, preposterous to apply the meaning which we are accustomed to attach to the word "poison" to the effects of such an excess. It is surely quite absurd to connect this meaning with the substances which we daily take in our food, and which are quite indispensable to our existence.

Dr. Kemmerich himself says (p. 31),—"I do not think of the possibility that beef-tea, in the form in which it is used for household purposes, could be the cause of poisoning; it therefore does not require a medical warning to protect from poisoning with Liebig's extract of meat." He further says:—"In medical practice, wine, ether, camphor, and musk are eminent analeptica (invigorating and refreshing remedies). Compared to these giants of medicine, beef-tea modestly occupies a subordinate position. If, however, it be necessary to preserve the exhausted body from protracted illness, then there is no other remedy in the whole rich store of medicine which can afford such assistance for regenerating the diseased organism as repeated doses of beef-tea."

One of the three theses defended by Dr. Kemmerich, on his promotion before the medical faculty at Bonn, is worthy of observation by the British Navy. It runs thus:—

Thesis 2. The best remedy against scurvy is beef-tea, or Liebig's extract of meat."

Munich, Nov. 1868.

Fine Arts.

Exhibition at Arras.—The town of Arras, not far from Amiens, is little known in the artistic world, except in relation with the old tapestry which formerly bore its name, but there is enough of taste there to make a picture exhibition successful. That which was recently closed has been eminently so, and the purchases amount to thirty thousand francs, a large sum for a provincial town of the second or third class. It is still more satisfactory to note that the pictures sold include several by eminent artists, such as a "Calvary," by M. Desiré Dubois, a fine half-length figure of an Armenian woman, by M. Charles Laudelle; a composition by M. Viger, representing "Josephine Beauharnais, afterwards Empress, during the Reign of Terror;" a view of the Palace of Westminster, by M. E. Bénard; a landscape, by M. Corot; and several other remarkable works. Such a result throws some other and larger provincial towns than Arras completely into the shade.

Manufactures.

New Process for Making Wine.—The *Markt-bericht*, quoted in the *Produce Markets Review*, speaking of a process known as Menada's, says:—"Menada finds that to preserve the full bouquet and flavour of wine the fermentation must be exceedingly slow, and for this purpose he has adopted the following method. After the bunches of grapes have been stamped the must and stalks are put into the vat, which, however, is only four-fifths filled: the opening is either closed with the flap generally used in vats, or with a cork. Through this a ten-inch tube is put, to the end of which a bladder is tied, after which all small openings are carefully closed up with cement. The fermentation begins after twenty-four hours, and develops carbonic acid gas, which presses into the bladder and squeezes it out almost to bursting point till the second, third, fourth, or fifth day. The carbonic acid gas, and the watery particles, escape through the pores of the bladder, while the alcohol and aroma are left behind. On the fifth, or at the latest, the eighth day, the bladder collapses, and this is a sign that rapid fermentation is at an end, and the wine can then be drawn off, or, what is better, it can be left alone until the following March, at which time the wine will be quite clear, and rich in aroma and flavour. After the wine has been drawn off, what remains in the vat can be pressed; or a very weak wine can be poured on to it, which, if drawn off from the eighth to the fifteenth day, will prove of excellent quality. This process, by which less, but therefore better, wine can be obtained, can also be applied to sour grapes; these, however, should not be trodden, but put whole into the vat, and left alone till the following March, after the fermentation has taken place. Other wines and spirituous liquors may be improved by this process. A small piece of bladder is sufficient, which is to be left throughout the summer on the top of the tube projecting from the vat."

Glass Works in the Neapolitan Provinces.—The manufacture of glass in the Neapolitan provinces has of late years fallen off considerably, owing to the proprietors not being willing to keep pace with the times, and not having introduced modern improvements in this branch of trade. The most important glass works in the provinces of Naples and Salerno are those of Portici, San Giorgio, near Cremano, and Bagnoli; these establishments employ 232 workmen, and produce annually about 30,000 metrical quintals of sheet glass. At the Portici works a Siemens furnace has been lately introduced; the other works, however, have not yet abandoned the old-fashioned furnaces.

Mechanical Industry in Italy.—One of the most important mechanical establishments in Southern Italy is that of Pietzarsa at Naples, belonging to the Società delle Industrie Meccaniche. These works employ about 1,250 persons, and are furnished with 300 machine tools driven by nine steam-engines, amounting in all to 88 horse-power. At this establishment they make locomotive carriages and every description of railway plant, iron bridges, boilers, cranes, pumps, war material, and marine engines up to 500 horse-power.

Commerce.

Decimal Coinage in Greece.—According to *La Presse*, the decimal system is about to be adopted in Greece. The unit will be the *dramma*, equal in value to a franc, and its hundredth part will be called the *septa* or centime.

Production of Honey in Italy.—Notwithstanding the little attention given by the Italian peasantry to their bees, the produce of honey during the present year amounted in value to 1,385,000 francs, and that of wax to 1,590,000 francs. The best honey comes from Bormio, Empoli, and Otranto.

Consumption of Coal in Italy.—The consumption of coal in Italy at the present time is estimated at upwards of eight millions of tons per annum, of the value of 360,000,000 francs (£14,400,000), the average cost per ton being 45 francs.

Production of Copper in the Ligurian Provinces.—The working of copper-mines on the Ligurian coast may be traced to a very remote era. The ore, generally speaking, is a copper pyrites, which yields from 10 to 12 per cent. of copper. The greater part of the ore obtained from these mines is exported to Swansea, where it realises about 200frs. per ton. The Apennines, on the coast between Genoa and Spezzia, appear to be the richest in copper veins. The most important mines are the mines of Loretto, Gallinaria, and Libiola, in the neighbourhood of Sestri, about half-way between Genoa and Spezzia. In 1862, 165 tons of copper-one were extracted from the mines of Monte Loreto, the working of which is at present abandoned. The mines of Gallinaria, in the commune of Casarza, produced, in 1867, 236 tons of ore, containing 12 per cent. of copper, whilst that of Libiola, in the commune of Sestri, produced last year upwards of 1,487 tons of copper-ore. The next in importance are the mines in the neighbourhood of Levante, and if they do not yield as much as those of Sestri it depends on the stupidity of the proprietors, who work them in a most primitive manner. At Monte Gove copper occurs in filaments and branches in a gangue of quartz. Numerous deposits of copper are met with in the Val d'Aveto, in the neighbourhood of Torriglia, and in the communes of Apparizione, Struppa, and Saint Olave, which might be worked with advantage. The Apennines to the west of Genoa, although not so rich in copper as those on the east, still contain numerous deposits of this mineral, which might also be worked to advantage. The principal veins occur from Sestri-ponente to Voltaggio, and it is met with at Biccia, Acquastriate, Prateccia, and Monte Lecco, over an extent of four to five kilometres, at but a short distance from the road, which would tend greatly to facilitate the transport when once the working of the mines was commenced. At the present time the total production of copper ore from the Ligurian mines amounts to about 2,000 tons per annum; but this industry might be greatly developed by opening new mines, and by improvements and economy in the working of the old ones.

Colonies.

Social Progress in Australia.—The altered circumstances of the country, and the great changes that have been introduced in the management of pastoral properties, have produced great alterations for the better in the character and stamp of the labouring men in the bush, and in no less is this improvement more apparent than in the shearers. The extravagance of days gone by, though not yet totally extinct, is every season becoming scarcer, and is gradually but surely being supplemented by the provident settler, who, in the slack season of the agricultural year, hurries away from his homestead, and increases his profit by shearing excursions. Under the old system, nine shearers out of ten knocked down the large earnings of the short but busy shearing season in a few days of extravagance, and then struggled through the remainder of the year in poverty and indigence. This sort of thing is, however, gradually dying out, and a large proportion of the gains of the wool-shed are now carried to the holdings of the smaller settlers, and there expended in the permanent improvement of their homesteads. With the general adoption of fencing, the shepherd is also fast becoming an institution of the past, his place being usurped by the more active and advanced boundary rider. All these changes are for the better, and are evident marks of improvement in the social condition of the labouring population of the bush.

Shearing in New South Wales.—The rate of wages for shearing in this colony is now 18s. per 100. Thus on the 10,000,000 sheep to be shorn this season in Riverina and the pastoral districts of New South Wales the wages paid will amount to £90,000. A top shearer can shear about 80 sheep a day; an inferior hand can shear 40. Extraordinary attention is being paid to the getting up of the clip on some stations.

Land in Tasmania.—The *Hobart Town Mercury* says that there is now before the Legislature an amended Waste Lands Act, which is considered a great improvement on those already in existence, inasmuch as it initiates a system different in some very material points from any already tried. Fourteen years are allowed for the payment of £1 per acre, with the addition of interest in equal annual instalments, so that a person who selects, for instance, an allotment of 100 acres has to pay in all £133 6s. 8d. in fourteen instalments. The payments are regulated in the following way:—

100 acres, at £1				£100	0	0
Add one-third for credit				33	6	8
				£133	6	8
Cash at time of purchase	£3	6	8			
First year	5	0	0			
Second year	5	0	0			
Succeeding 12 years £10 per annum	120	0	0			
Total	£133	6	8			

Notes.

The Mont Cenis Tunnel.—During the first fortnight of the past month (November) the progress made at the Mont Cenis Tunnel was 55·85 metres; of which 23·70 metres were driven on the Italian side, at Bardonnèche, and 32·15 metres on the French side, at Modane. The position of these works up to the 15th November was as follows:—

	Metres.
Length driven at Bardonnèche	5,287·00
Length driven at Modane	3,726·90
Total length of tunnel driven	9,013·90
Length remaining to be driven	3,206·10
Total length of tunnel	12,220·00

The Suez Canal.—From the 15th September to the 15th October, the excavation for the Suez Canal amounted to 2,038,196 cubic metres. The position of these works up to the 15th October was as follows:—

	Metres cube.
Amount excavated up to 15th September, 1868	49,309,522
Ditto from 15th September to 15th October	2,038,196
Total amount executed up to 15th October	51,347,718
Remaining to be excavated	22,764,412
Total excavation in line of canal	74,112,130

Exhibition of Bees at Milan.—An exhibition of bees will be held at Milan, in the Palazzo del Regio Instituto Tecnico Superiore, from the 10th to the 13th of December, under the auspices of the central association of agriculture in Italy. It will comprise a collection of all kinds of bees, honey, and of instruments and utensils employed in apiculture, for which various prizes will be distributed. A silver medal will also be given for the best mode of taking the honey without destroying the bees.

Re-naming of Paris Streets.—A new and long list of changes of names of places and streets has recently appeared in the *Moniteur*. In cases where new openings are in the line of old streets the name has been continued

in the former, and where two streets forming one line had different names one of these has been suppressed. The names adopted are in some cases those of French departments, and one takes that of the new settlement of Saïgon, in Cochin China, but the greater portion are those of celebrated men of past or present times, and foreign as well as French philanthropists, authors, musicians, artists, engineers, doctors, and others. The following are the best known—Cail, Abbé Groult, Murillo, Rembrandt, Abbatucci, Hippolyte Lebas, Milton, Condorcet, Perdonnet, Bréguet, Froment, Sibuet (Archbishop of Paris), Sœur Rosalie (the charitable nun, recently deceased), Regnault, Léonard de Vinci, Eugene Delacroix, Faraday, Torricelli Poncelet, Brunel, Condamine, Boissieu, Tardieu, Séguin and Secrétan.

Employment of Fowls in Destroying Worms.—The French farmers complain terribly of the prevalence of worms, which make sad havoc in corn and other lands, the highest cultivated fields being the most infested with these destructive pests. Fowls are known to be the most indefatigable worm destroyers; they pursue the devastator with extraordinary instinct and tenacity. But fowls cannot conveniently be kept upon every field, nor are they wanted there at all seasons. M. Giot has therefore invented perambulating fowl-houses, large omnibuses fitted up with perches above and nests beneath; the fowls are shut in at night, and the vehicle is drawn to the required spot, and, the doors being opened in the morning, the fowls are let out to feed during the day in the fields; knowing their habitation they enter it at nightfall without hesitation, and roost and lay their eggs as well as in any other house. The plan is said to answer admirably in every respect.

Population of the Northern Confederation.—The office of statistics at Berlin has just published the result of the census of the 3rd December, 1867, in the Northern Confederation. From this it appears that the number of inhabitants at that date was 29,758,552 souls, to which must be added 98,879, the number of persons absent from the country, making a total population of 29,857,431 souls.

Correspondence.

Diamonds at the Cape Colony.—Sir,—I have to ask the favour of a few lines in your columns, to allow of my replying to a letter signed "John Robinson," published in your impression of the 20th Nov., which not only contradicts, without the slightest attempt at argument, the statements set forth in my communication printed in your issue of the 13th Nov., but also unfairly imputes to me "a direct reflection upon the veracity of the many high and responsible officials who have borne testimony to the discovery," — *i.e.*, of diamonds at the Cape. An unbiassed perusal of my letter would reveal to Mr. Robinson that I opined the Government officials had been deceived by the erroneous conclusions of incompetent scientific guides, and by the concocted representations of interested parties; nor is such a scheme without precedent, as some years ago diamonds were brought to market purporting to have been found in Silesia, but the imposture was discovered and traced home to its origin. In answer to Mr. Robinson's fairer treatment of my remarks about the "gold-fields," I would beg leave to say that nothing is further from my wish or intention than to deny the existence of gold in South Africa, either in the places designated by Mr. Mauch, or elsewhere; but I think I am justified in protesting against the use or abuse of the term "gold-fields," at so early a stage, and without better foundation than the few scanty facts as yet known. My observations were, that although gold may and doubtless does exist in South Africa, as it does indeed in most parts of the world, England included, yet it is not there in sufficient quantities to pay to work, nor to warrant the name of gold-fields, so pompously applied to them. I need no better corroboration of my remarks than Mr. Robinson's own authority, quoted in his letter, as follows:—"I refer to Dr. Taylor's letter, published in the *Natal Mercury* of September 22nd. Among his remarks are the following—'From my own observation, I do not think it would be advisable for any one to go there from Natal with the idea of making a living by gold-digging, as none has yet been discovered in the alluvial deposits or rivers; but it would be desirable to send prospecting parties into the country supplied with requisite tools and provisions for twelvemonths.' Arrangements should be made with the Matabele to work in safety, and it is very probable that gold-fields would be discovered equal to any in the world." Mr. Robinson fails to give us, verbatim, the evidence of his "chief authority," Mr. Mauch, the which omission I beg to mend; for though this testimony is not in accordance with Dr. Taylor's and Mr. Gregory's views, yet it is so very decided and unequivocal that I think it ought to be made known. In the prospectus (recently issued) of the South African Gold-fields Exploration Company, there is an extract from a letter of Mr. Mauch's to the *Transvaal Argus*, to the following effect:—"December 3rd, 1867,—Ivory and feathers now form the greatest proportion of the remittances made from here, but gold, aye, precious gold, known by all in its coined state as sovereigns, and longed for by all, has hitherto been hid from the eyes of nearly all in South Africa. But I speak of days now past, for Mr. Hartley, the well-known elephant hunter, may count among the results of his last hunt the discovery of two gold-fields of enormous extent, the first of which has been traced and seen to extend to more than eighty miles in length, by from two to three miles in breadth; the other is twenty-two miles broad, and promises to be most valuable, in fact rivalling in value the diamonds recently found near Hope Town. The vast extent and beauty of these gold-fields are such, that, at a particular spot, I stood as it were transfixed—struck with amazement and wonder at the sight, and for a few minutes was unable to use the hammer." Any one reading this remarkable account would certainly imagine that the place referred to, if not precisely "Aladdin's Cave," yet abounded in visible gold in immense quantities (for a mere range of quartz rocks could not prove such a bewildering sight to an experienced traveller like Mr. Mauch); and I am unable to conceive why Mr. Mauch, or Mr. Hartley, at the least, who, I am informed, hunts the elephant as a commercial speculation, did not avail himself then, or during the year's interval, of the golden harvest; nor how it is, in face of these discoveries, that the Cape colonists have not turned them to better account. It is just possible that quartz-crushing in these regions might prove profitable, and constitute a proper field for the enterprise of a company, were the country easy of access, and under strong and peaceful rule; but I leave it to the sense of your readers to decide whether, on the data as yet furnished, there is justification for a call on the general body of emigrants. When I see ships advertised here to sail for the "gold-fields," and the announcement of a new source of auriferous supply blazoned forth in the Cape newspapers, I do think a few words of timely warning are necessary, to prevent individual emigrants rushing on an enterprise (fitted at the best for associations only), and proceeding to a colony where subsistence is dear, notwithstanding the comparative cheapness of meat and vegetables. In conclusion, let Mr. Robinson rest assured that "not all the disfavour," with which, he says, "South Africa and its affairs are regarded in many quarters, will defer indefinitely the day when this source of wealth is to be turned to practical account," nor prevent thousands upon thousands of emigrants hurrying to share in such riches when once it is established that they really have existence.—I am, &c., Harry Emanuel, F.R.G.S.

Edible Fungi. — Sir,—Attention has of late been drawn to fungi as an article of food, in this *Journal* and elsewhere; it is to be hoped with good results. So long as such pleadings on behalf of neglected aliments are addressed to the intelligent and educated, there is not much danger of their being abused, but, unfortunately, the influence, without the judgment, is likely to spread to the uneducated and reckless, with results not equally satisfactory. It is very questionable whether the great bulk of our agricultural population ought to be tempted to indulge in fungi to a greater extent than at present, because, after all, the discrimination of good from bad must chiefly depend upon botanical characters, and is not to be determined by any one unfailing test. Good service would be rendered by anyone who would make known some golden rule whereby to distinguish esculent from deleterious species, but hitherto all such attempts have failed. Even that of Mr. John Bell, alluded to in your *Journal*, will not, I fear, stand the test of experience. It is an undoubted fact that we have at least twenty* good species of esculent fungi which could be well recommended, and easily distinguished by anyone of ordinary intelligence, accustomed to note the differences in natural objects. That the great mass of our population are unable to appreciate the differences between different species of the larger fungi has evidence in the fact that so very few of them have distinct local or popular names. If they had I should have greater hopes of the success of any plan for their wider utilisation. A countryman never mistakes a blackbird for a rook, but his knowledge of them and their differences is quite apart from their zoological characters. Until children can be taught to distinguish *Coprinus comatus* from *Agaricus fascicularis*, although they differ much more from each other than the rook from the blackbird, there is little hope; and until they know them by distinct names (not in binomial Latinities), both are still likely to be called "toadstools," and if one is recommended to be eaten, both are likely to be tried with dangerous results. One of the best, and, as I conceive, the only practical way of extending information safely, is by the publication of good unmistakable figures of edible and poisonous species, like the two sheets by Mr. W. G. Smith. Mere description is valueless. With the very best instruction accidents are sure to accrue. Now, whilst in many districts only one kind, called mushrooms, are supposed to be edible, and all the rest "toadstools," and dangerous, we are constantly hearing of fatal results, produced through ignorance or carelessness. If in such places it comes to be believed that twenty kinds, instead of one, are edible, I fear that in the same ratio accidents are likely to increase, unless, at the same time, it is urged, equally strongly, that there are a greater number that cannot be eaten under pain of death. I am led to make these remarks under the conviction that the greatest caution should be used in inducing the public to depart from the old custom of eating only one or two species, unless some knowledge is possessed or acquired of some of their most prominent botanical characters.—I am, &c., M. C. Cooke..

Poisonous Mushrooms.—Sir,—The letter from Mr. Christopher Cooke, in your issue of November 13th, requires a few words of comment. First, to dispose of the death of the waterman who ate poisonous mushrooms and died the same evening, "with all the symptoms of mushroom poisoning" (*vide Lancet*), I would ask, Is it possible to distinguish the symptoms of mushroom poisoning from the general symptoms of narcotic poisoning in general? Vomiting does not always ensue, but from my own experience of dangerous fungi (and I have tried some hundreds) the general effect on the system is precisely the same as that described in all narcotic poisoning. At the time this particular death occurred, London and its environs were overwhelmed with mushrooms, "real and spurious" (to use Mr. Cooke's words); they were displayed on costermongers' barrows at every street corner, and were generally semi-putrid and of different species. I am assured that few persons could partake of such food without serious illness, or even death; all fungi (and, indeed, nearly all articles of food) become dangerous poisons when decomposition has once set in. The evidence of such persons as "cooks at inns," "nieces of hotel keepers," and country folk in general, is utterly worthless; and surely Mr. John Bell's test is of little more value, for who would think of eating fungi abounding with "pungency like pepper!" But even this does not hold good, for many highly dangerous species are perfectly mild when first eaten, and the deleterious qualities are not manifested till the fungi have been in the stomach for some time. Little dependence, too, can be placed on the colour of the gills, which vary according to the age of the plant, from the palest rose to full pink, chocolate, and finally black. But surely no one who had ever seen a true mushroom (*Agaricus campestris*), and had its peculiarities pointed out, could ever mistake another species for it, unless, indeed, it was the very near and wholesome ally, the horse mushroom (*A. arvensis*), the common species of Covent-garden-market, distinguished from the former principally by its more robust growth, whiter top, and paler gills. The true form of the mushroom never grows in woods; yet only last year a whole family was poisoned (one to death) by fungi gathered from a wood, and that, too, by a species noted for its offensive and forbidding odour (*A. crustuliniformis*); the *bona-fide* mushroom never grows on decaying stumps, but always in rich meadows; the whole plant is fleshy, has a delicate and inviting odour, a dry, whitish floccose top, and (which is of great importance) an irregular ring or collar round the upper part of the stem; if the stem is cut off, and the top laid gills lowermost on a sheet of writing paper, a profuse purple brown dust will be deposited from the gills; this dust (the colour of which is most important) consists wholly of the seeds or spores of the fungus. The above characters distinguish *Agaricus campestris* from every other of the six hundred species of *agaricus* found in this country. Our knowledge of the qualities of these plants is at present very imperfect, but I know that the majority of British species are not only wholesome and nutritious, but delicious articles of food; that they require to be known, I admit, but the knowledge of this subject, like the knowledge of all others, is not to be acquired in a few minutes by a royal road, neither is there at present any known chemical test whereby a poisonous species may be at once detected. To select only such mushrooms as are perfectly fresh, and grow in rich, open pastures, and to pass by all such as grow on or about stumps and in woods, is a golden rule for beginners.—I am, &c., Worthington G. Smith.

* Perhaps double that number, but all are not equally good, or as readily distinguishable.

MEETINGS FOR THE ENSUING WEEK.

Mon.....Society of Arts, 8. Cantor Lectures. Mr. W. H. Perkin, "On the Aniline or Coal Tar Colours."
Royal Inst., 2. General Monthly Meeting.
Society of Engineers, 7½. 1. Mr. Ewing Matheson, "On the Accumulator Cotton Press." 2. Mr. Baldwin Latham, "On the Application of Steam to the Cultivation of the Soil."
Entomological, 7.
Medical, 8.
Victoria Inst., 8.
London Inst., 6.

Tues ...Medical and Chirurgical, 8½.
Civil Engineers, 8. Discussion upon Mr. Wheeler's paper, "On the River Witham and its Estuary."
Photographic, 8.
Ethnological, 8. 1. Mr. H. H. Howorth, "The Westerly Drifting of the Nomades from the Fifth to the Nineteenth Century." 2. Col. Lane Fox, "On some Flint Implements found associated with Roman Remains in Oxfordshire and the Isle of Thanet."

Wed ...Society of Arts, 8. Mr. C. Tomlinson, F.R.S., "On the Drying Properties of various kinds of House Paint."
Geological, 8.
Graphic, 8.

Microscopical, 8. Dr. H. C. Bastian, "On Mounting and Tinting Sections of Animal Tissue."
R. Literary Fund, 3.
Archæological Assoc., 8.
Thur ...Royal, 8½.
Antiquaries, 8½.
Zoological, 8½.
Royal Society Club, 6.
Mathematical, 8.
Fri .....Astronomical, 8.
Sat .....R. Botanic, 3¾.

Patents.

From Commissioners of Patents' Journal, November 27.

Grants of Provisional Protection.

Ammunition, supplying to troops under action—3478—T. Martin.
Bales, hooping—3417—W. Riddle.
Boilers—3468—J. Howard and E. T. Bousfield.
Boots and shoes—3445—W. Thomas.
Braces—3382—S. Arnott.
Buffers, &c.—3385—H. Steffanson.
Cabs—3454—R. A. Gold.
Cannon wads, &c.—3381—J. C. Haddan.
Carding engines—3452—T. and A. T. Lawson.
Carding engines—3467—W. Richardson.
Carriage doors, fastening—3369—T. and T. P. Lucas.
Carriage shafts, safety stay for—3428—G. Piercy.
Castors—3474—J. C. Bowler.
Cattle food—3431—C. J. Chaplin.
Coal, &c., machinery for getting—3441—W. Donisthorpe.
Corsets, &c.—3424—W. S. Thomson.
Cotton seed, utilising a certain waste material obtained in treating—3405—T. Rose and R. E. Gibson.
Cotton, &c., presses for packing—3032—D. West.
Dental appliances—3289—J. Wallace.
Door knobs, &c.—3401—W. R. Lake.
Elastic fabrics—3466—A. Turner.
Electric telegraph apparatus—3462—P. Hill.
Engines for raising water, &c.—3399—W. M. Brown.
Explosive compounds—3408—G. Clark.
Fabrics, stretching and finishing woven—3476—J. Smith.
Fabrics, woven—3398—B. Hunt.
Fabrics, &c., beetling woven—3372—J. Parrott and W. Jones.
Felts, manufacturing—3249—J. Anderson.
Fences, &c., constructing—3425—M. H. Davies.
Fire-arms, &c., breech-loading—3433—H. Henkel.
Furnaces—3407—J. H. Johnson.
Furnaces—3418—T. R. Crampton.
Furnaces and fire bars—3376—W. Baker.
Hasps and hinges—3374—F. E. Martineau.
Hoeing apparatus—3397—R. McHardy.
Iron and steel—3419—H. Bessemer.
Iron, machines for straightening, &c.—3482—E. Hogg.
Iron ores, treating—3471—H. Aitken.
Kilns for burning bricks, &c.—3402—J. L. L. Sweatnam.
Lamp globes—3392—W. Corden.
Liquid meters—3464—R. Beckley and J. J. Hicks.
Liquids, separating solid matters contained in—3390—A. M. Clark.
Looms, &c.—3447—J. Dendy and J. H. W. Biggs.
Lubricators—3422—R. Halliday.
Metallic caps—3388—J. Sturrock.
Millstones, dressing—3409—J. Hine.
Night lights, cases for—3444—E. Owen.
Oil cake, &c., corrugated plates used in manufacturing—3346—M. Samuelson.
Pen rests—3345—R. W. Beckley.
Pickers—3432—S. and G. Holt.
Pipes, &c., moulding—3451—G. Markham and W. Knighton.
Pipes, &c., moulding, &c.—3453—C. Markham and W. Knighton.
Planing, mortising, &c., machinery for—3389—A. M. Clark.
Postage stamps, &c., cases for containing—3386—J. Macneill.
Potatoes, treating—3414—T. Cain.
Quartz, &c., crushing and grinding—3439—L. Wray.
Railway cattle trucks—3257—W. Reid.
Railway wheels—3472—J. H. Johnson.
Railways, splices for connecting the ends of rails on—3406—P. B. Tyler.
Reaping machines—3396—W. Manwaring.
Retorts—3412—J. Gregory.
Rock, &c., boring and working in—3383—J. Lewthwaite.
Rock, &c., cutting—3443—J. Kellow.
Ropes, cordage, &c.—3380—A. M. Clark.
Salts of ammonia—3484—A. McNiel and W. Wheaton.
Screw bolts—3420—T. Vaughan and E. Watteeu.
Screw piles, &c.—3442—G. P. White.
Screw threads, cutting—3387—J. H. Johnson.
Sewage water, &c., distribution of—3416—O. G. Abbott.
Sewing machines—3440—E. Haas.
Ships, propelling—3465—H. E. Newton.
Ships' waterclosets—3411—J. H. Wilson.
Ships, &c., propelling—3258—W. G. James.
Signal apparatus for the protection of property and game—3455—W. Burgess.
Size—3459—J. B. Green.
Sleeve-links, &c.—3020—J., F., and S. Jenkins.
Smoking pipes—3427—F. Holmes.
Soap—2362—E. S. T. Steane.
Soap, cooling and barring—3393—G. T. Bousfield.
Spindles, &c., machinery for manufacturing—3435—T. B. Colling wood and W. Hardman.
Steam generators—3460—T. Mills.
Sulphuric acid—3098—H. Deacon.
Suspension bridges—3486—W. Low and G. Thomas.
Taps—3366—A. H. Robinson.
Telegraph wires, protecting—3224—E. O. W. Whitehouse.
Tiles, roofing—2660—W. M. Jackson and R. Garsides.
Timber bearers for roofs, &c.—3437—D. Griffiths.
Tin, terne, &c.—3423—E. Madge.
Tobacco dish and cigar and spill rack combined—3395—H. Davis and J. Parsons.
Upholstery trimmings—3448—R. A. Dalton and G. S. Barton.
Walls, &c., hangings and coverings for—3449—C. E. Brooman.
Washing apparatus—3391—W. J. Criddle.
Whales, &c., capturing—3228—F. Bennett and R. Ward.
Yarns, dyeing and washing—3480—J. Matheson, jun.

Invention with Complete Specification Filed.

Artificial fuel—3511—H. D. Hoskold and G. P. Wheeler.

Patents Sealed.

1752. J. Reidy.
1755. W. Dalziel.
1757. T. Drake.
1764. R. H. Bentham.
1788. M. Chavagnat.
1792. O. Reynolds.
1794. S. Walker.
1795. J. B. Farrar.
1805. J. Avery.
1807. G. A. H. Lillie.
1842. A. M. Clark.
1856. J. Gerard.
1871. A. M. Clark.
1895. A. M. Clark.
1896. H. A. Bonneville.
1903. H. Turner.
1904. S. Barlow, T. Edmeston, and T. Beeley.
1905. W. Unsworth.
1935. C. Whitehouse.
1962. M. Demmer.
2038. T. Restell.
2085. C. E. Brooman.
2290. J. M. Hector.
2378. W. R. Lake.
2841. A. Rooker.
2898. J. H. Johnson.

From Commissioners of Patents' Journal, December 1.

Patents Sealed.

1447. W. R. Lake.
1801. E. P. H. Vaughan.
1803. T. Christy.
1811. L. Sterne.
1812. F. Schäfer.
1823. E. Fairburn.
1828. G. Hartley and P. Robertshaw.
1834. R. Woinar.
1836. J. Worth and A. Barker.
1841. M. Henry.
1848. F. Reddicliffe.
1850. W. J. Addis.
1872. G. Watson and W. J. and S. T. Baker.
1874. D. Coffey.
1882. G. Howard.
1890. W. Hamer and J. Davies.
1897. E. P. J. L. Terrel.
2173. W. Hadfield.
2305. C. E Brooman.
2916. R. Harling.
3117. W. R. Lake.

Patents on which the Stamp Duty of £50 has been paid.

3020. S. C. Salter.
3205. M. Klotz.
3041. W. E. Newton.
3119. R. A. Brooman.
3055. J. Thompson.

Patent on which the Stamp Duty of £100 has been Paid.

2955. J. Ronald.
2975. W. Firth and R. Ridley.
2980. F. A. Calvert.
2977. G. E. Donisthorpe, W. Firth, and R. Ridley.
3009. T. Ellis.

Registered Designs.

4975—Oct. 29—Gwynn and Fisher's hinges for sewing machines—J. F. Fisher and Gwynn, 140, Fleet-street, E.C.
4976—Nov. 4—A shirt-front fastening—C. E. Pearce, Signal-house, Commercial-road East.
4977—Nov. 7—Improved egg-beater—J. E. Woolf and W. Chavasse, 119, New Bond-street, W.
4978—Nov. 13—Hat ventilator—W. W. Twigg, Birmingham.
4979—Nov. 17—Improved hat ventilator—Richardson, Woolley, and Smith, Manchester.
4980—Nov. 18—A tray for a cash-box—G. Gough, 217, High-street, Camden-town.
4981—Nov. 21—A guard to be applied to the cylinders of carding engines—J. Tattersall, Preston.
4982—Nov. 21—The gauge dram bottle—J. Yates, Birmingham.
4983—Nov. 23—A secure fastening button—R. and J. Gough, Birmingham.
4984—Nov. 26—A wood-turning lathe—J. Braithwaite, Crook Foundry, near Kendal.
4985—Nov. 26—Stopper for bottles or other like vessels—R. Fenner, 28, St. John's-lane, Clerkenwell.

Journal of the Society of Arts.

FRIDAY, DECEMBER 11, 1868.

Announcements by the Council.

Ordinary Meetings.

Wednesday Evenings at eight o'clock :—

December 16.—"On Artificial Freezing." By Dr. B. H. Paul.

December 23.—"Description of the Electric Organ." By Henry Bryceson, Esq.

Cantor Lectures.

The first Course of Cantor Lectures for the present Session, the subject being "The Aniline or Coal Tar Colours," is now being delivered by W. H. Perkin, Esq., F.R.S., on Monday evenings, as follows :—

Lecture II.—Monday, December 14th.

Mauve, Magenta, and some of their Derivatives.

Chemical nature of mauve—Runge's blue—Magenta: its discovery and manufacture—Phosphine—Bleu de Lyon—Bleu de Paris—Violet Imperial—Hofmann's violets—Britannia violets.

Lecture III.—Monday, December 21st.

Various Aniline, Phenol, and Naphthalin Colours—Application of the Coal Tar Colours to the Arts.

Aldehyd green—Iodine green—Perkin's green—Aniline pink—Black, browns, &c.—Phenol—Picric and isopurpuric acids—Aurine, coralline, and azuline—Naphthalin yellow—Chloroxynaphthalic acid, &c.—Application of the coal-tar colours to the arts of dyeing and printing—Paper staining and colouring—Lithographic and other printing.—Conclusion.

Each lecture will begin at eight o'clock. These Lectures are open to Members, each of whom has the privilege of introducing two friends to each Lecture.

Other courses are being arranged, particulars of which will be announced.

Institutions.

The following Institution has been received into Union since the last announcement :—

Alnwick Scientific and Mechanical Institution.

Subscriptions.

The Michaelmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Food Committee.

The Committee met on Wednesday, 18th instant; present—Mr. Benj. Shaw (in the chair), Mr. E. Wilson, Mr. W. H. Michael, Mr. G. F. Wilson, F.R.S., Mr. J. T. Ware, and Mr. Seymour Teulon.

Mr. George Barham, managing director of the Express Country Milk Company, Museum-street, attended before the Committee, to give evidence relative to the conveyance and distribution of milk to London, &c.

Mr. Barham stated that Mr. Alexander Wood, deputy-chairman of the Great Western Railway Company, had expressed an opinion before the Committee that it was desirable that the size of the cans in which milk is brought to London by railway should be reduced from a capacity of eight barn gallons to about one-fourth that size, with tight-fitting lids, after the fashion of the French cans; also, that the vessels should be completely filled, so as to prevent disturbance of the particles of the milk by motion in transit. He (Mr. Barham) thought it was not desirable to reduce the size of the cans to the extent suggested, if at all, because, he said, the present large cans could be rolled along the platform of a station quicker than small cans could be carried the same distance by hand, the latter being so short that it would be impossible to roll them on the bottom, as was done with those now in use, which are protected at the bottom by a stout iron rim. The shaking of the milk in the conveyance would not be greater in a large can than in a small one, provided in both cases they were filled thoroughly full. His own opinion was, that if the milk were in a cool state before it was put into the cans, the shaking would have no prejudicial effect upon it. The great secret of getting the milk in good condition was in allowing it to cool sufficiently before being placed in the cans. A large quantity of milk arriving at night was left standing at the station till four a.m., when it was fetched for delivery. If the milk were put into the cans warm, and the lids were kept on all night, it would acquire a bad smell, and it would take two or three hours for that smell to pass off.

Mr. Michael inquired to what extent milk was influenced, and caseine deposited by agitation in contact with air?

Mr. Barham replied if the milk were packed at a temperature of 50° to 60° Fahr., the particles would not be injured by the agitation. It was very difficult to make butter with milk at that temperature. They might be all day over it. If the milk were packed at 70° or 80° Fahr., the agitation would tend to separate the butter, and to promote the deposit of caseine. If the temperature of the air were not higher than that of the milk, he thought no injury would be occasioned by the admission of the air to the milk whilst it remained in the cans.

Mr. Seymour Teulon suggested that, in addition to the space which the present size and form of the cans occupied unprofitably in the van, they could not be loaded and unloaded by one man.

Mr. Barham said it required two men to lift the loaded cans into the van. There were always plenty of hands at the station to do such work; smaller cans, no doubt, could be lifted by one person. That was the great difference between the two sizes. One man could lift an eight-gallon can out of the van, but could not lift it in alone. But there was always a porter to assist at all the stations, and the larger consignees in London generally had two men at the station.

Mr. Michael suggested that great economy of space in the vans would be gained by the cans being made in the form of a parallelogram, instead of circular with a considerable taper towards the top, whereby a great deal of space was wasted.

Mr. Barham replied the rectangular form might answer if the cans were of an easily portable size, but they could not then be rolled along the platform, as were the cans at present in use, and they would be very much battered at the angles. Another objection to the parallelogram form would be the difficulty of keeping the vessels perfectly sweet and clean.

The Chairman inquired whether the agitation of the milk in travelling destroyed the cream in the milk brought into London?

Mr. Barham replied in his opinion the globules would not be destroyed, if the milk were put into the cans at a sufficiently low temperature. He considered milk ought never to be packed at a temperature of more than 60 degrees, and if that were observed the milk would come to London in perfectly good condition. The Express Country Milk Company received milk for two years from Wareham, in Dorsetshire, a distance of 130 miles by rail and seven miles by road. It arrived in fine condition. He attributed this result to the chalky nature of the soil, and to the milk being thoroughly cooled before being packed. It was well known that the milk of cows fed off heavy, clayey land would not keep so long by several hours as that produced on a chalky soil. The agitation of the milk in travelling did not permit the obtaining of cream if it were required. The most favourable time for setting milk for cream was the moment after it came from the cow, or at about 90° Fahr. Dairies in the country were not kept at that temperature, but it was seldom they were so low as 60° Fahr. in the summer, and artificial heat was employed in the winter to maintain that temperature. If the object were to prevent the globules of the milk being destroyed by the shaking, that would be best effected by *completely* filling the cans. The cans at present in use cannot be so completely filled as to prevent agitation. The Express Country Milk Company received ten cans of milk from one dairy every day through the last summer, and there was not a particle of butter in them, though they travelled two miles by road to the station, forty-eight miles by rail to the metropolitan terminus, and three miles by van to the place of business. Some of the cans were only three-parts full, and yet the cream was retained on the milk, although, from being cooled, it would take some hours longer for the cream to rise. The best way of supplying cream in London would be to have it sent in a separate state from the country, as was done to a certain extent at the present time, though on a comparatively small scale. Cream might be supplied, in almost any quantity, daily if the demand were regular, but, as the demand was extremely irregular, beyond doubt there was occasional difficulty in obtaining it. The amount of cream which rose to the surface of the milk when set was rendered less by about 20 per cent. through travelling, that percentage being retained in the milk. He had never used the Devonshire method of getting cream, and he believed it had not been tried in London. The milk which was served in London in the morning would probably have been milked from four to eight hours previously; that supplied in the afternoon was more recently milked. The system of 12 hours milking was generally adopted. The milk supplied to London in the early morning was milked during the night, say from seven p.m. to two a.m., the hour depending upon the time the last train at night or the early mail train called at the country station. The afternoon milk was milked from nine to eleven a.m., and was distributed between two and four o'clock p.m. When cream was sent in a separate state, it was packed solid in bottles prepared for the purpose, and kept cool by grass or cabbage leaves fastened round the bottles.

Mr. Teulon inquired what was the average yield of cream, from milk of good quality, set as soon as it came from the can.

Mr. Barham replied it would be about five gills per barn gallon of milk set, from cows fed on good pasture. The same milk in London would probably not yield more than a pint of cream, and would require a much longer time to rise to the surface, owing to the cooling of the milk.

Mr. Michael inquired to what use the milk was put from which the cream was taken.

Mr. Barham replied it was sold as skim milk, at 2d. per quart. In some neighbourhoods there might be a demand for skim milk, but it was not generally the case in London, and it would require depôts in the poorer neighbourhoods to do anything like a trade with it. The major portion of the skim or surplus milk was disposed of at a low price to biscuit bakers, who use it in their manufacture in a sour state, when it forms lactic acid. Looking to the fact of the readiness with which milk can be tested by the use of the lactometer and the cream tube combined, it was surprising to him that customers did not more generally test the article they were supplied with, although he believed there was no test by which we could detect the water added by way of dilution from that which was in the milk naturally. He did not think feeding upon grains produced an inferior quality of milk, but such food, being of a stimulating nature, might increase the quantity of milk. He knew it was the habit of some dairy keepers to drive their cows to water before milk, in order to increase the yield of milk.

In reply to Mr. E. Wilson,

Mr. Barham added that he did not think there would ever be a large demand for skim milk in London, even in the poorest districts. The very poor—particularly the Irish poor—were for the most part excellent judges of milk, and what little they bought they preferred to have good. In some neighbourhoods diluted milk was sold as new milk at 2½d. to 3d. per quart.

Mr. Michael inquired whether Mr. Barham was able, as a rule, to equalise his supply and demand so as to have but little waste milk?

Mr. Barham replied certainly not; but it went to the biscuit bakers' or the pigs. It was the object of the milk dealers to obtain such a customer for surplus milk at a low price, or else it would be all wasted.

The Chairman inquired if it were the fact that there had been a considerable diminution in the number of London cow sheds since the late epidemic.

Mr. Barham replied in the affirmative. The medical officers of health had reported so frequently of the unhealthiness of localities where cows were kept, that magistrates would not grant any licences in particular districts. St. James's and St. Clement Danes were two instances, and in other districts it was well known that no new licence would be granted, nor an old one renewed, except upon proof of great cleanliness, space, &c. Many cowkeepers had had severe losses from disease, and were afraid to keep cows in London; and the sheds formerly occupied in that way were employed as stables for other purposes. Some of the London cowkeepers had farms out of town, and sent their milk by railway. He was decidedly favourable to the entire abolition of cow sheds in London, although he believed it was the opinion of some dealers that the presence of cows promoted their business.

Mr. Michael, reverting to the subject of the cans, inquired whether Mr. Barham considered there was any great advantage in the large cans, with the exception of the facility for rolling them from place to place?

Mr. Barham replied that the question of the return of the empty cans must be regarded, inasmuch as the railway companies charged as much for a small can as for a large one. He thought the transit was facilitated by the use of the large cans. In respect of the effects produced upon the milk itself, he did not know that the large cans gave any advantage over small ones. If suitable arrangements were made for the conveyance of small cans, he thought the large ones might be dispensed with; and in the event of milk being packed in a warm state, it might be advisable to send it in smaller bulks; but, if it were cooler than the atmosphere, the larger the bulk the better.

Mr. Michael remarked that, during the six cool months of the year, there would be no danger of the formation of lactic acid.

Mr. Barham concurred in that, and added that the air which was admitted through the holes in the lid of the can was not always sufficient in hot weather to keep the milk sweet. He had not tried the experiment of hermetically sealing the cans when completely filled, and excluding all air, nor was he able to give an opinion on that point. At present fully half the milk that was sent to London in small quantities came in cans that were not full. The Parisian milk was generally acknowledged to keep longer than that supplied to London; this had been attributed to its being hermetically closed while travelling; but an old Parisian dairyman had let him into the real secret, and that was they mixed bicarbonate of soda with their milk.

Mr. E. Wilson incidentally remarked upon the general scarcity of cream at the tables of persons in London who lived in the most luxurious style. He thought there was no good reason for this. Visitors from London to the country regarded cream as an article wholly beyond their reach.

Mr. Barham said if a daily supply were ordered by families, cream could be had in any quantity. It was owing to the uncertain nature of the demand that so little cream was sent to London. The retail price of four shillings per quart for cream made it about equal to that of a barn gallon of milk at the retail price, allowing eightpence for the skim milk.

Mr. E. Wilson asked whether Mr. Barham had considered the question of the different breeds of cows in reference to the quality of the milk when tested by the lactometer and cream tube?

Mr. Barham replied that he had done so to some extent. It did not much affect the specific gravity of the milk, but it bore upon the percentage of cream. For example, the specific gravity of cream was less than that of milk, but the richer milk was in cream, the larger quantity of the element caseine it contained, which, being heavier than either, the specific gravity of poor and rich milk was nearly the same.

Mr. Michael remarked that the conclusion to be drawn was, that neither the lactometer nor the cream tube was a satisfactory test of the quality of milk, but that it required scientific investigation beyond that.

Mr. Barham said the standpoint varied from 1030 to 1034 of specific gravity, and there should be at least 8 per cent of cream.

Mr. Michael observed that it was easy to apparently increase that percentage by simple artificial means.

Mr. Barham thought it would be too expensive, and people did not generally adulterate with ingredients more costly than the article to be adulterated.

In the course of some general observations made by Mr. Barham, he stated his opinion that London was better supplied with milk now than it had been at any previous period in his recollection, although he thought it could be greatly improved by the total abolition of the London cowsheds, and the use of properly-constructed railway vans for the conveyance of country milk. The London cowkeepers did not now, and probably never did, study the quality of the milk their cows give. The retail dealer and distributor, in obtaining his daily supplies, made an arrangement to milk the cows himself, and to pay a certain sum per gallon,—thus he defeated any direct attempt at adulteration; but as the cowkeeper's object was quantity not quality, he adopted every means of stimulating the secretion of milk in the animal, by the manner of feeding and keeping it, and by those means deteriorated the quality and wholesomeness of the article. Now, on the contrary, three-fourths of the present supply was obtained from the farms of noblemen, gentlemen, and farmers of repute, who take great pride in the breed and condition of their stock, and in the quality of the milk their cows yield. Mr. Barham further said that the Express Country Milk Company, of which he is the manager, derive a large portion of their supply from the home farms of the Earl of Macclesfield, at Shirburn Castle, Lord Monson, at Gatton Park, and Lord Lytton, at Knebworth.

Referring to the necessity of improved railway vans being used in the transmission of milk to the metropolis, Mr. Barham said that, in their present mode of conveyance, the railway companies were open to grave rebuke. Notwithstanding they charged 13 per cent. on the prime cost of the article for carriage, their manner of conveying it was simply abominable, not to say offensive. It is frequently put into the guard's van, and had baskets of fish, water-cress, and other material placed upon it, which were permitted to drain and drip through the perforated top of the cans and mix with the milk. He related an instance within his own experience, of a leaky can or bottle containing naphtha being placed on a milk-can, which, draining into the latter, totally spoilt 70 quarts of milk. He quoted other and similar instances of the neglect of railway companies as carriers of milk from country districts, notably, their custom of placing the cans in open trucks, exposing them in the summer time to the scorching rays of the sun attracted by the tin, and in the winter to heavy rains and snow, and at all times to the soot and coke drift from the furnace of the engine. Not unfrequently, continued Mr. Barham, the cans are placed in horse boxes, from which horses have just been removed, and in the summer season the smell in these boxes is most offensive.

The Committee thanked Mr. Barham for his attendance and the information he had given, and then adjourned.

Cantor Lectures.

The first lecture of Mr. W. H. Perkin's course "On the Aniline or Coal Tar Colours," was delivered on Monday evening, the 7th inst. A full report of these lectures will appear in the *Journal* at an early opportunity.

Fourth Ordinary Meeting.

Wednesday, December 9th, 1868; Professor W. Allen Miller, F.R.S., of King's College, London, in the chair.

The following candidates were proposed for election as members of the Society:—

Fison, E. Herbert, Stoke-hill, Ipswich.
Marchisio, Dr. J. E., 50, Baker-street, Portman-sq., W.
Stallard, J. H., M.D., 7, King's-rd., Bedford-row, W.C.
Sullivan, Thomas Durell, 56th Regiment.
Taylor, Edward James, Shawfield-street, King's-road, Chelsea, S.W.

The following candidates were balloted for, and duly elected members in the Society:—

Huggins, Henry, Gordon-house, Kentish-town, N.W.
Rönn, Hermann S. Von, 21, Kensington-park-grdns, W.
Sadgrove, Archer W., Ellerslie, Eltham-road, Kent.

The Paper read was—

ON THE DRYING PROPERTIES OF VARIOUS KINDS OF HOUSE PAINT.

By Charles Tomlinson, F.R.S., F.C.S., &c.

I owe an apology to this meeting for having been compelled to substitute for the subject originally announced, another, which, I hope, will not be without interest. When, some months ago, your excellent secretary asked me to prepare a paper for to-night, I thought the scientific details connected with boiling liquids would have been already discussed elsewhere

so that I could have had the honour of submitting the practical results to your notice. I still hope to do so if your Council will give me an evening after Christmas.

The question we have to consider to-night is, "Why does paint dry?"

The difficulties of this question presented themselves to me on the occasion of some house-painting during the last summer. "Capital weather for drying, sir!" was the remark of the painter. "Why does paint dry?" was the question of a child.

I have great love and respect for children. I love them because they think what they say, and say what they think. I respect them because they are good observers, and continue to be so until they go to school and learn how not to observe. Philosophers are children whose powers of observation have been cultivated. Children, left to themselves, are philosophers. What a pity they should cease to be so.

But why does paint dry? When a shower of rain wets the pavement and the sun shines out and the wet disappears, we know that a certain amount of heat-force has converted the water into invisible vapour, and we call this process of drying, evaporation. So also when we boil a kettle of water there is a change of state, of water into steam, and a process of evaporation is going on, only in this case it is more rapid than in the other, and evaporation is not superficial merely, but from every part of the liquid, more or less. Continue the process, and the water dries up by this rapid evaporation. Again, if we apply heat to oil of turpentine contained in a retort, it will boil at a little over 300° F., and the vapour may be collected and condensed in a cooled receiver. But if we try to boil linseed oil, for example, it will not only not distil over, but it will blacken and decompose instead. If we moderate the heat so as not to carbonise it, then it will lose about one-sixth of its weight and become thick, tenacious, and viscid; forming what is called printer's varnish. Raise the temperature above 600°, and if air be present the oil will take fire and burn quietly without further external heating until nothing but tar or charcoal is left. If, however, the burning be interrupted by closing the vessel, a brown viscid substance will be left, known as bird-lime.

There must be something, then, very different in the constitution of these two oils, turpentine and linseed, since they behave so differently under the influence of heat. Such is the case. Turpentine belongs to a class of oils known as *volatile;* that is, they can be raised into vapour by means of heat, and, under certain conditions, will evaporate, or dry up, in the sense that the wet on the pavement dries up after a shower of rain. Linseed oil, on the other hand, which cannot be boiled or distilled, belongs to a class of oils called *fixed*.

Some one now steps in with an objection. Painters not only boil their linseed oil, but the very process gives the name of *boiled oil* to the product.

What painters really do is this:—They gradually raise the oil to about 500°, when it begins to give off acrid vapours, and a little above 600° the oil itself begins to decompose with the escape of gaseous hydro-carbons, which, swelling up in bubbles, give the oil the appearance of boiling. Continue the process out of the reach of air, and the oil would be entirely broken up, past recall, into a mixture of solid and liquid hydro-carbons, and various fatty acids, with a very irritating body, known as *acrolein*, from its distressing action on the mucous membrane of the eyes and organs of respiration. It is quite clear, then, that the linseed or nut-oil used as the liquid vehicle of paint does not dry by the ordinary process of evaporation. I put the question, "Why does paint dry?" to an intelligent painter, and the answer was, "Because we mix *dryers* with the paint." These dryers, as they are called, consist of litharge, oxide of manganese, and sugar of lead. Linseed oil is heated with about one-twentieth of its weight of litharge, which the oil completely dissolves, and is then used as a dryer. A similar heating with manganese or sugar of lead also improves the so-called drying properties of the oil.

But what would be the effect of omitting the dryers altogether in the composition of the paint? I have no doubt most painters would say that the paint would never dry. Let us see the result of a careful experiment performed by Chevreul some years ago. Of course, you are aware that house paint, omitting the colouring matters or stainers, consists of three ingredients:—1st, white lead or white zinc; 2nd, a fixed oil, such as linseed, or nut, used for the purpose of reducing the white to a soft paste, to which are afterwards added variable proportions of linseed or other oil for thinning the paint; 3rd, the drying material or dryer which we now propose to omit.

Four oak strips were painted, each on one side, with a paint composed of white lead and linseed oil, and on the other side with a paint composed of white zinc and linseed oil. The strip No. 1 was exposed to the air to dry; No. 2 was put into a bottle of the capacity of two litres (3·52 pints) and closed; No. 3 was put into a similar bottle, containing dry oxygen gas; No. 4 was put into a similar bottle, containing dry carbonic acid gas. The results as to drying were examined after twenty-four hours, and again after seventy-two hours:—

After twenty-four hours.

No. 1. The lead paint was almost dry; the zinc paint had set, but was not dry. No. 2. The lead paint was almost dry; the zinc paint had set, but was not dry. No. 3. Both the lead and the zinc paints were perfectly dry. No. 4. Both paints were still wet and fresh, and had undergone no change.

After seventy-two hours.

Nos. 1 and 2. Both paints were perfectly dry. No. 4. The lead paint had almost set, but it had no adhesion to the wood, and could be easily removed by friction; the zinc paint had undergone no change, but stuck to the finger like fresh paint.

Now, how remarkable are these results. Paint, containing no so-called dryer, dries rapidly and completely in oxygen gas, within twenty-four hours, and does not dry at all in dry carbonic acid gas. It dries more slowly in the air, whether exposed or confined, and in another experiment it was shown that in drying in a confined volume of atmospheric air, the paint had absorbed all the oxygen, and left nothing but pure nitrogen in the bottle.

We can now answer the question, "Why does paint dry?" in a scientific, that is, in a satisfactory manner. Paint dries, not because it loses anything, as in the case of ordinary drying by evaporation, but because it absorbs oxygen from the air, and solidifies in combining with it. The drying of paint is not, therefore, a physical effect, as in the case of evaporation, but a chemical one, in which there is a change of properties attending a change of state from liquid or viscid to solid.

In the above experiments we omitted the dryers; what would be the effect if we left out the white lead or the white zinc, and exposed pure linseed oil to the air?

Linseed oil exposed to the air in thin layers dries up into the form of a resinous, transparent, moderately elastic mass resembling caoutchouc. This property of absorbing oxygen and gradually becoming solid, also applies to walnut, hemp, poppy, grapeseed, safflower, and some other oils, and hence such oils are termed drying oils. In undergoing this change these oils undergo slow combustion, and give off carbonic acid. Under certain conditions the drying oils absorb oxygen so quickly as to take fire, as when the cotton-wool, tow, &c., used in cleaning machinery is thrown aside, and has thus led to conflagrations.

The non-drying oils, or those that do not absorb oxygen, are rape, colza, olive, almond, and many animal oils. By exposure to air they become gradually changed, but in a different manner as compared with drying oils. They become rancid from the fermentation of the cellular substances of the plant or animal from which the

oil was obtained. They lose their colour, and, to a certain extent, their fluidity, and acquire an acrid, disagreeable taste. Such oils are of course quite unfit for the purposes of the painter, although there is ground for suspicion that linseed oil is sometimes adulterated with a cheap fish oil, the result of which in the paint is to produce a disagreeable kind of stickiness which is all but permanent. While studying the cohesion figures of liquids some years ago, I was anxious to procure a specimen of pure linseed oil. The specimens procured from oil warehouses gave different figures; but in the International Exhibition of 1862, there was a linseed-oil press at work. Here, I thought, is a splendid opportunity for getting a specimen of pure linseed oil. "It must be pure," said the man, "for we make it before your face." He gave me a bottle of oil, and generously volunteered to give also a sample of the seed. To my surprise, on examining the linseed, I found it mixed with various other seeds to the extent of at least one-sixth. What hope, then, is there of obtaining pure linseed oil, and, consequently, good drying paint, if not only the oil is liable to adulteration, but the source of the oil itself is impure.

The distinguished chemist who does us the honour of taking the chair to-night, has been good enough to place at my disposal some recent results obtained by the Dutch chemist, Mulder, who drew some of the oils experimented on from good fresh seed in his own laboratory. According to Mulder, the difference between non-drying and drying oils arises from the presence of oleic acid in the latter. He compares drying oils to blood; they absorb oxygen and give off carbonic anhydride (commonly known as carbonic acid). To prove this in the case of linseed oil, fragments of pumice stone were ignited, left to cool, and then put into a bottle, and the pumice was moistened with boiled linseed oil, the effect of boiling being to raise the oil into a state of greater activity. Air, previously deprived of carbonic anhydride, was next passed over the pumice, and then into a vessel containing baryta water, which, in a few minutes became turbid from the presence of carbonic acid, due to the slow combustion of the oil.

A pure linseed oil, drawn in the laboratory, was represented by the formula C 76·8 H 11·2 O 12. When made colourless by being passed through animal charcoal, its composition was not altered. Poppy oil, nut and hemp seed oil, were found to be similar in composition. The chief component of these oils, and probably of all drying oils, is a neutral fat known as linoleine. Linseed oil also contains the fatty bodies known as elaine, palmitine, and myristene. Poppy oil contains elaine, myristene, and laurine. Walnut the same, but rather less laurine. The mucilaginous matter said to exist in these oils, and to act as a ferment, was not found.

The ash of good linseed oil was found to contain only one per cent. by weight of the oil burned.

In the so-called dry distillation of linseed oil, when carefully conducted, decomposition begins at 250° C (482° Fahr.); it yields acroleine, which, by partial oxidation, forms a certain quantity of acrylic acid, sebacylic acid, palmitinic acid, and myristinic acid, while the great bulk of the oil left in the retort is the anhydride of linoleic acid not unlike birdlime, or fused india-rubber. It is insoluble in ether. It is dark-coloured in the mass, but of a straw-yellow in thin layers, and very elastic. This is the basis of our printing inks. In preparing it, in practice, there is usually a great loss, from the application of too strong a heat, so that volatile hydro-carbons and even oil-gas are produced.

Linseed-oil, by saponification, yields glycerine, linoleic acid, elainic acid, palmitinic acid, and myristinic acid.

100 parts, by weight, of several drying oils, yielded by saponification from 87·7 to 95·4 parts of fatty acids, dried at 100° C. Fresh linseed-oil 95·4 parts, old walnut oils 87·7 parts.

Linoleine is readily saponified by means of a solution of basic acetate of lead, the effect being the same as boiling the oil with litharge, or red lead.

Pure linoleine is not disposed to become rancid. The drying oils become slowly rancid by changes produced in the other fatty bodies present, especially in the elaine.

Poppy and nut oils become much sooner rancid than linseed oil, but in general, the drying oils become less rapidly rancid than the non-drying.

The acid compound of linoleine is linoleic acid. This is a colourless compound when pure, and it is very fluid at 14° C., and is not solidified at—18° C. Its specific gravity is 0·9206. It reddens litmus, and is soluble in alcohol and ether. When exposed to air in thin layers linoleic acid absorbs oxygen and turns red. This change is greatly promoted by the presence of bases. The lime and baryta salts of linoleic acid are soluble in boiling alcohol. The lime, zinc, copper, and lead salts are soluble in ether. The acid readily oxidises, yielding linoxic acid, a substance something like Venice turpentine; it is colourless, but becomes blood red by being exposed to the heat of boiling water, as also by contact with strong caustic alkalies and acids. The alkaline carbonates do not affect this acid in the same way. The change in colour is not accompanied by change in composition.

In the change produced by the exposure of linoleic acid to the air, a body known as linoxine is first formed, and some months elapse before the peculiar stickiness of the Venice turpentine-like body is formed. With raw linseed oil, however, the change takes place in about two weeks, with boiled oil in a few days. Linoxine is formed by the loss of one equivalent of the elements of water from linoxic acid. Linoxine is an important body, it being the chief compound resulting from the application of oil colours and paints. It is amorphous and somewhat elastic, like leather or gutta-percha. It is not hygroscopic. It is heavier than water, and is not soluble in water, alcohol, or ether; it swells up in chloroform and bisulphide of carbon; it is not affected by acetic acid or by dilute mineral acids. Caustic alkalies dissolve it and turn it red, and it is precipitated from those solutions without change. The best solvent for linoxine is a mixture of chloroform and strong spirits of wine, aided by a moderate heat. Oil of turpentine renders it gelatinous, but does not dissolve it. It is not affected by being raised to 100° C., only it gets a little darker. It cannot be fused without decomposition.

Such are Mulder's results, very briefly stated. They ought to have a marked effect not only on the practice of the house-painter, but also on that of the printer's ink maker. Chevreul's details also are full of practical instruction, and we now proceed to lay them before you.

Roughly speaking, the setting of paint is due to the absorption of oxygen; hence we can understand why painters, in order to prevent their brushes from getting hard, put them into water when they leave off work; and also cover a painted surface with water when they want to keep the paint from setting.

We have spoken of white lead, or white zinc, as the basis of paint; white antimony has also been proposed. In order to determine the relative merits of the three M. Chevreul instituted an experiment, in which 10 grammes (154 grains) of pure linseed oil were mixed up with sufficient quantities of the three solids without the addition of any dryer. It was found that the zinc paint covered a less surface than the lead, but more than the antimony paint. The drying of the different coats of these paints required very different times, as will be seen in the following table:—

Coats.	Lead Paint.	Zinc Paint.	Antimony Paint.
	days.	days.	days.
First	4	18	50
Second	$3\frac{1}{2}$	15	28
Third	3	5	27
Total	$10\frac{1}{2}$	38	105

Hence it appears that lead paint dries much more quickly than zinc or antimony paint. Indeed, unless it were possible to hasten the drying of zinc paint by the addition of a dryer, zinc paint would be of very little use in industry, since the practice of house painting requires that not more than two or three days shall elapse between the application of the first coat and that of the second.

Antimony paint is also too slow in drying to be used. A tin paint was also tried, but the oxide of tin was found to delay the drying of the oil. Pure linseed oil dries more quickly on glass than when mixed with oxide of antimony, so that this oxide is actually anti-siccative relatively to glass.

We now come to the dryers, such as litharge, manganese, &c., and their action is very remarkable in causing the paint to absorb oxygen quickly and decidedly. For example—two cubic centimètres of linseed oil absorbed, in 30 days, 2·445c.c. of oxygen; but the same quantity of manganese dryer absorbed 21·45c.c. of oxygen; while a mixture of the two, consisting of 1·56c.c. of linseed and 0·44 of the dryer absorbed 30·826c.c. of oxygen. That is, the absorptive, or, as a painter would say, the *drying* power of the mixture is far greater than the sum of the powers of the two substances, since 1·56c.c. of linseed oil absorbs of itself 1·985c.c. of oxygen, and 0·44 of the manganese dryer 4·719c.c. of oxygen in 30 days, the sum of the two absorptions being 6·714c.c. But the mixture really absorbed 30·826c.c., or more than four-and-a-half times as much as the same fluids absorbed when exposed separately.

Experiments, scientifically conducted, have also shown, that in preparing his dryers, the painter wastes both good materials, fuel, and time. He boils his oil too long, and maintains the temperature too high.

The usual mode of preparing dryers is to heat the linseed oil in an iron pot until it appears to boil. The surface is skimmed from time to time, and after from three to six hours, about one-tenth, by weight, of litharge is added, and the heat is maintained five or six hours longer; or 100 parts of very old linseed oil are heated about six hours, when six parts of litharge, and about three of burnt umber are added. The heat is continued six hours longer, when the liquid, after being left quietly to cool, is decanted. For the manganese dryer, the oil is heated at the so-called boiling point during five hours; peroxide of manganese is thrown in, and the boiling continued for eight hours. We have already seen that the boiling is not the formation of vapour, but the escape of gas-bubbles due to decomposition.

Chevreul's experiments prove that pure linseed oil is more siccative after three hours' boiling than if not boiled at all; but it is less siccative after five hours' boiling than after three. The oil boiled during three hours with one-tenth of litharge is much more siccative than if heated without the addition of this oxide, so that the drying property is not conferred on the oil by the action of heat, as some have supposed, but it is by the mutual action of the oxide and of the oil, assisted by a high temperature, that the drying properties are developed. Litharge is more siccative than manganese; and what is very curious is, that litharge, heated once with oil, is more active than fresh litharge. It is still more curious, that manganese that has been heated several times with the oil is more active than fresh manganese. But this excess of activity in the oxides is no longer exerted on oil that has already been boiled five hours. All the experiments proved that the drying property of linseed was injured by a prolonged heating at high temperatures; and the remarkable and unexpected result came out, that linseed, exposed to the temperature of from 100° to 176° Fah. during six hours in contact with ten per cent. of manganese, can be used immediately in painting without the addition of any other dryer. Linseed oil alone, exposed to a similar moderate temperature, improves in its siccative property, but not sufficiently so to dispense with the manganese. A very energetic dryer is obtained by boiling the oil for three hours only in contact with fifteen per cent. of the metallic oxide.

Everyone knows what is expected of good paint. In the first place it should be sufficiently liquid to spread under the brush, and sufficiently viscous to adhere to the surface, even though it be vertical, without running, or becoming unequally thick in different places. In the second place, it should become solid within a reasonable time after being applied; thirdly, the solid should adhere strongly to the surface.

We have seen that lead and zinc paints become solid by the absorption of atmospheric oxygen. But as pure linseed oil also becomes solid by exposure to the air, the drying of the paint is not due to the presence of a dryer, or of the oxide of lead or of zinc. It is true that the dryer acts by increasing the absorptive power of the oil for oxygen gas. The lead and zinc oxides have also drying properties, and we must not neglect the influence of the surfaces that are to be painted. Paint dries at different rates on glass, wood, and metal; it dries better on some kinds of wood or of metal than on others, of course under similar conditions of experiment.

Take glass, for example. Surfaces of glass were coated with linseed oil, also with the oil containing a little white antimony, and with the same compound with the addition of a little litharge. The linseed dried quickly, the antimony compound not so quickly, while in the third compound the presence of the litharge seemed to neutralise the retarding effect of the antimony. The following table shows the results:—

	Linseed oil.	Linseed oil and oxide antimony.	Linseed oil and litharge dryer and oxide antimony.
	days.	days.	days.
First coat dried in	17	26	21
Second „ „	17	8	9
Third „ „	9	9	2
Total.....	43	43	32

It appears from this table—1. That a glass surface does not allow the paints to solidify so readily as a surface formed of the solid oil or paint. 2. That the antimony oxide is anti-siccative, which effect is corrected by the litharge. 3. That in the second coat the glass seems to be still exerting a retarding action on the oil, but this is not so evident in the antimony paint. 4. That the influence of the litharge dryer is evident in reducing the time required for the drying of the third coat. This influence seems to depend not only on the presence of the litharge dryer in the viscid paint, but also on its presence in the solid surface on which the fresh paint is laid.

The influence of the kind of surface employed on the drying of paint is well shown in the case of oak. On oak surfaces stained brown, three coats of linseed oil took 46 days to dry, oil with a litharge dryer 7 days, oil with a manganese dryer still less time. It was also found that linseed oil and white lead, and linseed oil and white zinc dried more quickly with a manganese dryer than with a litharge dryer. On a surface of clean oak the first coat of oil took a very long time in drying. On the twenty-second day it was soft and pasty beneath the surface; the oil had sunk into the pores of the wood, and thus prevented it from absorbing the oxygen required for its solidification. This explains why oil dries more quickly on a painted wooden surface than on a porous one. On a porous surface the dryers seem to act with great effect, probably from covering the wood and preventing the oil from sinking into the pores. Their influence is shown in the following table:—

	Linseed oil and white zinc.	Linseed oil and litharge dryer and white zinc.	Linseed oil and manganese dryer and white zinc.
	days.	days.	days.
First coat dried in	66	6	5
Second „ „	6	5	3
Third „ „	6	5	3
Total.....	78	16	11

This also shows that a surface of linseed and white zinc allows the paint to dry much more rapidly than a surface of porous wood does. A similar effect is produced when the paint is laid on an old surface of paint. The paint itself also becomes more siccative under the influence of time and atmospheric exposure.

It appears from experiment that paint dries more quickly on poplar than on oak, and more quickly on pine than on poplar. In the experiments on metallic surfaces the most remarkable results were obtained on lead. The first coat of linseed oil dried very quickly on this, as also the first coats of lead paint and of zinc paint. The zinc paint dried first, then the linseed oil, and lastly the lead paint. The zinc paint, however, tended to retard the drying of the subsequent coats. A newly-scraped surface of lead acted more energetically than one that had been tarnished by exposure to the air, but the lead covered with one coat lost its influence in hastening the drying of the subsequent coats. The first coat of oil on bright lead was only ten hours in drying. In short, we get this remarkable result, that lead is siccative with reference to pure linseed oil, while white lead itself, a siccative body, is anti-siccative with respect to linseed on metallic lead. The influence of various metallic, vitreous and wooden surfaces is thus summed up by M. Chevreul:—

First Coat.

On Copper.—Oil dried more slowly than both oil and white lead, and oil and white zinc.

On Brass wire and Zinc.—Oil dried as rapidly as oil and white lead, but more rapidly than oil and white zinc; but on the brass wire the drying was more rapid than on zinc.

On Iron.—Same results as on zinc; but oil and white zinc dried more quickly on iron than on zinc. This is analogous to the fact noticed with lead. The oil and white lead dried more slowly on lead than did the oil and white zinc.

On Porcelain and Glass.—Oil dried a liftle more quickly than oil and white zinc, and oil and white lead a little more quickly still.

On Plaster.—The oil and white zinc paint dried in about equal times.

On Poplar and Mountain Ash.—Oil dried more slowly than oil and white lead, and also than oil and white zinc.

Three Coatings.

On Copper, Brass Wire, Zinc, Iron, Lead.—Oil and white lead dried more quickly than oil and white zinc. This was also the case on porcelain, glass, plaster, poplar, and mountain ash. In the case of the woods, linseed oil was found to dry more quickly on ash than on poplar, and more quickly on poplar than on oak.

Some of these surfaces may, however, be regarded as indifferent, as respects their influence in quickening or retarding the drying of paint; but the temperature and other circumstances modify any general conclusions that may be drawn on the subject. Paint dries more quickly at from 77° to 82° Fah., than from 59° to 64° Fah., other things being equal. This explains why, in practice, the proportion of dryer varies with the temperature. In winter it is customary to add from three to nine, and even ten per cent. of dryer to the linseed; in summer not more than half, one and a-half, or two per cent., and it may even be left out altogether in the last coat. The drying property of linseed oil is nearly always increased by the addition of white-lead, and in most cases by that of white zinc. If the compound be not sufficiently siccative, it can be made so by the addition of a dryer, whether of litharge or of manganese, due respect being paid to the varying conditions of the surface, number of the coats, whether first, second, or third, the temperature of the air, and the amount of natural light present.

But the influence of the lead or manganese dryer, as will be gathered from the foregoing details, is not so important as is generally imagined. It can be dispensed with in the second and third coats, and even in the first if the temperature of the air be favourable. Linseed oil by exposure to light and air loses its yellow colour and becomes siccative, so that it can be employed alone with white-lead or white zinc without detriment to their purity. If white zinc be associated with the sub-carbonate of zinc, the drier may be dispensed with altogether.

Paint owes its lustre and smoothness to the oil alone. If oleic acid were mixed with metallic oxides in such proportions as to form solid chemical compounds, and the acid were to pass quickly from the liquid to the solid state, the result would not be a smooth, uniform, oleate; but when the drying oil passes slowly into the solid state, in consequence of the gradual absorption of oxygen, and the changes pointed out by Mulder, the very slowness of the process allows the oily molecules to arrange themselves into a symmetrical compound, which would be transparent were it not for the opaque particles of the white-lead imprisoned in the compound. If these opaque particles are not in excess, the molecular arrangement is such that the paint dries into a surface that is lustrous, and even brilliant, in consequence of the mirror-like reflection of the solidified oil.

No notice has yet been taken of the action of the turpentine, which is added by painters in order to diminish the viscosity of the paint, and to allow it to spread more easily under the brush. If the surface is to be polished, a large proportion of turpentine is used; if it is to be varnished, as much turpentine is added as will render the paint very fluid, but not too fluid to work with; if the paint is to be very durable, and is to be neither polished nor varnished, only a small proportion of turpentine is to be added. As turpentine dries to a great extent by evaporation, one of its chief uses is to hasten the drying of paint. Thus, three layers of linseed oil on glass dried in twenty-five days; but when about thirty per cent. of turpentine was added to the oil the mixture dried in twenty days. This drying effect is promoted by a previous exposure of the turpentine to the air. When both oil and turpentine have been previously exposed, the drying takes place still more quickly. Exposure to air has a similar influence on the other ingredients of paint, even on the white zinc.

This exposure in the case of turpentine favours the combination with atmospheric oxygen and the consequent resinification of the liquid. Exposure in the case of a porous body like white zinc may also lead to the physical absorption of oxygen, and thus hasten the drying. If this physical effect were really obtained in the case of white zinc and white lead, Chevreul thought it likely that the presence of other solid bodies in the paint might have a similar effect. But before putting them into the paint, their influence as surfaces was tested. When linseed oil was laid on white lead three coats dried in seven days; but on sulphate of zinc they occupied eighteen days in drying, twelve being required for the first coat and two for the second; white lead is therefore more siccative than the zinco-sulphate. In both cases the first coat acted as a dryer to the second. When a mixture of sulphate of lead and white lead was used as the surface, the oil dried almost as quickly as on white lead alone. It has already been shown that the addition of the litharge and manganese dryers made the linseed oil dry more quickly, that is, it became more capable of absorbing oxygen from the air. It is remarkable that this absorptive power is increased by the addition of solid bodies such as sand. Linseed oil

mixed with white lead dries more quickly than the oil alone, so that white lead is a dryer or siccative. Oil mixed with sulphate of lead dries very slowly; but a mixture of oil, sulphate of lead and white lead dries as quickly as oil mixed with white lead only. Hence the presence of white lead confers extra drying power on sulphate of lead. Carbonate of zinc acts as a dryer, when added to oil or white zinc; and the mixture dries more quickly than oil mixed with white zinc only. Oil mixed with zinc carbonate sets more rapidly than with zinc white; but it forms a semi-transparent, not an opaque paint. As zinc carbonate renders oil and white zinc more siccative, it might be substituted for the manganese dryer, which has the disadvantage of imparting colour to zinc white. Two paints were prepared, one consisting of 100 lbs. of linseed oil, 75 lbs. of zinc white, and 25 lbs. of zinc carbonate; the other of 98 lbs. of the oil, 2 lbs. of manganese dryer, and 100 lbs. of white zinc. With each of these paints a door was painted. Four hours after they had been applied both paints appeared to be equally set; but the surface coated with the first paint was whiter than that coated by the second, the whiter paint was, however, the less adherent.

In conclusion, I venture to think that the question, "Why does paint dry?" has been fully answered, and that the intelligent house painter will find, in the details thus brought together, some material for the improvement of his useful art. The only object of science is the discovery of truth; but the truths of science form a rich resource for the technologist. He finds in them the only proper basis for real improvement; and the Society of Arts is, I think, never better employed than when it brings the man of scientific theory into direct contact with the intelligent man of practice. The time is happily passed away for ever when the so-called practical man boasted of his independence of all theory. He now knows that, by such a self-imposed blindness, he placed himself at least half-a-century behind the intellect of his age. Every art that depends on chemistry seeks the aid of science; and in working out technical results on a large scale scientific truth is often assisted; just as, by the same righteous law of reflex action, the results produced on a small scale in the laboratory, apparently for the benefit of science alone, are often reproduced on a large scale in the factory to the advantage and profit of the whole community. I repeat, that the Society of Arts can never be better employed than in acting as the medium of communication between the man of theory and the man of practice.

DISCUSSION.

Mr. Laing said he was familiar with the names of several of the dryers mentioned by Mr. Tomlinson, but he was not acquainted with manganese, which he should like to hear a little more about, as a good dryer was greatly needed in the painting trade, in which he had been engaged for about forty-five years. As regarded the oils used for paints, linseed was the only one which appeared really fit for the purpose, although various other oils had been introduced into the mercantile world. Linseed was naturally a good drying oil, and by the introduction of various dryers, according to circumstances, they were able to produce a paint which would even dry in five or six hours. There were practical differences which a painter had to contend with, connected with the atmosphere, temperature, &c., which rendered it by no means easy to form a correct theory upon the subject. Copperas was a very good ordinary dryer, but for special circumstances they had to heat it with whitening over a fierce fire, and this produced what was called "burnt copperas," and it had to be ground up immediately with the paint, or it would become worthless, from contact with the atmosphere. When paint was properly prepared with it, however, it would dry in two or three hours. Some years ago it was found that oils were very extensively tampered with, sulphuric acid being introduced in order to produce an effect on the colour; and the consequence was that the paint prepared with such oil never became hard, and it could easily be rubbed off. He thought all in the trade must feel greatly indebted to the gentleman who had given them so interesting a paper, but the great desideratum was a good dryer, which would enable them to prepare paints that would dry quickly, and so avoid the annoyance which was now constantly arising from paint remaining long wet. Some short time ago a patent dryer had been introduced, which he believed was a combination of copperas and lime, but, unfortunately, it affected the colour of any paint to which it was applied. Sugar of lead was the only pure dryer he was acquainted with; red lead and litharge would affect almost any colour.

Mr. P. L. Simmonds said he did not quite agree in all that had fallen from the last speaker. There was little doubt that as demand was created, and the wants of commerce became known, some new drying oil other than linseed would be obtained. The researches of the chemist would come in to the aid of the arts. The subject which his friend Mr. Tomlinson had so ably introduced to their notice was one of very great importance, nationally and commercially, for the use of paint was not limited to dwellings, it was also largely in demand for out-door purposes, for vehicles, structural edifices of all kinds, bridges, railways, &c., and also for our extensive mercantile and royal marine—all civilized nations shared in the requirements. The subject had been recently brought very prominently before his notice when acting as a juror at the Havre Maritime Exhibition, on the class which comprised oils, varnishes, paints, and anti-fouling compositions for ships' bottoms, &c. The examination of oils and paints there occupied the long and serious attention of the scientific men on the jury, and the comparative merits of those in use in different countries were much discussed. All who had experienced the inconveniences of a newly-painted house (and who had not?) were interested in the drying properties of paints and their composition, purity, and durability, and the rapid drying properties of the oils with which they were mixed were of great importance. The trade in paints and oils in this country alone was an enormous one, and any investigations or scientific researches calculated to improve their character and guarantee their purity would be most valuable both to the trade and to the public. The Society of Arts had always been foremost in these investigations, and had already done much good by the inquiries it had set on foot and the experiments it had stimulated. Now that iron was so much used, paint-coatings, or compositions calculated to protect the surface, were more in demand, and, with so many iron ships afloat, effective anti-fouling compositions for ships' bottoms were eagerly sought for. There had been many tried, but he believed none were yet found effectual, as the requirements were that the composition should not form a glaze on the metal, but rather a shiny surface, which would prevent the adherence of weeds and barnacles, those great clogs to speed. A friend of his, Dr. Marchisio, had invented an anti-galvanic composition of this kind, which was highly reported on at Havre after careful chemical analysis. When it was considered that vessels had to be painted about twice a year, the importance of any economy effected would be seen. Our Royal Navy required a black paint, as ships of war did not go forth in the coloured paints which merchantmen adopted, and there was some difficulty in getting a mineral base for such a paint. However, this was but a question of time.

Mr. Childs said the affinity of some bodies for oil had been explained in the paper, but he did not think that all the phenomena connected with the drying of paints were to be thus accounted for. The rapidity with which paint dried upon lead might be explained by the fact that oxide of lead, commonly called litharge, had a great affinity for oil, and the presence of the metallic lead

facilitated the chemical reaction involved in the drying. Linseed oil, under some circumstances, had a tendency to turn what painters called "fatty," which condition was supposed to arise from age, and the absorption of oxygen from the air; but when it was in this state it did not dry by any means well, therefore, he did not see how the phenomenon of the drying of paint could be accounted for altogether by the absorption of oxygen from the air. White zinc was a very excellent paint for many purposes, but water must not be put upon it, or it became lumpy and hard; and though it might be supposed that this kind of paint would dry as readily in a moist as in a dry atmosphere, this did not prove to be the case. As he had before remarked, he did not think the whole matter was explained by saying that the oil absorbed oxygen from the air; he believed that, by its combination with other bodies present in the paint, its condition became changed. Oil and white lead dried more readily and formed a harder compound than oil and anything else. This showed that there was something in the combination which affected the result. The white lead used in the trade, however, was invariably mixed with sulphate of barytes, and unfortunately it happened that there was great difficulty in getting good barytes. Some barytes would dry very well when mixed with the paint, but other descriptions would scarcely dry at all. Other kinds, again, would discolour the paint with which they were mixed, showing evidently that there was some other substance present. This matter was now under investigation, and he was able to say that it was ascertained that the adulterating matter was soluble in water. He should be very glad if scientific men would turn their attention to this subject. The firm which he represented (Messrs. Pontifex and Wood) would be most happy to afford all possible facilities for investigation and experiment. Very curious effects were produced by the mixture of different bodies with oil. Many of the ochres mixed with linseed oil dried very rapidly; as much so as any of what were called dryers, but this was not the case with all. He did not think the present analysis of ochres was sufficiently accurate to give a proper idea of their ingredients; but, at any rate, the principal ingredients, when used separately in combination with oil would not dry at all. He believed that a great many of the recent complaints of the bad qualities of paint arose from the fact that the turpentine now in the market was not so good as that in use before the American war. French and mineral turpentine had been used rather extensively, and the consequence was that the paint was complained of. He believed that American turpentine was now coming in again, made from the old trees, for it was a curious circumstance that the turpentine produced from old trees was infinitely better than that made from the young ones. It was the same with regard to oils; oils made from young plants was always deficient in some of the characteristics of that made from the mature and ripe tree. As good old American turpentine was now coming in again, they would probably not have so much outcry about the paint, and the varnish makers, who had also come to grief from the same cause, would be placed in a better position. Zinc paint was not, he believed, very much used in England, although it was in America; but as the zinc required more oil, did not (as Mr. Tomlinson said) spread so far, and cost about the same as lead, he supposed lead would continue to be principally used. Indeed, he did not think they would ever improve much on the materials they now had, although they might on the manner in which they used them, which latter he hoped would be the ultimate effect of the paper he had had the pleasure of hearing.

Mr. Fordred remarked that there was one somewhat important point which had not yet been attended to, and that was the origin of the linseed oil. For many years it had been a matter of considerable difficulty to obtain pure linseed oil. Before the Russian war the oil was much better than it had been since. Before that time the oil was made chiefly from Russian seed, but difficulties then arising in the way of its importation, seed was brought from the East Indies. This was found to yield the oil much more freely, but painters objected to it, and said it did not dry so freely by a good deal as Russian oil. He could not say how far this was true, but the popular idea was that the difference arose from the seed being grown in a hotter climate. The best seed was that which came from Archangel, and after that the shipments from Odessa were most esteemed. Another difficulty with the East India seed was, that it soon began to be adulterated with rape and other seeds, which made the difficulty so great to obtain good linseed oil, that at length the Linseed Association of London was formed, and after a time it became a pretty well recognised rule that the price for linseed varied according to the amount of adulteration, and in consequence the seed was now sent in a purer state. With regard to the effect of the air on the drying properties of linseed oil, the idea had been for many years, as stated in the paper, that the oil absorbed oxygen from the air, which added to its drying properties, and in consequence painters were willing to give £2 or £3 more per tun for oil which had been some years in the tanks than for that freshly made. There was no doubt that the oil did undergo a change from the absorption of oxygen, and perhaps also from other causes not yet thoroughly understood. As it was evident, therefore, that oil lying in a tank could only absorb oxygen from the air at the surface, and that thus the process must be an exceedingly slow one, it had occurred to him that this change in the character of the oil might be accelerated by passing air through it. He therefore made some experiments, which showed that by simply blowing cold air through the oil its drying properties were materially increased, and in fact it assimilated in character to old oil; if, however, a slight degree of heat was applied, the oil dried much more rapidly; in fact, if it were heated to about 250°, and then cold air passed through it, the oil so treated was almost equal to that which had been boiled with dryers. So cheap was this process that five tuns of oil could be maintained at the requisite temperature as long as was necessary for about 5s., and there would be merely the additional expense of blowing the cold air into it. If this process were generally adopted, he believed that a very valuable oil might be put on the market, but the chief difficulty was that painters were not willing to pay more for the oil so treated. It also tended to bleach the oil, producing a pale lemon colour, which was in itself an advantage to the painter, and it dried with a most extraordinary lustre. He had seen two coats of paint, made simply with this oil without dryers, put on and dry within two hours. An allusion had been made to sulphuric acid being introduced into linseed oil; the fact was sulphuric acid would not mix with linseed oil, but the oil prepared for white lead grinders was treated with sulphuric acid, and then washed with water, for the purpose of making the oil finer and paler in colour. Mr. Tomlinson had remarked on the adulteration of linseed oil with fish oil. He (Mr. Fordred) had never known of such a case, and thought the difference in colour and smell was too palpable to allow of such a thing being done, but he believed cotton seed oil had been largely used for this purpose. It was an extensive article of commerce in America, where in some parts, after being boiled with litharge or other dryers, it was used almost exclusively for paint. It occupied an intermediate rank between drying and non-drying oils, linseed and olive oils occupying the two extremes. It was much cheaper than linseed oil, and was in consequence so much used to adulterate it that many persons would not have their linseed oil from a mill in which cotton seed oil was also produced.

Mr. Varley expressed the great pleasure he had felt at hearing the paper read, which, he said, had conveyed a clearer impression to his mind than had been produced

by a personal visit, some years previously, to a varnish manufactory.

Mr. Hubbuck could not agree in the opinion expressed by Mr. Fordred, that linseed oil was adulterated with that made from cotton seed, because, in the first place, if the mixture were put into ice, the latter would immediately fall to the bottom, while the linseed oil would float at the top; and, in the next place, cotton-seed oil had been for some time about 10 per cent. higher in price than linseed. The importation of linseed from the East Indies was a matter which deserved attention. Some years ago not more than 50,000 quarters came from India, while about 700,000 quarters came from Russia; but during the war the trade with the latter country was, to a great extent, suspended, and had never recovered itself; and the supply from India was now as large or larger than that from Russia. The latter, however, was the better article for the painter, for, as a general rule, the colder the climate in which the seed was grown, the greater were the drying properties of the oil, although it was not so good in colour. That from Archangel was no doubt the best, but the supply was so small that, practically, it was not to be had. The adulteration of linseed oil really arose from the fact that the cake which was imported into this country for fattening purposes, still contained a great deal of linseed oil, which it was the custom to squeeze out under hydraulic pressure, and with it came a considerable amount of non-drying oil; and if paint were made with this compound, it would always remain sticky. There was no need for painters to use it, however, because if they went to a respectable firm, and stated the purpose for which they required the linseed oil, they could always get what they wanted. The East India seed produced a thick, glutinous oil, much preferred by soap-boilers, but not so well adapted for painters' use as that made from Russian seed. As to the introduction of sulphuric acid, if that were allowed to remain the oil would not dry at all; but it was the practice to pass a jet of steam through it, which carried off all the free sulphuric acid. English manufacturers always adopted this process, not only with linseed, but also with rape or colza oil; but the French manufacturers were not so careful, and the consequence was that the English oil was much preferred. If linseed oil were boiled properly there need be no increase in the colour; and, therefore, those who wanted a paint which would dry immediately, might always secure it by that means. He (Mr. Hubbuck) sat every day in a counting house that had had four coats of paint laid on in two days, and he had sat in it on the day following. There was no difficulty in the matter; you only required to employ the right people, who would use the right kind of materials, and paint could be made to dry almost immediately. At Mr. Tomlinson's request, he had brought down some boards, showing the comparison between white lead and white zinc paints; the former showed a circular patch, almost black, where a bell-glass of sulphuretted hydrogen gas had been applied, while it had left the zinc unaffected. The bilge water in the holds of ships being impregnated with the same gas, produced the same effect in passing over any paint of which white lead was the basis. Another board was shown covered with paint made from antimony, which was also unaffected by the gas, and which, as well as the zinc, had the advantage for household use, that a room painted with it in the day could be slept in without inconvenience the same night. He had been astonished at the statement in the paper, on the authority of M. Chevreul, that zinc paint would not go so far as lead. His experience was that only two-thirds or three-fourths of the quantity, by weight, of zinc paint was required, although it might, being lighter, look more in bulk. True, he had seen men in Paris using it mixed much too thin, but an Englishman would use it in quite a stiff paste, and, by strength of arm, work it out to the surface required. Zinc white was made by boiling zinc until it rose in a vapour, and when air was admitted, the vaporized metal combined with the oxygen, and fell to the floor of the room like snow, in the form of white oxide of zinc. There was nothing sandy in its consistency, it was perfectly fine, and the less oil mixed with it the better was the result; it only required just enough to keep it together. White-lead, on the contrary, was always granular, however much it might be pulverised, and nothing would make it otherwise. It lay on the surface of the wood, and could be scraped off without much difficulty—there was no key to it, whereas zinc paint would be found to have sunk into the pores of the wood for a considerable distance. [Mr. Hubbuck then exhibited a board which had been painted for twelve years or more, one-half with white zinc paint, and one-half with white-lead, the latter being perceptibly darker in colour.] If a man went into a house on a twenty-one years' lease, and had it painted at the beginning with four or five good coats of zinc paint, it would be at the end of the term in a fit state to deliver over to the landlord, whereas, if gas were used in the house, or if there were any smell from the drains, white-lead would soon be discolored. Mr. Tomlinson had alluded to the use of sulphate of lead, but that was not found to answer in practice, as it interfered with the properties of the linseed oil. The great object was to prevent any sulphuric acid from being mixed with the linseed oil, and although it was neutralized in the sulphate, it was still found to have some effect, and was much better left out. The oxide of zinc was made in America, direct from the ore, and the consequence was, that some of the sulphur, which was present in the coal used in smelting, remained in the oxide, and could never be got rid of, and this affected the paint. In Europe, where the process adopted was to make it from the metal, in a close vessel, from which the coal was excluded, the results were much better. He believed zinc paint would be preferred by all who considered its durability, and the health both of those who worked with it and those who lived in the houses where it was used. It was also to be observed that zinc paint reflected the light, while white-lead absorbed it.

Mr. Childs could not agree that white lead was in any way coarser than white zinc. When it was properly levigated, and the dust put under a powerful microscope, some of the particles could hardly be discerned, which he believed was not the case with the zinc. White lead was not fit for the market unless it had been carried a considerable distance by water, flowing at a very slow speed, a process which necessitated its being in a very finely divided state. With regard to linseed oil, he believed one difficulty arose from the fact that unripe linseed made the best cake for farmers, and as the oil was in some respects a secondary product the painters had to suffer. The best oils were always produced from perfectly ripe and matured seeds.

The Chairman proposed a vote of thanks to Mr. Tomlinson for the interesting and valuable paper he had read, which had elicited a most practical discussion, although one or two important points had been too lightly touched upon. It was very obvious that during the drying of paint there were chemical changes going on in which oxidation bore a most important part. In the use of these oils they were dealing with substances that contained organic acids, and these, like all other acids, had different degrees of attraction for bases or metallic oxides. Consequently, it did not require any extended knowledge of chemistry to understand that in the use of such oils certain metallic oxides would naturally and necessarily produce much more rapid solidification than others. Oxide of lead had properties which caused it to combine freely with the oil, and thus a part of the solid character of lead paint was due, not merely to the absorption of oxygen from the air, but also to the combination which occurred between the oxide of lead and the acids of the oil. There were other oxides which had a tendency to this combination, amongst which was the

oxide of zinc, but the compound was of a different character to that formed with the oxide of lead. It was known, as shown by the observations of Mr. Laing, that certain substances had a great tendency to accelerate the drying of the oil; copperas was instanced, particularly when mixed with lime, as a powerful agent in this direction, and they could easily understand the reason of that. The oxide of iron in the copperas (sulphate of iron) acted upon the oil, decomposed it, and set free the linoleic acid, which was thus enabled to combine with the oxygen of the air, and a rapid solidification was the result. The whole question was somewhat complicated, and although the discussion had only thrown an imperfect light upon it, it showed they were in the right track to elicit a more extended knowledge on this subject than they at present possessed. The inquiry only required to be followed up in the spirit in which it had been commenced to arrive at very practical conclusions.

Mr. Fordred said the copperas alluded to by Mr. Laing was white copperas, or sulphate of zinc, not sulphate of iron.

The Chairman said this did not affect the results stated by him. In each case there was a metallic oxide which produced the effects described.

Mr. Tomlinson said he had been so much interested in the discussion that he had omitted to make notes of it, but he believed it would be considered the most valuable part of the evening's proceedings. It had been said of one gentleman that although not witty himself he was the cause of wit in others, and in the same way, although not a practical painter himself, he had by the paper he had read been the occasion of eliciting valuable technological information from others. He felt sure that if such a discussion had taken place in France, the government would immediately have appointed a commission of competent scientific men, would have paid them well, and in the end a report would have been presented, which would have greatly relieved the embarrassments of painters. He hoped that if any gentleman present had the ear of the new government he would impress upon them the desirability of appointing such a commission, and thus another good result would arise from the reading of the paper.

Proceedings of Institutions.

Yorkshire Union of Mechanics' Institutes.—*Bingley Mechanics' Institute.*—On Monday night the annual *soirée* of this Institution was held in the hall of the Institution. The president, Mr. A. Harris, presided. Mr. Holgate, the curator, read the report, from which it appeared that the Institution has made little or no progress during the year, the class for elementary instruction having been attended on an average by only forty males and seven females on two evenings each. There had been a decrease of sixteen females during the year, the books showing only fourteen females at present members of the Institution, and 229 general members, making, with the annual subscribers, 330 members of the Institution, an increase of three over last year. The income and expenditure showed that the income, with a balance of £39 14s. 8d., was £243 6s. 1½d., the expenditure £233 14s. 1½d., leaving a balance of £9 12s., which, however, was more than absorbed in interest due on the mortgage on the Institution. The Chairman, after the reading of the report, addressed the meeting upon the importance of uniting together, not only to increase the members, but to diminish the debt upon the building. It would be a great benefit to the town of Bingley if freed from debt. He concluded by pointing out to the young the importance of being well educated. The meeting was addressed by the Rev. A. P. Irwine, vicar, Rev. J. H. Mitchell, Mr. H. H. Sales, Rev. E. S. Heron, and the Rev. A. Hudson. *Batley Mechanics' Institute.*—The annual meeting was held on Tuesday, November 29th, in the Town Hall, Batley, Lord Milton, M.P., in the chair. After the report had been read, and the certificates for proficiency in elementary knowledge, awarded by the Yorkshire Board of Education, had been presented by the chairman, addresses were given by Mr. J. Jubb, president of the Institute, Mr. W. St. J. Wheelhouse, M.P., Mr. E. Huth, Mr. Henry H. Sales, and other gentlemen, lay and clerical.

Fine Arts.

Students of Fine Arts at Turin.—The total number of students of fine arts at the R. Academia Albertina delle Belle Arti at Turin is at present 456, divided as follows:—

Architecture	31
Perspective	11
Ornament	138
The figure	102
Wood engraving	3
Painting	23
Sculpture	11
The nude figure	65
Descriptive anatomy	72
Total	456

Manufactures.

Cheap Watch.—It will be remembered that a paragraph appeared in the *Journal* of 9th October last (p. 789), quoted from *Les Mondes*, in reference to a cheap keyless watch, manufactured by M. Theuner, of Neuchatel. The price was there stated at 25 francs, but a communication has since been received from the manufacturer to the effect that this is an error; the price is from 35 to 45 francs.

Aluminium Bronze.—At the meeting of the Academy of Sciences at Paris on the 30th of November, the Count of St. Cricq-Cazeaux proposed to cover the worn-out steps of the column in the Place Vendôme with thin sheets of aluminium bronze. M. Dumas approved of the idea, and reminded the meeting how successfully this bronze was now being used in various kinds of mechanism, especially in saws driven by steam power, which saws, although much thinner, lasted a much longer time than those of steel.

Manufacture of the Extract of Meat.—The *Buenos Ayres Standard*, of 3rd September last, gives the following particulars of the Liebig's Extract of Meat Company's Establishment, at Fray Bentos, on the Uruguay, South America:—"The new factory is a building that covers about 20,000 square feet, and is roofed in iron and glass. We first enter a large flagged hall, kept dark, cool, and extremely clean, where the meat is weighed and passed through apertures to the meat-cutting machines. We come to the beef-cutting hall, where are four powerful meat-cutters, specially designed by the company's general manager, Mr. Geibert; each machine can cut the meat of 200 bullocks per hour. The meat, being cut, is passed to "digerators" made of wrought iron; each one holds about 12,000 lbs. of beef; there are nine of these digerators, and three more have yet to be put up. Here the meat is digerated by high-pressure steam of 75 lbs. per square inch; from this the liquid which contains the extract and the fat of the meat proceeds in tubes to a range of 'fat separators,' of peculiar construction. Here the fat is separated in the hot state from the extract, as no time can be lost for cool operations, otherwise decomposition would set in in a very short time. We proceed downstairs to an immense hall, sixty feet high, where the fat separators are working; below them is a range of five cast-iron clarifiers, 1,000 gallons each, worked by high-pressure steam

through Hallett's tube system. Each clarifier is provided with a very ingenious steam tap; in the monstrous clarifiers the albumen and fibrine and phosphate of magnesia are separated. From hence the liquid extract is raised by means of air-pumps, driven by two thirty-horse-power engines, up to two vessels about twenty feet above the clarifiers; from thence the liquid runs to the other large evaporators. Now we ascend the staircase reaching the hall, where two immense sets of four vacuum apparatus are at work, evaporating the extract by a very low temperature; here the liquid passes several filtering processes before being evaporated in vacuum. We now ascend some steps and enter the ready making hall, separated by a wire gauze wall, and all windows, doors, &c., guarded by the same to exclude flies and dust. The ventilation is maintained by patent fans, and the place is extremely clean. Here are placed five ready making pans, constructed of steel plates with a system of steel discs, revolving in the liquid extract. These five pans, by medium of discs, 100 in each pan, effect in one minute more than two millions square feet evaporating surface. Here concludes the manufacturing process. The extract is now withdrawn in large cans, and deposited for the following day. Ascending a few steps we enter the decrystallizing and packing hall, where two large cast iron tanks are placed, provided with hot water baths under their bottoms; in these tanks the extract is thrown in quantities of 10,000 lbs. at once, and here is decrystallized and made a homogeneous mass, and of uniform quality. Now samples are taken and analyzed by the chemist of the establishment, Dr. Seekamp, under whose charge the chemical and technical operations are performed. It may be mentioned that the company's butcher kills at the rate of 80 oxen per hour; separating by a small double-edged knife the vertebræ, the animal drops down instantaneously on a waggon, and is conducted to a place where 150 men are occupied dressing the meat for the factory, cutting each ox into six pieces; 400 are being worked per day."

Commerce.

Coffee in the United States.—Mr. H. E. Moring gives the total stock of coffee in the United States, on the 1st November, as 15,085 tons, against 10,336 tons on the same date last year, an increase of 4,749 tons, or 31 per cent. The total imports to the United States for the ten months ended 31st October were 87,074 tons, against 79,412 tons in 1867, and the monthly consumption this year has averaged 8,466 tons, that of 1867, 7,533 tons, and that of 1866, 6,187 tons.

Madeira Wines.—It appears by Messrs. R. Symonds and Son's *Circular*, that this year's vintage shows a very considerable increase on recent years, and may attain about 4,000 pipes—a quantity still very small compared with that produced in the prosperous days of the island before 1851—and even so, the statement as to present quantity must be taken with some reserve, inasmuch as, since the abolition of the tithes, no official returns have been made. About nine-tenths of the produce was grown on the south side of the island, where the best "Madeiras" were formerly produced, and will probably be good wines, taking into consideration the youth of the plants, and certainly better than in previous years; the remaining tenth, grown on the north side, will be very inferior. Of the total quantity, about three-fourths —say 3,000 pipes—will be required for island consumption, and for conversion into brandy, so that only about 1,000 pipes will ultimately be available for exportation. These will be the best wines of the year; but, before they are shipped, should be allowed some five years to attain thorough maturity. The progress of renewed vine culture is slow, but it is, nevertheless, marked as regards both quantity and quality.

Trade in Silkworms' Eggs in Japan.—Every year a number of agents are sent out from France and Italy to purchase silkworms' eggs in Japan. They are principally representatives of the various *Comizi agrari* (agricultural societies) of the silk-producing districts in Italy (chiefly from Lombardy, Piedmont, and Trent). The agents from France are less numerous. The best grains are purchased by the Italians, and the inferior qualities are sold to the French, who naturally give a lower price. The grains produced in the province of Oschin are most sought after, and the best quality fetch as much as from five to six dollars per card, which contains, on the average, about 25 grammes, or rather less than an ounce. The average price for good seed, however, does not range quite so high this year; the price of good seed was from three to three and a-half dollars per card. The inferior qualities are sold as low as from one to two dollars, but do not find purchasers amongst the Italian agents. To guarantee purchasers in Europe each card is stamped by the European consuls in Japan. At the Italian consulate this stamp is gratuitous, while at the French a sum of one dollar per hundred cards is charged. Some of the representatives of Italian houses of good standing have discontinued having their cards stamped, as their signature is sufficient guarantee to insure the quality of the seed. The quantity of seed produced during the present year by agents sent out to Japan, and by the various firms established at Yokohama, for European houses, amounts probably to not less than two millions of cards, or more than double of that produced last year, the total exports from Japan in 1867 being 832,000 cards of seeds, of which 515,000 were purchased by Italian houses, and 317,000 by French; the total value being upwards of two millions of dollars. Yokohama is the great market for silkworms' eggs; a considerable quantity of seed is also obtained at Osaka, but of an inferior quality, ranging in price from one to two dollars per card; this, however, does not find purchasers amongst the representatives of the Italian houses. The cards are packed in cases, which contain from 200 to 300, the most usual size being that which contains 200, weighing 18 kilogrammes. The cards are placed ten by ten in grooves, so as to have a small space between. Formerly the cases were closed hermetically, but now a tin plate, perforated with small holes, is placed at each end, so as to allow ventilation. In the island of Nippon there are twenty-one silk-producing provinces, the richest being Oschiri, and having an area of 2,500 square miles. The total production of the twenty-one provinces is about 4,300,000 kilogrammes of silk, or 86,000 bales of 50 kils. each. This is nearly double the total production of France, and about equal to that of Italy and Spain together. The principal market for Japanese silk is Kioto, situated about 30 kilometres distant from Osaka. The opening of the port of Yokohama, in 1859, to commerce, has had a most beneficial effect upon the silk trade in Japan, the price having increased 100 per cent., and the production at least 25 per cent. Up to the present time a preference has been shown, by both the French and Italians, for the Suez route, for sending the seed to Europe. But since the establishment of the French Transatlantic service between St. Nazare, Aspinwall, Panama, San Francisco, and Japan, there is every reason to anticipate that this line will be chosen in preference for the future by purchasers of seed. The service will be fully organised by next season, with regularity in the arrivals and departures, and the length of time employed between Japan and Europe will in no way be increased, and, moreover, the voyage through the tropics will be lessened by twelve days, and there will be less fear of the seed suffering the effects of the tropical heat than there is by the present mode of transport, passing by the Chinese and Indian Ocean. About 300 cases were sent *via* San Francisco last year, and arrived in Europe in a perfect state. Another advantage in this route is the saving in freight on the Suez route, which now costs about 33 centimes per lb. by the latter, and 28 centimes per lb. by the former.

Bitumen in Sicily.—An important deposit of bitumen is about to be worked in Sicily by a French company, who have lately purchased a mine in the neighbourhood of Ragusa, in the province of Siracusa. Its quality is said to be superior to any that is found either in Belgium or France. The area of this deposit is about seventy-four acres. The company is also in treaty for the purchase of other mines in the same district where bituminous deposits are most abundant.

Colonies.

Cotton in Queensland,—A Brisbane paper says:—"There is a growing impression that this staple is one of the safest, if not the most remunerative, that Queensland growers can invest in. Confidence is felt in the crop as experience is gained, and it is found that instead of five or six acres a family can manage twenty or thirty. There is much uncertainty in the colony on the best methods of ginning. English brokers have represented that the Queensland staple is cut and broken in the ginning process, and recommend roller instead of saw-gins. Experienced men in the colony, who know how cotton is turned out in America, India, and elsewhere, maintain that the picking, sorting, and ginning of Queensland cotton is remarkably well done, and that the fault of irregular staple is owing to the mixed seed used in the colony, and that the gins break it here no more than they do in other countries."

Manufactures in New South Wales.—The galvanizing manufactory of Mr. Zollner consumes a by no means small quantity of sheet iron in the course of a year; and it is a branch of trade that is yearly growing in importance. In a community like that of New South Wales, of which so large a proportion of the population is engaged in mining pursuits, anything that gives facility for the development of the mineral resources of the colony must be of great advantage, as well to the community at large as to the miners themselves. The substitution at the mines of galvanized tubs and buckets, for the ordinary wooden articles previously used, has been a great boon to the miners; and now that they can be supplied at a less cost than the easily destroyed wooden implements, the expense of the miner's outfit has been considerably reduced. The sheet iron used in this work has as yet to be imported expressly for it. It is essential to the success of the galvanizing operation that the sheets of metal should be perfectly clean and free from rust. To secure this, they have to be carefully packed prior to exportation, in zinc-lined waterproof cases; and the expense of all this care brings up the cost of material to something beyond that of ordinary sheet iron. Yet, in spite of this, articles of galvanized iron are now, by the application of labour-saving machinery, and by a proper distribution of labour, made up in the colony at a price which not only competes with the imported article, but which has succeeded in completely shutting out the foreign article from the colonial market.

Cape Wines.—By the last mail from the Cape of Good Hope, we (*Produce Markets Review*) learn that "The Cape merchants have taken up the question of the depressed state of the wine trade, and were about to hold a conference with the Paarl residents, to obtain information, with the view of farmers and merchants forming a company, for the purchase, storage, and export of wines, of age and quality. Wine farmers are in great distress, in consequence of low prices, and immediate relief was required. To our mind, the reform wanted in the Cape vineyards is, to give up the spurious imitations which have made 'South African Port' a compendious description of all that is nasty in wine, and to manufacture instead lighter and more natural descriptions. With such a climate, the quality of Cape wines should be magnificent, and if it is not so the fault is probably man's—not nature's."

Extension of Territory in Australia.—A Melbourne paper says:—"Settlements have now been formed from Rockhampton to Somerset, on the York peninsula, from Cooper's Creek up and along the Gulf of Carpentaria, thus adding immensely within the last few years to the available territory of the British dominions in Australia. The example set by these enterprises in the East was soon followed by South Australia; and fine runs are continually being opened towards the centre of the continent, and along the track originally laid out by the indomitable pluck of M'Dougal Stuart. Western Australia, apparently not so favourably situated as her sister colonies on the east coast, is struggling hard for an extension of her territory, both towards east and north; and one of her most recent achievements—the successful occupation of the land round Nicol Bay and along the Fortescue and Ashburton rivers—places it beyond the reach of doubt that the north-western coast will one day likewise become a fine settlement. In the far north, on the shores of the Van Diemen's gulf, the efforts to establish new settlements have not been crowned with equal success; for only a short time ago the South Australian branch colony at Adam's Bay, after a struggle of nearly three years, had to be abandoned again. The same government has, on the other hand, succeeded in discovering an excellent harbour and starting-point for the occupation of the land round the Great Australian Bight, which, though on Western Australian territory, will ultimately prove of great importance also to the western districts of South Australia. Notwithstanding all these efforts and explorations, there still remains a vast territory between Cambridge Gulf in the north and the Australian Bight entirely unknown. The successful settlement of the north-western seaboard will depend ultimately on the progress made in the exploration and occupation of the western interior; for so long as there still remains an unknown territory of nearly a million of square miles between the eastern and western colonies, there is little hope that the latter can attain to a really prosperous condition. But let the communication once be fairly established, and there can be no doubt that it will give an enormous impulse to the progress of every one of the colonies."

Publications Issued.

The Indicator Diagram Practically Considered. By N. P. Burgh, Engineer. (*E. and F. N. Spon.*)—It appears by the preface that this work was virtually commenced in the latter part of the year 1867, when the author had occasion to test some indicator diagrams. The means he adopted were to consider, first, the proportions of the details that regulated the admission, expansion, and exhaustion of the steam; and, secondly, their geometrical delineation. It was then concluded that as the length of the motion for the indicator barrel was virtually that of the stroke of the piston, the scale of the geometrical test employed must be subject to that circumstance. Accordingly a drawing was made of the cylinder ports slide valve, link motion, eccentrics and rods, a portion of the piston, length of the connecting rod, and crank circle at the same scale that the stroke of the piston in inches was equal to the length of the indicator diagram. From this resulted a correct knowledge of the positions of all the details that regulated the steam at all points of admission, cut off, expansion, exhaustion compression, and lead in relation to the positions of the piston and crank pin at the same scale as the diagram; and by laying it on the circle it was apparent how it was formed in relation to time and speed, and the cause of the defects, if any existed; indeed, this is the only method of gaining that information truthfully, which is illustrated by the frontispiece plate. After this test had succeeded the

author looked around him to see if any one else had published a similar process, but could not find any record, or even a hint on the subject. He therefore thought it worth while to put the matter in print for public use, intending at that time to make a small work only on that special branch. On conversing, however, with a few of his professional friends on the affair, they urged him not to condense the matter thus, but to make a really practical work on the entire subject, as it was much needed, at the same time offering him all the assistance necessary for the purpose; and accordingly Messrs. Penn, Field, Barclay, Rennie, and Napier assisted him; and no author but himself has been so honoured with their contributions, not only in this case, but in others when he has solicited information from them. The most reliable information on the indicator diagram, in ten chapters, is therefore made public in the following order:—Chapter I. contains the description and use of the indicator, illustrating, on a working scale, Messrs. Maudslays' and Mr. Richards' indicators.—Chapter II. is under the heading, "How to take an indicator diagram correctly," and treats of the action of the steam in the cylinder, the definition of the diagram, correct indicator gear for horizontal, vertical, and oscillating engines, and indicating notes.—Chapter III. deals with the proof of atmospheric pressure and particulars of steam pressures, and also includes rules and tables bearing on the subject, with practical examples and illustrations.—Chapter IV. is a complete description and illustration of the theoretical geometry of the indicator diagram in a more practical manner than hitherto published.—Chapter V. is the practical geometry of the indicator diagram, which fully explains the frontispiece-plate and other figures in connection with it.—Chapter VI. commences the illustrations of indicator diagrams and gear constructed by the engineers mentioned, and others whose names are noted under the figures; this chapter contains twenty-one diagrams from ordinary modern screw-engines of all classes; three from compound engines; two illustrations of indicator gear for return acting engines; and three diagrams of steam-launch engines.—Chapter VII. is devoted to diagrams taken from the most modern paddle-engines, and contains two illustrations of them; also the most improved indicator gear by Messrs. Penn and Napier.—Chapter VIII. treats of land engine indicator diagrams, showing eleven examples taken from various classes, including locomotive engines.—Chapter IX. fully explains and illustrates air and water pump diagrams.—Chapter X. closes the work, with the explanation of the indicated horse-power in connection with the diagram. The whole of this is expressed in 160 pages, and illustrated by 100 wood-cuts; so that the entire matter has been fully explained, but not more so than requisite.

Notes.

Technical Education in Italy.—The mining school at Agordo has just been re-opened, with some slight modification in the courses of instruction on those of previous years. These courses are gratuitous, and occupy three years' study in the following subjects:—First year—Elements of mathematics and geometrical drawing; chemistry; elements of physics and natural history. Second year—Mining and underground surveying, with the relative drawing; analytical chemistry, with laboratory practice; mineralogy and geology. Third year—General mechanics as applied to mining purposes, with relative drawing; mineralogy; principles of construction.

Industrial School at Constantinople.—According to the *Takvimi Vekxi* (the official journal of the Turkish government) an industrial school is about to be established at Constantinople by order of the Sultan.

Agricultural Societies in Prussia.—In Prussia there are 31 general agricultural societies, with 640 branch committees in the various provincial towns. There are also 166 smaller independent agricultural societies.

Emigration from Italy to South America.—The following is the emigration from the port of Genoa to South America during the month of May, 1868, as compared with that of the same month, in 1867:—

	1867.	1868.
No. of ships	12	11
No. of crew	162	241
No. of passengers	742	866

Of this number in May, 1868, 179 emigrants were from the province of Genoa, 109 from that of Como, 60 from Milan, 152 from Salerno, 48 from Potenza, 20 from Novara, 41 from Pavia, 37 from Turin, 33 from Lucca, 29 from Brescia, and 25 from Alessandria. The emigration from Genoa during the first five months of the present year, as compared with a similar period of 1867, was as follows:—

	1867.	1868.
No. of ships	57	59
No. of crew	807	1,218
No. of passengers	5,669	8,127

Joint-Stock Companies.—The following summary of a return relative to Joint-Stock Companies shows the decline of the limited liability mania during the last five years:—In 1863 there were 783 companies registered, with a proposed capital of £139,988,242; in the following year the number increased to 992, with a proposed capital of £237,437,083 14s. Since then the falling off has been rapid, as shown by the following figures:—

	Companies.	Capital.
1865	1,013	£205,391,818
1866	752	76,824,823
1867	469	31,444,982
1868 (Jan. 1 to May 31)	201	13,896,182

Population of the United States.—The population of the United States has increased steadily during the last sixty years, as will be seen by the results of the census, which have been made every ten years:—

1790	3,930,000
1800	5,306,000
1810	7,240,000
1820	9,638,000
1830	12,866,000
1840	17,069,000
1850	23,192,000
1860	31,445,000

At the present time the population of the United States is upwards of 40,000,000, and has doubled itself in twenty-three years, increasing three and a-half per cent. in a year, or thirty-five per cent. in ten years. Should this rate of increase still keep the same, the population will be in:—

1870	42,450,000
1880	57,302,000
1890	77,357,000
1900	104,431,000

The population of Mexico and the British possessions amounts to from twelve to fifteen millions of inhabitants.

Education at Turin.—The total number of pupils at the municipal schools of Turin entered for the scholastic year, 1868-9, is 14,358, an increase on that of the preceding year of 802, and may be classed as follows:—

Day Schools.	
Boys	4,936
Girls	4,447
Boys and girls in suburban schools	2,105
Evening Schools.	
Technical classes	1,305
Elementary classes	1,520

Treatment of Seed Wheat with Sulphate of Copper.—The preservation of seed wheat from destruction by means of sulphate of copper is recommended and adopted largely in France; and a farmer communicates his method of applying the solution to the *Journal de l'Agriculture* of Paris, and his letter, together with an illustration, may be found in the last number of that journal, published on the 20th of the last month of November. The apparatus used is of the simplest kind. A table on tressels, one of which is three or four inches higher than the other, so that the former is on an incline, a border of planks nailed around the edges of the table, with an opening in one side at the lower end, to allow of the seed being drawn out when saturated; the plank at the lower end of the table is pierced at the bottom all along its central half with a number of small holes, and beneath these stands an ordinary tub. The tub is nearly filled with a solution of sulphate of copper, in the proportion of eight pounds of the salt to seven or eight gallons of water. The operation is easy enough. The seed-corn is brought in a double-handled basket, and is then dipped into the tub of solution; the contents of the basket are then turned out upon the table, and the surplus solution runs back into the tub, through the holes in the plank, already described. If there is a large quantity of seed to be steeped, of course the solution in the tub must be replenished. A pound of the salt is said to be sufficient to saturate three hundred times, or more, its own weight in corn. The dipping, shooting on to the table, and the draining must do away with the chance of any of the grains escaping the solution.

The Brindisi Route.—The Southern Railway Company have recently purchased a large building near the railway station at Brindisi, which they are now fitting up as an hotel for the accommodation of passengers proceeding and returning from the east. This hotel will be provided with every accommodation for travellers, and will have gardens, baths, billiard rooms, &c., attached. The Railway Company are also about to establish a line of steam ships to Bombay, which will make the voyage in twenty days, a saving in time of four days, and in fare of 300 francs, on the route *via* Marseilles.

Correspondence.

Poisonous Mushrooms. — Sir, — Mr. Worthington Smith's description of the *bonâ fide* mushroom seems to me a very good one, but I doubt his correctness as to their never growing in woods. I have never found the best sorts in dense woods, but in open woods I have found them wholesome. The fact of a fungus growing in a wood does not appear to indicate its being unfit for food, for some of those which are now named as "excellent and delicious" by Latin titles, grow in woods. Undoubtedly, however, those mushrooms which grow on open downs are the best. My remarks as to the test by pungency seem to have been somewhat misunderstood. I only applied this test to a kind or two which much resemble mushrooms, and never suggested that they would supply a reliable test in the case of other fungi. Wherever I have found a mushroom which has seemed to me doubtful, I have applied the above test of tasting in the raw state—and I have been a great gatherer of mushrooms, from my youth, in various parts of England and Wales, and have never been unfortunate in my sport (for sport it is if you choose to make it so) and it leads you into places as pretty as trout-fishing does. Indeed, I have often gathered mushrooms by the side of trout streams, and when the fish would not rise, have put some leaves into my creel, and filled it up with fungi. I say I have been fortunate in my mushroom sport. Indeed, I am not aware even that I have been "*particeps criminis*" to even an indigestion. But there are several reasons which produce such various accounts about the wholesomeness, or the contrary, of mushrooms. With some people it is very probable that any mushrooms would be unwholesome, just as one finds people who could not eat eels or shrimps without being very poorly afterwards. Then, there is the want of proper cooking. In a former letter to you on this subject I gave a notable instance of a wonderful fungus, like a cauliflower, in Italy, which was cooked by some friends of mine in two or three waters, and was excellent, and was eaten without the least ill effects. But this emboldening some other people to try the same species of fungus, they, unfortunately, only boiled it once, and were very ill. Heaven sends fungi; perhaps it is some one else who sends cooks! Then there is another reason which would make even roast beef a poison. If people gorge themselves on mushrooms, and are ill after it, it serves them right. Fancy anyone making a dinner off *pâté de foie gras*. Such an one would deserve to be ill, and it would be a pity if he was not. These savoury materials are intended to be adjuncts. Used as adjuncts, or as *petits plats*, they are excellent, but not for the staple of a meal. I do not think there would be many cases of mushrooms injuring people if they were thus used in moderation. For an excess there is no excuse for the richer classes. For the poorer there is. They cannot afford a variety of dishes, and if their one turns out bad they are sufferers to be pitied. And, as far as I can recollect, the cases of serious injury from mushrooms have principally occurred among these, when a meal has been made of wrong sorts, or such as have been decayed and unfit for food, although originally they might have been good enough. People should understand that they should not make a meal of mushrooms any more than they should off *pâté de foie gras;* and then I do not think that there will be much injury done. People do not generally make a meal off truffles, or onions. The former instance will illustrate the suggestions to the richer class; the latter to the poorer; the full investigation, however, of this source of food is, I gladly see, fairly within the province of the Society to foster.—I am &c., John Bell.

The Safety of our Collieries.—Sir,—The work carried out underground by miners is such that they must ever be subject to occasional unforeseen accidents, but we shall never be in a position to reduce those so frequently caused by bad ventilation, ignorance, and mismanagement, until we get rid of a wretched, false economy, introduced in former rude and *quasi* semi-barbarous times when coals were first begun to be obtained from the bowels of the earth. A shaft was sunk near the lowest dip of the strata in order that underground water might flow to the sumph, or pump-well, and so drain the whole of the works. Thus far the operation was judicious, but when, instead of sinking a second, they came to divide the one shaft in two with a bratticed partition, for both down and upcast, and for other purposes, a series of fatal errors were introduced. In the first place fire-damp or impure hydrogen is lighter than atmospheric air, therefore a less power of ventilation is required when the upcast is sunk more towards the higher level of the coal measures than when at the lowest. The cost of two shafts was an expense that colliery owners formerly would not hear of—a false economy, the cause of many accidents and stoppages. In the second place, as exhaustion is generally considered the best mode, and the furnace the cheapest, the custom is to put it half way down the upcast, in order to save the expense of building a high chimney, and so force the foul and explosive gases through the fire bars with great risk of accidents and stoppages. In the third place, since the introduction of the safety lamp, that invaluable test of the state of the air of the mine, the men have been enabled to work in a poisonous atmosphere, highly detrimental to health, and shortening by many years the duration of working life. It has indeed been observed that since that introduction fatal accidents have been more frequent, but I believe that opinion to be founded in error, from not taking into consideration the

great increase of collieries of late. Probably the proportion is much the same—a sign that the use of the lamp has not produced much benefit. More than all, it is highly improper to cause the life of the miner to depend upon strictly carrying out minute regulations, upon his own carelessness or ignorance, or upon the perfect state of the lamp, itself subject to various unavoidable—sometimes wilful—accidents. In order to carry out the management of our collieries with safety and economy, the ventilation should be entirely independent of the miners themselves, who should be enabled to work as freely as above ground, save in respect of the confined space and liability to suffer from falls, though they, again, are often caused either by improper cutting or insufficient timbering. The fact is that the very prohibition of smoking below is a certain indication of bad or insufficient ventilation, and a law to compel owners and lessees to defray every expense attending or following colliery explosions would be a most salutary move. I merely throw out these few crude suggestions in order to start the subject.—I am, &c., Henry W. Reveley.

Reading, December 8th, 1868.

MEETINGS FOR THE ENSUING WEEK.

Mon.....Society of Arts, 8. Cantor Lectures. Mr. W. H. Perkin' "On the Aniline or Coal Tar Colours."
Society of Engineers, 7½.
R. Geographical, 8½. Dr. H. Blane, "Journey in Western Abyssinia, from Metemma to the King's Camp in Damot."
British Architects, 8.
Medical, 8.
London Inst., 6.

Tues ...Civil Engineers, 8. Mr. Samuel Parker Bidder, jun., "On Machines employed in Working and Breaking-down Coal, so as to avoid the use of Gunpowder."
Statistical, 8. Dr. Robert J. Mann, "Statistical Notes regarding the Colony of Natal."
Pathological, 8.
Anthropological, 8.

Wed ...Society of Arts, 8. Dr. B. H. Paul, "On Artificial Freezing."
R. Society of Literature, 8½.

Thur ...Royal, 8½.
Antiquaries, 8½.
Linnæan, 8. Mr. Andrew Murray, "On the Geographical Origin and Relations of the chief great Coleopterous Faunæ."
Zoological, 4.
Chemical, 8.
Numismatic, 7.
Philosophical Club, 6.

Fri .....Philological, 8½.
Quekett Club, 8.

Patents.

From Commissioners of Patents' Journal, December 4.

Grants of Provisional Protection.

Advertising, mode of—2870—J. H. Johnson.
Agricultural machines—3544—C. J. Foster.
Bamboo, &c., preparing fibre from—3245—M. Sautter.
Boxes for packing bottles, &c.—3514—W. Thompson.
Carding engines—3481—E. and A. Priest.
Carding engines—3548—J. Bowden and M. N. and B. R. Mills.
Carriage wheels—3450—J. Stephens.
Carriages, folding steps for—3554—B and B. T. Newnham.
Cartridges, renovating discharged—3509—W. L. Groundwater.
Cast iron, converting into wrought iron—3565—C. D. Abel.
Chairs, cradles, &c.—3547—J. Mangnall.
Chimney pots—3493—J. E. H. Harris and T. Lumley.
Coal, &c., breaking down—3488—J. Jones and S. P. Bidder, jun.
Conservatories, &c., heating water for—2288—F. Warren.
Corn-flour jelly—3378—W. Irmer.
Electro-telegraphic apparatus—3556—W. A. Lyttle.
Fabrics, fixing colours on textile—3534—C. Descat and H. Guillaume.
Fabrics, manufacturing and ornamenting—3542—J. Sims.
Feet, &c., imparting heat to the—3519—D. Jones and J. Jackson.
Fire-arms, &c., breech-loading—3512—G. V. Fosbery.
Fishing rods—3528—B. Britten.
Game, apparatus for playing a new—2990—H. Jewitt.
Gas—3541—C. E. Brooman.
Ginger snaps, &c.—3497—A. Clark.
Hay and straw, baling chopped—3536—W. R. Lake.
Heavy weights, safety tackle for raising and lowering—3567—J. H. Johnson.
Iron and steel, &c.—3569—C. W. Siemens.
Iron ships, constructing—3508—B. Bell.
Kilns—3496—W. Mansfield.
Land, tilling by steam power—3487—S. W. Campain.
Lead ores, treating—3400—P. E. De Wissocq.
Lime, burning—3561—J. R. Swann.
Locks—3549—W. La Penotière.
Looms—3499—C. Richardson.
Metallic caps, &c.—3557—J. Sturrock.
Millstones, dressing—3559—A. V. Newton.
Motive-power apparatus—3492—G. Montrichard.
Motive-power engines—3463—G. J. Worssam.
Needle cases—3517—W. Avery and A. Fenton.
Pen-holders—3500—J. M. Prichard.
Phosphate of lime—3516—H. Carrigg.
Phosphatic manures, &c.—3506—A. McDougall.
Phosphorus, &c.—3515—C. D. Abel.
Pianoforte hammers—3563—W. H. Dreaper.
Pianofortes—3375—T. Harrison.
Pianofortes, &c.—3558—C. Montagu.
Pig skins, treating—3309—W. H. Liddell.
Ploughs—3526—A. Guthrie.
Railway carriages, movable sleeping berths for—3552—J. Howlison.
Railway signals, &c., apparatus for working—3498—H. A. Kehde.
Rope, &c.—3521—J. Green.
Ropes, untwisting—3523—J. McGlashan.
Rotary engines and pumps—3403—H. L. Bennison.
Safety lamps—3413—W. H. Hall and J. Cooke.
Saws, operating reciprocating—3532—W. R. Lake.
Sewing needles—3535—A. V. Newton.
Sheep, &c., washing, &c.—3510—W. T. Bassett.
Ships, propelling—3218—C. Shaw.
Shirts—3520—J. McGrath.
Stays—3494—L. M. Prewitt.
Steam engines, &c.—3546—W. Inglis.
Steam generators—3479—P. J. Ravel.
Steam hammers—3545—F. W. Webb.
Stereotype printing machines, &c.—3470—J. C. MacDonald and J. Calverley.
Tables, apparatus for expanding—3483—J. Hare.
Telegraph wires, covering—3490—R. Green.
Telegraphic line wires, fastening and adjusting—3501—C. W. Siemens.
Tobacco pouch and cigarette former combined—3539—C. D. Abel.
Tumblers, goblets, &c.—3518—T. G. Webb.
Vegetable and animal substances, preparing and preserving—3352—M. Sautter.
Water, &c., distributing in fine particles—3531—H. B. Cowell.
Window sashes, opening and closing—3524—J. D. Judkins.
Wood, &c., machinery for shaping—3429—J. Lewthwaite.
Wool, &c., liquid for oiling—3503—C. E. Brooman.
Wool, &c., preparing—3538—J. Scholes and J. Leach.
Wort, &c., cooling—3507—A. W. Drayson.
Yarns, preparing—3537—J. G. Tongue.

Patents Sealed.

1301. J. C. and H. T. Fugl.
1849. A. Prince.
1851. O. T. and G. A. Newton.
1852. J. Wadsworth
1864. G. Finnegan.
1881. R. B. Boyman.
1981. W. S. Carr.
2011. W. A. Gilbee.
2013. A. M. Clark.
2014. C. Whitehouse.
2042. E. Mucklow.
2096. A. M. Clark.
2296. J. H. Johnson.
3003. B. W. Stevens.
3063. W. E. Newton.

From Commissioners of Patents' Journal, December 8.

Patents Sealed.

1876. R. Husband.
1883. J., J. W., & D. S. Stafford.
1888. W. Ferrie.
1889. J. T. Ladyman.
1892. C. W. Siemens.
1901. T. E. Williams.
1910. W. Henderson.
1911. J. S. Cockings and A. Umbach.
1913. J. Lord.
1914. A. E. G. Thenard.
1917. A. S. Stocker.
1927. N. D. Spartali.
1931. W. Richards.
1961. J., J., and J. Booth.
1964. D. Mitchell.
1972. A. M. Clark.
1993. W. Umpherston.
2087. C. E. Brooman.
2097. W. Daglish.
2356. F. Lambe, A. C. Sterry, and J. Fordred.

Patents on which the Stamp Duty of £50 has been paid.

3071. W. Thompson.
3123. I. Holden.
3093. T. A. Weston.
3095. E. B. Wilson.
3143. N. Salamon and W. J. L. Davids.
3172. A. V. Newton.
3326. R. M. Marygold and S. Fitzjohn.
3127. G. E. Donisthorpe.
3130. A. B. Brown.
3163. A. Parkes.
3233. T. R. Hetherington and S. Thornton.
3116. J. J. Ashworth.
3142. A. C. Bamlett.
3153. P. de Moudésir, P. Lehaitre, and A. Jullienne.
3174. R. A. Brooman.
3184. N. W. Wheeler.
3379. G. Hawksley.

Patents on which the Stamp Duty of £100 has been Paid.

3066. J. J. Russell & B. L. Brown.
3031. G. T. Bousfield.
3078. C. F. Varley.
3060. J. D. Napier.

Journal of the Society of Arts.

FRIDAY, DECEMBER 18, 1868.

Announcements by the Council.

Ordinary Meetings.

Wednesday Evenings at eight o'clock :—

December 23.—"Description of the Electric Organ.' By Henry Bryceson, Esq.

Cantor Lectures.

The last lecture of the first course for the present Session, the subject being "The Aniline or Coal Tar Colours," will be delivered by W. H. Perkin, Esq., F.R.S., on Monday evening next, as follows :—

Lecture III.—Monday, December 21st.

Various Aniline, Phenol, and Naphthalin Colours—Application of the Coal Tar Colours to the Arts.

Aldehyd green—Iodine green—Perkin's green—Aniline pink—Black, browns, &c.—Phenol—Picric and isopurpuric acids—Aurine, coralline, and azuline—Naphthalin yellow—Chloroxynaphthalic acid, &c.—Application of the coal-tar colours to the arts of dyeing and printing—Paper staining and colouring—Lithographic and other printing.—Conclusion.

The lecture will begin at eight o'clock. These Lectures are open to Members, each of whom has the privilege of introducing two friends to each Lecture.

Other courses are being arranged, particulars of which will be announced.

Subscriptions.

The Michaelmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Food Committee.

The Committee met on Wednesday, November 25th. Present—Mr. Benj. Shaw (in the chair), Mr. G. F. Wilson, F.R.S., Mr. W. H. Michael, and Mr. E. Wilson.

Mr. Robert Davison, member of the Institution of Civil Engineers, attended to give information on the subject of desiccation as a preservative process.

Mr. Davison stated that some years ago he made experiments on the application of rapid currents of hot air to the purification of brewers' casks, and the desiccation of animal and vegetable substances, some of which were communicated at the time to the Society of Arts, and were published in their Transactions.* His attention was first given to the subject in the year 1843. The importance of hot blast had been discovered in the melting of metals, and it occurred to him that impelled currents of hot air might be advantageously applied to other processes of manufacture, especially as a purifying and desiccating process. In reference to its application to the purification of brewers' casks, the question arose, in the first instance, as to the effect it would have upon the strength of the wood. He experimented on the subject, and found that, so far from deteriorating the wood, it gave increased strength to it to a large extent. He saw that impelled currents of hot air were a valuable thing which had been overlooked, and he then turned his attention to the desiccation of vegetable and animal substances. He was successful in the first instance in desiccating potatoes and other table vegetables, which were preserved for a very long time; and he afterwards operated upon a quantity of rump steaks, and by depriving them of all their moisture, they were preserved in a perfectly sweet and wholesome condition for several months. At the time he was engaged in these experiments an intelligent young man, brother-in-law to Dr. Livingstone, who was then his pupil, mentioned to him that he was doing by an artificial process precisely what the North American Indians did with their buffalo meat and venison by the natural heat of the sun in preserving their provisions, and at the same time he gave him an extract from Catlin's work on the subject. The Indian method of drying their meat was to cut it up into thin strips, which were hung upon the branches of trees for several days in the heat of the sun. The moisture was entirely evaporated. The meat was then stowed away, and would keep good for years. Salt they never used, notwithstanding the country abounded with it. What the Indians did by natural means, he did by artificial, by the employment of impelled currents of heated air. He cooked some of the steaks desiccated by this process three or four years after they had been operated upon, and they were perfectly good, and retained their flavour. After it had been soaked in water the meat recovered nearly its original bulk. In the process of desiccation nothing but the water was removed, the albumen being all retained in the meat.

Mr. Michael remarked that if the effect of this process was to produce anything like the charqui with which we had hitherto been acquainted, the meat would never be in favour with the general public. Several shops were opened in London for the sale of charqui, but it was impossible to get rid of it. He would be glad to hear in what respect the meat dried by the process described differed from charqui?

Mr. Davison replied that the difference was very material. He had not entertained the idea of preparing meat in this way for the tables of the gentry, but his idea was to have the meat cut into thin slices, thoroughly dried, and packed away for use as we should biscuits. In this way he thought an excellent article of food might be prepared for shipping purposes, and for the poorer classes.

Mr. Michael observed that although it was sold at a low price, there was a great objection on the part of the poorer classes to eat charqui.

Mr. Davison remarked that three or four years ago an article appeared in the *Times*, expressing a hope that some plan would be devised for desiccating meat in a better manner than had hitherto been done. The results of the process he had described were decidedly superior to any charqui that he had seen. He had long since parted with the last portion of the steaks he had experimented upon. The apparatus for desiccation was at present largely in use for other purposes, such as the seasoning of wood, the purifying of casks, &c. It was extensively used for the former purpose in the royal dock-yards. He had no doubt he should be able to make the experiment for the satisfaction of the Committee, and should have great pleasure in doing so at the earliest opportunity. The heat of the air in his experiments

* See Supplemental vol., 1832, page 145.

was 180°, but he believed the desiccation would be effected equally well at a temperature of 120°, when the albumen would not be coagulated. Practically, he found that meat dried with a current at 180° preserved its full flavour. He had experimented with the same process on poultry, and after three or four years it was perfectly sweet. The meat and poultry were kept in his office. They were seen by Dr. Copland and Mr. J. Dalrymple, who took very great interest in the matter, and said there could be no question that meat could be preserved in that way for a very long time. The meat was cooked as steak, and not as stew. After being soaked for about four hours, the meat resumed its original bulk and plumpness, and it retained all the flavour of fresh killed meat.

Mr. E. Wilson inquired what was the percentage of moisture which was driven off by the process of desiccation?

Mr. Davison replied that a memorandum he had found stated in one case it was 51 per cent., and in another 58 per cent. He had not experimented in that way with meat containing bone. His present idea was that it was applicable only to meat in the form of steaks or strips, and not to joints of considerable bulk and thickness or containing bone. The bones remained in the poultry which he submitted to the process, and it was perfectly good in all respects. The steaks were thoroughly dried throughout the whole substance of the meat. On one occasion he desiccated some blood, which lost 82 per cent. of moisture; he had also made experiments with potatoes and milk. A few hours soaking sufficed to restore the necessary quantity of moisture to the desiccated meat. Mr. Davison added that he was not a believer in any of the plans for sending meat to this country in bulk or in joints from the colonies, either commercially or otherwise.

Mr. E. Wilson remarked that it was very important in sending meat from long distances to save half the bulk and weight by taking away the moisture, and restoring it when used here.

The Committee thanked Mr. Davison for the information he had given them.

Mr. William Bridges Adams attended to give information on the subject of dried meats as prepared in South America.

Mr. Adams stated that he had resided a considerable time in South America. He had noticed that the meat of Chilé was of richer flavour, and more approaching that of venison than the meat of Buenos Ayres. The climate of Chilé, from its extreme dryness, was better adapted for the curing of meat than Buenos Ayres, where there was a certain degree of humidity. The cattle were driven in in herds and slaughtered. After flaying, the bones and fat were removed from the flesh, which was cut up into strips a quarter or three-eighths of an inch thick, and hung up in the full rays of the sun, and in about eight hours it was dried almost as hard as a piece of glue. It was then packed in raw hides which shrunk upon it, and kept it very tight. His experience was, that meat dried in this way would not putrify, but after a time mites were found in it as was the case in cheese. His first experience in eating this description of meat was on a journey with two English friends south from Valparaiso. They carried a supply of charqui with them, and on the first day he voluntered to cook the supper, and accordingly proceeded to cut up the meat in shreds as small as a quill, which he placed in a vessel on a fire to boil. He observed a strange grin on the face of their attendant. When he imagined it was sufficiently cooked, he removed it from the vessel, but it was as hard as india-rubber. This appeared to cause a great deal of amusement, and he laughed heartily. He then requested the man to try his hand at it, on which he removed the shreds of meat from the vessel, and, having roasted them thoroughly brown over the embers of the fire, pounded them into very small pieces on a flat stone. They were then returned to the vessel, mixed with some vegetables, and produced a most excellent mess; but it appeared that no amount of boiling would have made the meat tender or eatable without roasting and reducing the fibres. He had said that after a time mites appeared in the meat, but there was no unpleasant flavour except there was any fat left on it; and that became rancid. For all purposes of soup or stew it was a valuable article of food.

The Chairman remarked that experience in such cases showed that with the keen appetite produced by outdoor life and mountain air, food was eaten with a relish which did not exist among home populations.

Mr. Adams said that was quite true, and there were not the same faculties of digestion. The mill workers obtained little oxygen during the day. In those countries where charqui was used as a food in travelling, it was customary to have it pounded, mixed with fat, and prepared beforehand, and slipped into a sheep or goat skin like a large sausage. He had travelled upon it for two months together, and found it very good food. All they had to do was to cook it up into a soup or stew. Some of the charqui which came to London he believed was perfectly uneatable. That which he obtained was like eating bad candles, and where there was any fat it was quite rancid. The moisture would be replaced to a certain extent by long soaking, but the meat would never be restored to its original flaccid condition. He thought it would not have less flavour. He believed the Russian frozen provisions lost their flavour to a great extent. He should have supposed that considerably more than half the weight of water was lost by the drying of the meat. He apprehended that in the process of desiccating by hot air a coating would form on the outside of the meat, which would retain the moisture, and therefore he thought a comparatively slow process of drying would accomplish the object most effectually. The heat of the sun in Chilé would be from 120° to 130° or 140°, but they had a thoroughly dry atmostphere as well. The mode of preserving meat in Buenos Ayres, South America, was by partially salting, and afterwards drying, in which case the fat was used. That description of meat was rancid, and principally consumed by the negro population of the Brazils, and it was a treat to them to get some fat, but it could scarcely be considered fit for the food of civilized people. What he would suggest was, that when the meat was brought to the condition known as charqui, it should be pounded or granulated, pressed by hydraulic power into a solid mass, and packed in iron casks, and when it was required for use should be grated out of the lump. A valuable food would thus be produced, though not altogether of the character that would be called "nice" in this country, *i.e.*, of the first quality.

Mr. Michael inquired whether Mr. Adams had seen any of the dried mutton sent from Australia.

Mr. Adams replied he had not. He advised the solid pressing of the meat to prevent mites in it. It would be preferable that the meat should be prepared in a state of powder where it was dried, and packed under pressure in iron cases for exportation. Excellent soups for ships or hospitals might be made from that preparation. It could be effected by granulating machines, and afterwards packed tightly in iron casks.

Mr. Michael asked whether Mr. Adams was aware of the fact that some very fine samples of raisins and currants had been sent to this country from Chilé.

Mr. Adams replied that he never, to his recollection, saw any currants in any part of South America; those which Mr. Michael alluded to were probably a very small description of grapes. Very fine grapes were grown in that country, and they made remarkably fine fruit when dried, which was done by hanging them on the gables of the houses. They took about two months to dry, and the most unwholesome time to eat them wa when they were partly dried. In Chilé grapes were almost always grown on irrigated land, very large and

watery. In making wine from them it was therefore requisite to throw off a portion of the water by boiling before fermenting. He thought there was no difficulty in bringing dried beef and mutton from foreign countries. He had succeeded in drying veal perfectly in his own house, which was a difficult thing to do, but it did not succeed in strips thicker than $\frac{1}{8}$th of an inch. He succeeded in preventing the putridity of the meat even in hot weather. The objection that in drying meat the flavour was lost did not appear to Mr. Adams to be well founded. Boiled meat, however fresh, had scarcely any flavour, and boiled fowls and boiled veal were very insipid food without bacon and butter. The flavour of meat was brought out by roasting, and could be induced from dried meat as well as from fresh, and this was the reason for roasting the charqui. Soup was usually made from unroasted meat, gravy from meat partially roasted. He thought, with proper care taken, charqui might be prepared so as to be a saleable article in this country, but people would have to get rid of the existing prejudice against it, as was the case with regard to Indian corn in Ireland. The people formerly would not touch it, but it was now found to be a most nourishing kind of food, and great quantities of it were consumed not only in Ireland but in England in various forms. With reference to the Australian cooked beef which had been sent to this country in large quantities, Mr. Adams expressed a favourable opinion of it both as regards the flavour and nutritive qualities. His own family liked it so much, that on one occasion they ate it for three days consecutively in preference to any other meat. In that which he partook of there was no loss of osmazone, and it did not appear to be so overcooked as that which had been in the market more recently. Twenty years back Alderman Finnis presented him with an eight-pound canister of this meat, which was prepared in Australia for the use of emigrant ships, and not for commerce. Its cost, brought to England, was 4d. per pound, beef of very fine quality. He thought if people could obtain such a pabulum at a cheap rate they would have no objection to supply the flavouring which might suit their various palates.

Mr. E. Wilson remarked that it was possible to defer too much to prejudices on these points. He recollected, on the occasion of a lecture being given in the adjoining room upon horseflesh as human food, everyone who spoke upon it stood out for the insuperable prejudices against its being accepted as an article of food. The lecturer stated that portions of that meat had been dressed in various ways, and those who chose to do so might taste and judge for themselves. After the meeting there was a great demand for it, so that the prejudice against it did not appear to be very deeply seated.

Mr. Adams believed the real objection to horseflesh as a food was that, like venison, it required the addition of good sauces to make it palatable. He had no doubt that every variety of flesh fit for human food might be preserved for any length of time, as easily as Egyptian mummies, by the process of thoroughly drying, reducing to powder, and pressing into a solid mass capable of being grated when wanted for use. In this mode all the constituents of the meat were retained, which was not the case when extracts only were prepared. He did not for a moment dispute the value of extracts, but fibre was also an important element in building up living muscle; the fat there was no difficulty in dealing with in another manner—by melting and removing the gelatine. A remark had been made that the Australian process of highly cooking the meat in tins had a tendency to coagulate the albumen. It might be so, but there was a curious fact in domestic cookery which might be brought to bear on the subject. In boiling eggs in the shells, if after the boiling point was reached the eggs were suffered to cool, no after-boiling could coagulate the white. It was possible that in preparing cooked tins of meat in Australia this hint might be of value.

Mr. Adams was thanked by the Committee for his interesting information, after which they adjourned.

Cantor Lectures.

The second lecture of Mr. W. H. Perkin's course "On the Aniline or Coal Tar Colours," was delivered on Monday evening, the 14th inst. A full report of these lectures will appear in the *Journal* at an early opportunity.

Fifth Ordinary Meeting.

Wednesday, December 16th, 1868; Seymour Teulon, Esq., Member of the Council, in the chair.

The following candidates were proposed for election as members of the Society:—

Armstrong, George Frederick, C.E., 37, Norfolk-street, Strand, W.C., and 10, Albion-place, Doncaster.
Campbell, George, 60, St. George's-square, S.W.
Croll, Alexander, Sussex-house, Tudor-road, Upper Norwood, S.E.

The following candidates were balloted for, and duly elected members of the Society:—

Crellin, Philip, jun., 87, Regent-street, W.
Peters, Major James, Junior Carlton Club, S.W.

The Paper read was—

ARTIFICIAL FREEZING AND REFRIGERATION.

By B. H. Paul, Esq., Ph.D.

Heat and cold, which we are commonly accustomed to regard as being diametrically opposite and distinct in their nature, do not, however, present any such difference when regarded from a scientific point of view, but are merely differences in degree of a condition common to all known material objects, and represented by the term temperature. The distinction habitually made between a thing that is hot and a thing that is cold, is a distinction which has reference only to the average temperature of the human body. Thus, when we term freezing water cold, and boiling water hot, we merely express the facts that the one has a degree of temperature lower, and the other a temperature higher than that of the human body, which is about mid-way between the two. Both ice and steam possess heat or caloric, and both may have their temperature reduced by abstracting heat from them.

In most industrial operations, especially those involving chemical alteration of the raw material employed, a greater or less increase of temperature is essential for effecting the desired object, inasmuch as chemical action is generally facilitated by heat, and, therefore, the means of producing heat and of augmenting temperature have hitherto attracted far greater attention than the reverse procedure of abstracting heat and reducing temperature. But, though it is most frequently the object of a manufacturer to stimulate chemical change by increase of temperature, there are cases in which it is desirable to hinder the natural tendency to chemical change, even within the ordinary range of atmospheric temperature. For these and other purposes it is requisite to abstract heat and reduce the temperature. The natural means of effecting this object is furnished by ice, which has now become an article of commerce, and is largely employed in several manufacturing operations, as well as for purposes of domestic economy.

Prior to the year 1840 little or no ice was imported into this country, but about that time the Wenham Lake

Ice Company was formed, for the purpose of bringing over ice from a lake some distance from Boston, in the United States. This enterprise does not seem to have been very successful at first, and eventually it was found that ice could be obtained with greater advantage from Norway, whence the ice now imported into the United Kingdom is chiefly derived.

In 1864 the quantity of ice imported is stated to have been over 30,000 tons.

The amount of waste in the transport and storing of ice will, of course, depend much on circumstances of a variable nature—such as the heat of the weather and of the sea during the voyage, the season and time of storing, &c. It appears to amount to about 30 or 40 per cent. of the quantity shipped.

The price of ice has varied, acording to the season, from 18s. to 40s. and even 60s. per ton. Besides its use for domestic purposes, which cannot be very great, it is largely used in curing pork and fish, and by brewers during summer.

Altogether the consumption of ice in this country is insignificant as compared with the consumption in America, where it is considered as a necessary; and it is stated that in the city of Boston alone, as much as 90 thousand tons a year are used.

The price at which ice is sold retail, viz., about one penny per lb., or at the rate of from £7 to £9 per ton, is a very great bar to its more general use in many instances.

The advantages experienced by the use of ice for various technical purposes, and the increased demand for it, naturally led to the question being raised whether ice could not be produced artificially at such a cost as to compete with the natural sources of supply, and in such abundance as to admit of its use being extended. Artificial refrigeration has long been practised on a small scale by means of what are termed freezing mixtures. The following table gives the composition of several kinds of freezing mixtures, together with statements of their efficacy:—

Composition and Effects of Freezing Mixtures.

Ingredients.	Parts by weight.	Temperature produced, starting from 50° F.	Reduction of Temperature.
Nitrate of ammonia ..	1	4° F	46°
Water	1		
Nitrate of potash	5		
Chloride of ammonium	5	10°	40°
Water	16		
Nitrate of ammonia ..	1		
Carbonate of soda	1	—7°	57°
Water	1		
Crystallised sulphate of soda	8	0°	50°
Hydrochloric acid ..	2		

The reduction of temperature produced by these mixtures is due to the absorption of heat accompanying the solution of the salts. In like manner, mixtures of snow, or finely-crushed ice, with half its weight of common salt, or with one and a half times its weight of crystallised chloride of calcium, will give a reduction of temperature from 32° to —4° and —50° F. respectively, if the salts and the vessels in which they are mixed with the ice be previously cooled to 32° F.

Freezing mixtures of this kind are often very useful for domestic and other purposes, but they are quite unsuited for most of the manufacturing operations in which reduction of temperature is a desideratum.

In discussing the subject of artificial freezing and refrigeration, it will be convenient, in the first place, to consider in the abstract what is the nature and amount of the work to be done; and to begin, I will take the case of the production of ice.

Before doing so, however, I will endeavour to describe some of the effects of heat, and to state briefly the mode in which quantities of heat are determined, and the amounts of heat in different substances ascertained. Heat, being merely a condition of energy of material substances, cannot be weighed or measured, like the substances themselves, and therefore quantities of heat can be determined only by a comparison of the effects they produce. Temperature is one of those effects, and for a given substance, the amount of heat which it contains is proportionate to the temperature. Thus, when, in ordinary language, we say a piece of iron at 100°Fahr. is hotter than a similar piece of iron at 50°Fahr., we correctly express the fact that the one contains a larger amount of heat than the other. But this would not be true of equal quantities of iron at 100°Fahr. and water at 50°Fahr., nor would the differences of temperature indicate in either case the proportions between the actual quantities of heat in the substances; for equal quantities of heat do not always produce equal differences of temperature, either in different substances or in the same substance.

There are also other effects of heat besides changes of temperature, and substances may contain heat in considerable amount without its having any influence on their temperature. This is termed latent heat, in contradistinction to the heat to which temperature is due, that being termed sensible heat, and it is heat in this latent condition which determines the liquid and vaporous states of substances. Thus, for instance, when a pound of ice is immersed in about three-quarters of a pound of boiling water, the ice gradually melts, and is converted into the liquid state. At the same time the water will be cooled down to 32°Fahr. In this case the amount of heat absorbed, or expended in effecting the liquefaction of the ice is about three-fourths that corresponding to the interval of temperature between 32° and 212° Fahr. Again, if steam at 212° Fahr. be forced into water at 32° Fahr. it disappears, and is converted into the liquid state, or, as it is commonly termed, condensed, the temperature of the water rising gradually until it reaches 212° Fahr. The increase of temperature in this case is due to the liberation of heat by the steam condensed; and if the weight of the water be ascertained, it will be found about one-fifth greater than it was before forcing in the steam. The amount of heat liberated in the condensation of steam is therefore about five times as great as that corresponding to the difference of temperature between water at 32°Fahr. and water at 212°Fahr. In like manner, if ice be mixed with steam at 212° Fahr., the ice will be liquefied and the steam condensed, while the water resulting from these changes will have a temperature of 32°Fahr. and weigh about one-eighth more than the ice melted. Therefore the amount of heat liberated in the condensation of steam is about eight times as great as that expended in effecting the liquefaction of ice.

The amounts of heat thus abstracted from water or from steam in the liquefaction of ice, and from steam in the heating of water, are the amounts which determine the liquid and vaporous states of water, and they represent respectively the expenditure of heat requisite for converting ice into the liquid state, and water into the state of vapour.

In order to express the quantities and relative amounts of heat concerned in producing these and similar effects, it is necessary to adopt some one effect of heat as the standard of comparison. The specific heat of water is generally taken for this purpose, and it is customary to take a certain increase in the temperature of a certain weight of water, as the effect referable to the unit of heat. In this country the unit of heat is the quantity of heat which raises the temperature of one pound of water one degree of Fahrenheit's scale.

To proceed now with the subject of artificial refrigeration or ice-making.

Water at the temperature of 60° Fahr. contains an amount of heat greater than that contained in an equal weight of ice at 32° Fahr., to the extent of 170·65 heat units for each pound, so that to convert water at a temperature of 60° Fahr. into ice, it is necessary to abstract that amount of heat from it. Thus, for instance, to produce one ton of ice—taking the specific heat of water as the measure of the heat to be abstracted, and the quantity of heat necessary to raise or lower the temperature of one pound of water to the extent of one degree Fahrenheit as the unit of heat—it would be necessary to abstract from the ton of water

$$\overset{\text{Heat units.}}{62{,}720} = 2{,}240\text{lbs.} \times 28 = 60^\circ - 32^\circ$$

in order to reduce it to the temperature of 32° Fahr., or the freezing point of water. But then it would still be water, and to convert that into ice it would be necessary to effect a still further abstraction of the heat which, in the latent condition, determines the liquid state of water. That heat amounts to 142·65 units for each pound of water,* and consequently for a ton it would be

$$\overset{\text{Heat units.}}{319{,}536} = \overset{\text{lbs.}}{2240} \times \overset{\text{Latent heat of water.}}{142{\cdot}65}$$

Hence the total quantity of heat to be abstracted from water at 60° in order to produce one ton of ice is 382,256 heat units (= 319,536 + 62,720). This is a quantity of heat equivalent to the evaporation of about 3 cwt. of water at 60° Fahr. and is not more than about $\frac{1}{80}$ of the heat capable of being generated by one ton of ordinary coal.

Refrigeration, or the artificial production of ice, is, therefore, simply a manipulation of heat. In this respect it is perfectly analogous to the production of steam by heating water. Both processes consist simply in the transfer of heat from one substance to another. They are, however, reverse processes. In generating steam, heat, produced by the combustion of fuel, is communicated to water. In refrigeration, on the contrary, heat is abstracted from water, and in this process the water, which is cooled, corresponds to the fuel burnt in generating steam, or in producing any other vapour. Just in the same way that fuel in burning yields its heat to the substance vaporised, so does water in refrigeration yield its heat to some substance capable of receiving it.

Having thus defined theoretically the nature and amount of the work to be done in producing a ton of ice, so far as the reduction of temperature is concerned, I will now proceed to consider the means by which such an amount of heat may be abstracted from water.

This work is to be done within a limited range of temperature, which, for mere cooling, must not much exceed the ordinary atmospheric temperature, and, for making ice, must not much exceed the freezing point of water. Therefore, it will be necessary to consider what are the conditions requisite for its performance, and what are the characters required in the materials which for this purpose are to take the place of water in the steam boiler, and to abstract heat from the liquid to be cooled or frozen, which again corresponds to the fuel burnt under the steam boiler.

In all cases of the conversion of a solid substance into the liquid state, or of a liquid into the state of vapour, it is well known, as I have already stated, that there is always a certain definite amount of heat absorbed, or rendered latent, in such a way as not to have any influence in raising the temperature of the substance.

This is one of the means by which either the heat to which the temperature of water is due, or that which determines its liquid condition, may be abstracted and transferred to some other substance capable of undergoing a change, such as vaporisation, which involves an expenditure of heat.

The amounts of heat thus absorbed by various substances, in changing their state, are given in the following table:—

	Latent heat per lb.	Authority.
	heat units.	
Water vapour	966·10	Regnault
Gaseous ammonia	900·00	Favre & Silbermann
Alcohol vapour	364·30	Andrews
Ether vapour.....	162·80	

Applying these data to the artificial production of ice, it will be evident that for a given weight of these substances their efficiency in abstracting heat will be in the same ratio as the amounts of latent heat in their vapours, and that the quantities of each of the above substances which would have to be vaporised, in order to produce one ton of ice, by abstracting from water 382,256 heat units, would be in the inverse ratio, as follows:—

	lbs.	
Water	395·669	to be vaporised.
Liquid ammonia.....	424·728	
Alcohol	1,049·272	
Ether	2,348·009	

Another process in which heat is expended without producing increase of temperature is the expansion of air. The amount of heat thus absorbed is at the rate of ·069, or about $\frac{1}{14}$ of a heat unit for each pound of air expanded to the extent of ·002035, or about $\frac{1}{490}$ of its volume, at 32° Fahr. By compressing air, an equal amount of heat is liberated in proportion to the degree of compression, and the temperature of the air is raised. If the compressed air be then cooled to a low temperature, and afterwards allowed to expand, so as to overcome some pressure or resistance, a part of the heat which determines the temperature of the air is absorbed or rendered latent in effecting the expansion, and thus the temperature of the air is reduced, proportionately to the degree of expansion. Thus, for instance, if one pound of air, at 60° Fahr. (= 13·093 cubic feet under normal atmospheric pressure), were compressed to 1·24 cubic feet, the quantity of heat liberated would amount to 32·44 heat units.

Then, since air requires ·169, or about one-sixth of a heat unit, to raise the temperature of one pound 1° Fahr. when the volume remains constant, the heat liberated by the compression would produce a rise of temperature amounting to 191·98° Fahr., equal to 32·44 heat units, and the temperature of the air would become 251·98 (= 60° + 191·98°). By cooling this compressed air to 32° Fahr., the quantity of heat abstracted would amount to 37·18 heat units per pound of air, and by expanding it then to say 4 cubic feet, heat would be rendered latent in this expansion, and it would amount to 7·56 heat units. This heat would be abstracted from that to which the temperature of the air, viz., 32° Fahr. was due, and that temperature would be thereby reduced to the extent of 1° for every ·169 heat unit thus rendered latent by the expansion, or in the case here supposed, to the extent of 44·72° or to —12·72° Fahr.

Every pound of air cooled to this temperature would reduce the temperature of about ·108 lb. of water from 60° to 32° Fahr., so that to cool a ton of water, from 60° to 32° Fahr., in this way, it would be requisite to compress and cool to 32° Fahr. 9·256 tons of air; and then, to convert that water into ice, it would be requisite to compress and cool a further 46·28 tons of air, or, in all, 55·53 tons, to produce one ton of ice.

It must, however, be remembered that the free expansion of compressed air produces heat as the result of

* According to the most accurate determinations by Person.

internal friction, and consequently is attended with little or no reduction of temperature.

These, then, are the means by which heat may be abstracted from water and transferred to some other substance, so as, on the one hand, to cool or freeze the water, and, on the other hand, to effect some change in which heat is expended.

If the amount of heat rendered latent by the vaporisation of any substance were the only point to be considered, in regard to its efficiency, as a refrigerating agent, it would be evident, from what has been already stated, that water would be the best material to employ for that purpose, both on account of the large amount of heat it requires for conversion into vapour, and from its being much more readily obtainable than any other substance except air. But this is not the case, for, besides the relative capability of abstracting heat in vaporising, there are other circumstances which exercise quite as great an influence in determining the practical efficiency of any material for refrigerating. In the first place it is necessary to take into account the degree of facility with which the substances are vaporised, and the range of temperature within which they can be readily converted into vapour. The relation of the above-named substances in this respect is shown by the following table, which gives their boiling points under the normal atmospheric pressure of 30 inches of mercury, and the tension of their vapours at different temperatures :—

		Ammonia.	Ether.	Alcohol.	Water.
Boiling point		—28·66°	95°	172·2°	212° F.
Tension of vapour in inches of mercury at		inches.	inches.	inches.	inches.
	104° F.	463·64	35·81	5·26	2·16
	68°	254·61	67·06	1·75	·68
	50°	181·58	11·28	·96	·36
	32°	124·52	7·22	·50	·18
	— 4°	55·03	2·66	·13	—
	— 40°	20·81	—	—	—
	—108·76°	9·45	—	—	—

It is evident from these data that the differences obtaining in this respect entirely alter the relation of the substances as refrigerating agents. In the case of water, which has the largest capability of absorbing heat in vaporizing, the normal boiling point is much too far above the freezing point of water to admit of its being applied for cooling water; while at temperatures much below the normal boiling point, the tension of the vapour—which is the measure of the capability of vaporisation—is so small that the rate of vaporisation would not be sufficiently rapid to produce the refrigeration required in making ice. The characters of alcohol in this respect are but slightly more favourable than those of water.

In the case of ether, on the contrary, the normal boiling-point is only 35° above the ordinary atmospheric temperature, and at temperatures below that point the vapour has a considerably greater tension than those of alcohol or water. Still, the tension of ether vapour, within the range of temperature of 60° to —4° Fahr. is too small to admit of its being used as a refrigerating agent without increasing the rate of vaporization, by means of an air-pump, and evaporating in vacuo.

With liquid ammonia, however, the case is very different. This substance is gaseous within the ordinary range of atmospheric temperature under normal pressure, the boiling-point of the liquid being about —29° Fahr. under normal pressure; and it requires, at ordinary temperatures, a pressure of from 8 to 10 atmospheres (117 to 150 lbs. on the square inch) to maintain it in the liquid state. At the same time, the latent heat of ammonia approaches very near to that of water, as already stated; and the tension of its vapour between 50° and —4° Fahr. is about 18 times as great as that of ether vapour. This, then, is a material possessing the characters requisite in a refrigerating agent in a degree eminently favourable to its application for that purpose. It is only necessary to reduce the pressure by which ammonia is retained in the liquid state, in order to effect its vaporization, and thus to bring into play the capacity for absorbing heat from water or any other substance to be cooled.

For making ice, therefore, the choice of a refrigerating agent lies between air, ether, and ammonia, so far as is yet known, and as any machine which will make ice will also perform the lighter work of cooling liquids or air, I shall only refer specially to those machines which have been devised for making ice.

The compression of air appears to have been the means first applied for this purpose by Dr. Gorrie in America. In this country, ether was the material employed in one of the earliest ice-making machines, viz., that invented by Harrison in 1856.* This machine was afterwards improved by Messrs. Siebe, in 1862,† who have since that time specially applied themselves to the manufacture of ice machines. An ice-machine of their construction has been in use for some months at Messrs. Truman and Hanbury's brewery.

In the meantime—during the year 1860—another machine was invented by M. Carré, of Paris,‡ in which ammonia was used as the refrigerating agent. This machine has been largely used in the South of France for effecting the crystallization of salts by cooling. In 1862 another machine was invented by Mr. Kirk,§ of the Bathgate Chemical Works, in Scotland, in which the alternate compression and expansion of air was applied as the means of refrigeration. This machine has been used in paraffin oil works, for the purpose of effecting the separation of solid paraffin from the oil, and has also been worked in Messrs. Flowers' brewery, at Stratford-on-Avon. In 1867 Mr. Reece patented an improved form of ice-machine, in which ammonia is used as the refrigerating agent; and during the present year an apparatus has been patented by Messrs. Mort and Nicoll,¶ of Sydney, in which the expansion of cold compressed air is proposed to be applied.

Several other patents have been obtained for ice-making machines and refrigerators; but those named above appear to me to be the most important and the most representative.

In order to compare the relative efficacy of the refrigerating agents as used in these machines, I will now state what would be the minimum requirements for machines capable of producing ice at the rate of 5 cwt. an hour from water at 60° Fahr. For this purpose the effective refrigeration must amount to 95,564 heat units per hour, that being the quantity of heat which 5 cwt. of water at 60° Fahr. contains over and above the heat contained in 5 cwt. of ice.

$$\overset{\text{lbs.}}{560} \times 170{\cdot}65 = 95{,}564$$

In the case of a machine worked with ether, the hourly rate of vaporisation in the refrigerator corresponding to this effect must amount to at least 587 lbs.; with liquid ammonia it must be at least 106 lbs. per hour; and with an air machine, worked as already stated, it would be necessary to compress and cool air at the rate of 14 tons an hour.

With an ether machine, the necessary rate of vaporisation must be maintained by means of a powerful air-pump worked by a steam-engine. In the air machine, also, the compression of the air requires the expenditure of considerable power. In a machine worked with liquid ammonia, on the contrary, there is no such expenditure of power requisite, owing to the high tension of its vapour at low temperatures. But it is necessary in this

* Specification No. 747.
† Specification No. 782.
‡ Specification No. 2,503.
§ Specification No. 1,218.
¶ Specification No. 3,278.

case to keep up a great pressure within the apparatus, in order to convert the ammonia into the liquid state; and there is, consequently, greater difficulty in preventing leakage from the joints, cocks, and working parts of the machine. The use of ether as a refrigerating agent is attended with great advantage in this respect, as there is no outward pressure in the refrigerator, and when efficient condensation is applied, only a very slight outward pressure in the other parts of the machine. This circumstance admits of the work being done without much loss of refrigerating material.

The expenditure of power in working the various kinds of ice-making machines has not been very accurately determined. There can be no doubt, however, that it is largest with the air machine, and least with an ammonia machine.

I shall subsequently have occasion, in speaking of the practical working of ice-making machines, to show that the ratio of mechanical work performed to useful effect produced, is, in some cases, very much greater than it is in others; but for the present purpose a comparison may be made on the above basis, leaving out of consideration, for the present, the expenditure of mechanical power required in the various machines for producing a given effect.

Hitherto I have spoken only of the amount of vaporisation required for making ice with ether or ammonia; but it will be evident that this vaporisation in the refrigerator must be accompanied by an equivalent amount of condensation in the other part of the machine; that is to say the vapour produced in effecting refrigeration must be again condensed by the removal of its latent heat, and thus rendered capable of repeating its work as a refrigerating agent. When the expansion of compressed air is applied for ice-making, water must also be used for cooling the air before its expansion. For this purpose a copious supply of cold water is required, which in the case of an ether machine, producing five cwt. of ice per hour, will not amount to less than about 500 gallons per hour, supposing the water to enter the condenser at 60°, and to leave it at 80° F.

With an ammonia machine of the same capability the requisite supply of water for cooling will not amount to less than 500 gallons per hour, and a further quantity will be required for cooling the liquors. The condensation of the ammonia gas produced in the refrigerator is, however, chiefly effected by bringing it in contact with water which is capable of absorbing and dissolving about 500 times its volume of the gas, under normal conditions of pressure and temperature. It is also by this continuous absorption of the ammonia gas produced in the refrigerator that the vaporisation itself is determined.

Kirk's air-engine is very analogous to Stirling's power-engine. It consists of a cylinder and piston fitted with a wire gauze regenerator, arranged in such a way that when the piston is moved, the air enclosed in the cylinder may pass freely through the regenerator, and give out or absorb heat from it, the air being compressed at the one end of the cylinder, and thereby becoming heated, while it is expanded at the other end, and thereby becomes cooled. The heat generated during compression of the air is removed by a current of cold water circulating over the cover at one end of the cylinder, while the cooled expanded air abstracts heat from a current of brine circulating over the cover at the other end of the cylinder.

In Mort and Nicoll's apparatus it is proposed to compress air by hydraulic pumps to the extent of from 300 to 600 lbs. on the square inch, cooling it at the same time, and then to allow it to expand freely into a jacket surrounding the vessel containing the air or water to be cooled.

The original ether machine constructed by Harrison was a rather crude arrangement though very simple, consisting of an air-pump connected with an evaporating vessel or refrigerator, on one side, and with a condenser on the other. By the action of the air-pump ether was vaporised in the refrigerator, and the vapour forced into the condenser, where it was liquefied, and then returned to the refrigerator by means of a pipe furnished with a valve. Although the fundamental principle on which this machine was based was correct, there appear to have been several serious errors made in its application, and it did not come into use in this country.

Siebe's machine is a much improved modification of Harrison's, and though differing from that only in matters of detail, it has been found to work very successfully.

Carré's apparatus for using ammonia is of a more complicated nature. Its operation is as follows—viz., a concentrated solution of ammonia in water is heated, in a vertical boiler, under a pressure of from 8 to 9 atmospheres (=100 to 135 lbs. on the square inch). The gaseous ammonia and steam produced in this boiler pass off through an ascending coil of pipe attached to the upper end of the boiler, into a tubular condenser surrounded by water, where the distillate is cooled and liquefied under the pressure above stated. This condensed liquid collects in a receiver, and thence passes into the refrigerator, at a rate which is regulated by a special contrivance.

The upper end of the refrigerator is connected by means of a pipe with a vessel surrounded by cold water, called the absorber, where the gaseous ammonia contained in the refrigerator coming in contact with water is absorbed, and thus such a reduction of pressure is produced that the liquefied ammonia in the refrigerator is vaporised, and thereby abstracts heat from water, or brine contained in tubes fitted in the refrigerator.

The solution of ammonia produced in the absorber is continuously pumped away and forced through the outer casing of a vessel called a regenerator, fitted with tubes through which hot water, exhausted of ammonia, flows from the boiler in the opposite direction. Here an exchange of temperature takes place, the solution of ammonia becoming heated, while the exhausted liquor is cooled.

The solution of ammonia thus heated is thence forced into the vessel through which passes the coil of pipe connecting the boiler with the condenser, and, while the vapour passing through the coil towards the refrigerator is cooled and partially condensed, the solution of ammonia is there still further heated, and then flows out of this vessel through a pipe connecting the upper end of it with the boiler, where the ammonia is again distilled off through the ascending coil to supply the refrigerator.

The hot liquor exhausted of ammonia flows through the regenerator in a continuous current, regulated by a valve; thence through a cooling worm surrounded by water, where its temperature is sufficiently reduced, and is then passed into the absorber, where it becomes charged with ammonia, and is then returned to the boiler as already described.

The operation of this machine is therefore continuous, as in the case of the ether machine.

In Reece's apparatus the boiler, containing water or a weak solution of ammonia, is connected with a vessel called the analyzer, consisting of a series of plates arranged one above the other within a tall columnar vessel. The steam passing from the boiler, under a pressure of eight atmospheres (= 110lbs. on the square inch), into the bottom of this vessel, comes in contact with a stream of concentrated solution of ammonia, which is continuously pumped into the analyzer at the top, and in falling from plate to plate the ammonia of this solution is converted into gas, while the steam is chiefly condensed and runs back to the boiler. The ammoniacal vapour then passes from the analyzer into a vessel called the rectifier, where the remaining steam is condensed and runs back to the analyzer, while the ammonia, passing on to a condenser surrounded by cold water, is liquefied, and collected in a receiver, whence it flows into the refrigerator.

Meanwhile a regulated current of spent liquor runs from the boiler through a long tube, called the heater, fitted with an internal set of tubes, through which the concentrated solution of ammonia is pumped into the analyzer. By this means the solution of ammonia is heated, and the spent liquor from the boiler is cooled sufficiently to be used for supplying to the absorber, into which it is forced by the pressure in the boiler, through a pipe fitted with a cock to regulate the supply. In the absorber it becomes saturated with ammonia discharged from the refrigerator, and is then pumped out into the analyzer.

It is here necessary to mention a very important feature of the ice making machine invented by Mr. Reece, since it constitutes a very great improvement on the ammonia machine employed by Carré. The improvement to which I refer consists in the dehydration of the ammonia, and in using as the refrigerating agent liquid ammonia, which is practically free from water, instead of a liquid containing 25 per cent. of water, and only 75 per cent. of ammonia, that being the refrigerating agent used in Carré's machine.

The effect of this difference upon the working of the machines is very great. Thus, for instance, in Carré's machine, the distillate passing from the boiler is separated into 95 per cent. of solution, containing 25 parts of ammonia—which, after being cooled, is used for supplying to the absorber—and 5 per cent. of a solution, containing $\frac{3}{4}$ ammonia, and $\frac{1}{4}$ water, which passes to the condenser, furnishing a distillate containing 25 per cent. of water. Then, since the ammoniacal distillate produced in the condenser contains 25 per cent. of water, and as water is capable of dissolving and retaining in solution its own weight of ammonia, at the temperature of from 22° to −40°F., produced in the refrigerator, only two-thirds of the ammonia in the distillate will be available for refrigeration, while the remaining third of the ammonia, being retained by the water passing into the refrigerator in the 212 lbs. of distillate, will be of no service for refrigeration, and this solution of ammonia must from time to time be run off into the boiler. Therefore, since a machine of the power here assumed must vaporize at the rate of 106 lbs. of ammonia an hour, it would be requisite to produce in the condenser a distillate at the rate of 212 lbs. per hour for supplying the refrigerator, since of this quantity 53 lbs. will be water, and that water will retain 53 lbs. of ammonia, leaving only 106 lbs. for refrigeration. Then, since the cooled exhaust liquor introduced into the absorber already contains 25 per cent. ammonia, it will dissolve only $\frac{1}{20}$ more of its weight of ammonia, and it will be necessary, in order to produce the above-mentioned quantity of distillate per hour, to supply at the rate of 200 gallons of this liquor per hour to the absorber, and to pump nearly one ton of ammonia solution from the absorber into the boiler against a pressure of 10 atmospheres, which will require an expenditure of power to the extent of $\frac{1}{2}$ horse-power per hour.

In the apparatus devised by Mr. Reece, on the contrary, the distillate passing from the boiler and containing 30 per cent. of ammonia is separated by the operation of the analyzer into 75 per cent. of a solution containing 5 parts of ammonia, which is returned again to the boiler, and into 25 per cent. of gaseous ammonia, which passes on to the rectifier, where it is more fully dehydrated, and thence passes to the condenser, where it is liquefied and delivered to the refrigerator almost anhydrous. In this case, therefore, $\frac{5}{6}$ of the ammonia distilled from the boiler passes into the refrigerator, and the whole of that is effective for refrigeration, so that to maintain a vaporization in the refrigerator, at the rate of 106 lbs. per hour, only 127 lbs. of ammonia has to be distilled from the boiler, while in Carré's apparatus only $\frac{1}{3}$ of the ammonia distilled from the boiler passes into the refrigerator, and of that quantity $\frac{1}{3}$ is ineffective for refrigeration. A still further advantage of Mr. Reece's arrangement consists in the use of water containing but very little ammonia, or about 5 per cent., for effecting the absorption of the gas generated in the refrigerator, and as that is capable of dissolving a further 20 per cent. of the gas, only $\frac{1}{5}$ as much as is requisite in Carré's apparatus is necessary, consequently there is only $\frac{1}{5}$ as much liquor to be pumped back into the boiler.

These are advantages of a very striking and important nature, and they offer, for the first time, an opportunity of realising to the fullest extent the great capabilities of ammonia as a refrigerating agent, in such a way that it is likely to surpass in efficiency all others.

I will now proceed to consider the application of ice-making machines, and certain conditions affecting their practical working in a general way, and to point out some remarkable differences in the results obtained with them under different circumstances. Hitherto little has been done in this country in making ice, since the artificial ice has certain defects, which for some purposes place it at a disadvantage as compared with the natural ice imported from Norway.

But apart from the actual production of ice, machines of the kind just described may be of great service for various other purposes. Thus, for instance, in breweries, though there water is a thing unknown, brewers being affected with a kind of chronic hydrophobia, it is frequently requisite to cool down large quantities of "liquor," or wort, and for this purpose ice has been largely employed. The importation of the large quantities of what may be termed waste meat from the Australian colonies, and from South America, appears to depend mainly upon a practical solution of the question whether a sufficiently low temperature can be maintained in a cargo of meat during the passage to England, at such a cost as would leave a profit on the trade. To obtain any large sale for that meat in this country it must be brought over in a fresh state; and there is every reason to believe that, if meat be kept at a freezing temperature, it will remain sweet and good for a very long time. In connection with this subject, therefore, the possibility of refrigerating, or making ice by artificial means, acquires a very great degree of interest for all who suffer from the present high price of meat in this country; and, perhaps, still more for the farmers of Australia and for shipowners, since there can be no doubt that if Australian meat could be brought here in a sound, wholesome condition, it would give rise to a great trade, and be a great benefit to all concerned.

In making ice with any of the machines already mentioned, it is impossible to effect the refrigeration of the water directly, since the apparatus would thus become blocked up with ice. It is therefore necessary to employ a refrigerating medium, which will bear cooling to a temperature considerably below the freezing point of water without solidifying. Many saline solutions possess this property, and a strong solution of chloride of calcium, or a concentrated solution of common salt, answers very well for the purpose. This solution is made to flow at a convenient rate through tubes or other spaces arranged in the refrigerator or vessel within which the refrigerating material is being vaporised, and when the temperature of the solution is sufficiently reduced, it is passed into a kind of trough, fitted with cellular metallic vessels containing the water to be frozen, and arranged so that the cold solution flowing round the outside of these cells abstracts heat from the water and reduces its temperature.

The lower the temperature to which the salt solution can be cooled in its passage through the refrigerator, the more effective it will be in producing ice, for the rapidity with which heat is abstracted from the water will be greater in proportion to the difference between the temperature of the water and that of the saline solution, which for ice-making must of course always be lower than the freezing point of water.

At the same time there will always be some waste

arising from the absorption of heat from the surrounding atmosphere by the cold saline solution, and this waste will also be greater in proportion to the difference between the temperature of that solution and the temperature of the atmosphere, so that there will probably be, in this respect, a practical limit to the reduction of temperature beyond which the advantage gained in one way would be counterbalanced by the increased amount of waste.

The actual amount of waste due to this cause is altogether but small, and it has been very much overestimated. By carefully padding the pipes and vessels through which the cold saline solution passes, it may also be very materially reduced.

There is, however, another far more important circumstance which affects the ratio of work done to useful effect realised, and this relates to the range of temperature within which refrigeration is effected. Thus, for instance, in an ether machine, making ice at the rate of five cwt. an hour, the temperature of the refrigerating medium must be reduced below the freezing point of water, say to 14° F., and, though the vaporisation of the ether would, on the average, take place at a temperature somewhat above that point, the tension of the vapour produced would correspond to 14° F., or be equal to a column of 4·46 inches of mercury.

We have seen that to do this amount of work the effective refrigeration must amount to 95,564 heat units per hour, and that the corresponding vaporisation must be at least 587 lbs. of ether per hour. Now, contrast this case with one in which the temperature is not reduced below, say 41° F. At this temperature the ether vapour will have a tension equal to 9·25 inches of mercury, or twice as great as the tension at 14° F., and as the density of the vapour is proportional to the tension, the air pump will exhaust at each stroke twice as much ether at 41° as it would at 14° F. Consequently, at the higher temperature, the rate of vaporisation will be double what it is at the lower temperature, and the refrigeration produced in a given time will be twice as great as that produced in making ice. At the same time, the expenditure of power will be relatively greater at the lower temperature, since there will be a greater resistance to overcome in forcing the ether vapour into the condenser, owing to the greater difference between the tension of the vapour on the exhaust side of the air-pump piston and that on the delivery side, these being as 9·25 inches to 18 in the one case, and 4·46 to 18 in the other; the differences being in the one case 13·54 inches, and the other 8·75 inches.

In the case of a machine worked with ammonia, there is not this disadvantage in working at a low temperature, for although the tension of the vapour produced in the refrigerator at 14° Fahr. is only equal to 55·03 inches, or $\frac{1}{3}$ as great as the tension at 41° Fahr., viz., 153·05 inches, the absorption of gaseous ammonia by water takes place readily even at the lower temperature; and as this is the means by which the ammonia vaporised in the refrigerator is removed, it is only necessary to control the copious supply of water for cooling the liquor by which the ammonia is absorbed, and to regulate its temperature during the absorption, in order to maintain a given rate of vaporisation, and to work with as much advantage at a low temperature as at a high one.

But in many cases where refrigeration is required, it is by no means necessary to produce ice, and, in fact, there may be a very great advantage gained by not doing so, especially when an ether machine is used, as has already been pointed out, for it must be remembered that the work to be done in cooling water to the freezing point is only one-sixth of that requisite for converting it into ice, and that in making ice five-sixths of the work required, has to be done under the greatest disadvantage, within a range of temperature below the freezing point. Thus, for instance, in curing-houses or breweries, where the object is to keep down the temperature of large enclosed spaces, or to cool down large masses of liquid to the extent of 10° or 25°, it would be possible, with a machine of given capability, to obtain a far greater amount of actual duty by direct refrigeration to the extent required, than by making ice and then using that for the purpose of cooling.

The practical recognition of this fact is a circumstance of very great importance in regard to the application of ice-making machines, so much so, indeed, that it may be said to have given an entirely different aspect to the question which would naturally suggest itself to every practical mind, whether the advantage to be gained by using such a machine compared with the original outlay, current expenses, &c., would be greater than in using natural ice.

The merit of having put to the test of practical trial the idea of applying ice-making machinery to direct refrigeration is due to Mr. King, the engineer of Messrs. Truman and Hanbury's brewery, and it is to his enterprise that those interested in the subject of artificial refrigeration are indebted for the working out of this problem. An ice-making machine of Messrs. Siebe's construction, and capable of making five tons of ice in twenty-four hours, has been for some months in operation, on this plan, under Mr. King's direction, and a most remarkably successful result has been obtained.

I am indebted to the kindness of Mr. King for an opportunity of observing the work of this machine, and for several details of the results obtained with it. Thus, for instance, when used for refrigerating "liquor," he has found that, with an atmospheric temperature of 62°, 1,000 barrels of water was cooled to the extent of fifteen degrees, or from 57° to 42° Fahr. within twenty-four hours. This result expressed in heat units amounts to

$$5{,}400{,}000 = 1000 \times 360 \text{ lbs.} \times 15 \text{ degrees.}$$

And it serves well to illustrate the advantage to be gained in certain cases by direct refrigeration, for while the machine with which this result was obtained is capable of producing only about 5 tons of ice in 24 hours, the refrigeration above referred to, is, in fact, equivalent to the production of no less than 14 tons of ice from water at 60° Fahr.

	Heat units.	Tons.
Refrigeration obtained	5,400,000	
Quantity of heat to be abstracted from water at 60° Fahr. in producing 1 ton of ice.....	382,256	= 14·126

I have thus far endeavoured to show how artificial refrigeration may be effected, and that by carrying the operation far enough ice may be produced. I have pointed out the means by which this may be done—the requirements of a refrigerating agent, and the chief methods which have been adopted or proposed for this purpose, and I have done so with the object of putting before you the question whether, in a general way, artificial refrigeration, or the making of ice, is or is not practicable and useful—which methods are in that respect the most advantageous, and what are the applications for which it would be useful.

In considering these questions there are many points to be taken into account, such as the consumption of fuel, power required, original cost and durability of the apparatus, which would occupy too much time to discuss this evening, and as there are many gentlemen present who have practical experience of these matters, and can speak with more authority than I can pretend to, I will not trespass longer on your patience.

DISCUSSION.

The Chairman, in inviting discussion on the subject which had been brought so ably before the meeting, requested the speakers to bear in mind the beneficial results which might be obtained by the use of cold in the carriage of provisions to market. It was said that in America, the introduction of ice into railway vans had enabled large quantities of meat to be brought from long

distances and delivered in excellent condition, and it certainly appeared to him that it might be possible to maintain, by some of the means to which Dr. Paul had alluded, such a temperature in the hold of a vessel as would allow of meat being brought in good condition even from Australia. It was quite plain that if an ice-making machine would so reduce the temperature of a fluid flowing through pipes as to be useful for a brewer, the same machine worked in a steam vessel would keep down the temperature in the hold; at any rate this was a matter well worthy of attention. For a considerable time there had been a Food Committee of this Society sitting, and receiving evidence on the subject of obtaining a better and cheaper supply of food, and it seemed possible that by some such means as had been alluded to in the paper, the surplus food, as it might be called, of Australia, might be imported in good condition for the benefit of this country.

Mr. Boyle had been rather disappointed at not hearing a reference made in the paper to the obtaining of ice by the well-known experiment of Leslie with the air-pump, which he had himself repeated some years ago, which led him to believe that further results might be looked for. He believed that in the last century a patent had been taken out by a member of the family of the Duke of Norfolk for boiling sugar in vacuo, under which condition the operation could be conducted at a temperature of 100° instead of 212°. With regard to bringing meat from Australia, it was well known that thousands of tons of good meat were annually boiled down for tallow, which, if it could be brought to England, would be of immense value. He hoped yet to see the day when ice would be much more largely used, and be rather an article of necessity than of luxury in every household, even if they were not able, as many would desire, to have skating all the year round.

Mr. Carnegie said that when they considered that the weight of fish consumed annually in London was equal to the weight of butcher's meat, and how often large supplies of fish were held back in summer time, simply from the knowledge that if it were sent, large quantities of it would have to be destroyed for the want of ice in which to preserve it during the journey and on arrival, and also how often meat had to be sold in considerable quantities at unremunerative prices, to avoid total loss, it was very evident that if any means could be perfected for producing a practically unlimited supply of ice at a moderate cost, the benefit must be immense to the community at large. It would not only tend to reduce the price of food, but also to prevent those fluctuations which did more than anything else to prevent a constant and large supply to the London markets. He should therefore like to know at what price machines could be supplied which would manufacture four or five tons of ice per day. If they could be procured at a moderate cost he had no doubt that at many places round the coast they would soon be introduced, and prevent the waste of large quantities of fish, which were now often used simply as manure.

Mr. Shand believed the means existed not only for preserving fish in any quantity for a considerable time, but also, if desired, of providing sheets of ice for skating all the summer. With regard to the prices of the apparatus by which this could be accomplished, he could supply any one who wished to know with the requisite information respecting a refrigerating machine which had lately been made in Paris, and which was actually now being applied for the purpose of refrigerating the holds of vessels, for transporting meat from Monte Video, and also for the purpose of conveying fish a considerable distance by sea. He referred to an apparatus invented by M. Tellier, which, he believed, was very similar to, but was, probably, an improvement on, that made by Harrison, to which allusion had been made. M. Tellier had a chamber of considerable size on his premises, near the Champ de Mars, which was cooled down to about freezing-point, and it could easily be reduced considerably lower, so that if any one wanted to enjoy skating all the year round, he had only to apply one of these machines to a room of sufficient size, and he could then have the floor covered with a sheet of ice. A short time ago there was a proposition in *Punch*, founded on a speech of Mr. Disraeli's, with respect to the Irish climate, suggesting that some such apparatus should be set up in Ireland sufficiently powerful to bring the climate of the country into a condition which it was supposed would be more suitable to the moral improvement of the people. He (Mr. Shand) had suggested to M. Tellier the idea of applying a refrigerating machine to cool the atmosphere of a chamber, it having occurred to him, when engaged in the construction of large ocean steamers, that any plan by which a cool atmosphere could be secured when in the tropics would be an immense advantage, not only in the way of comfort to the passengers and crew, but also in saving the waste which was continually occurring in regard to preserved provisions from the excessive heat. A machine had been placed on board a vessel at Havre, which was going to South America for the purpose of plying up and down the Amazon, and supplying fresh fish to the large towns in Brazil. Arrangements were also being made for applying the same invention to a vessel for the purpose of importing fresh meat from Monte Video, and he saw no reason why the same apparatus, or one more convenient, if it could be found, should not be applied to the importing of fresh meat from Australia. He had seen in M. Tellier's cool chamber joints of meat, both beef and mutton, and also game which had been hanging there for at least seven weeks, and after it had been removed thirty-six hours it showed not the slightest sign of decomposition. A fish after being hung for a fortnight in the cool chamber was cooked at a celebrated restaurant in the Palais Royal, together with one of the same kind purchased fresh in the market, and the company present were unable to distinguish between the two. He had himself been a witness of these facts, which he considered of great importance, especially with regard to the supply of fish to the European markets. It had been pretty well decided in France, that the fisheries on the European coast were fast being exhausted, and although the English parliamentary commission in 1864 did not quite arrive at the same conclusion, yet it was disclosed in the evidence laid before them, that on many occasions ten tons of haddock a-day had been thrown into the sea by one fishing company, for want of sufficient means of preserving it. Had one of Tellier's machines been available, such a thing need not have happened. It was true that it had not been practically tried for this purpose, but it would soon be, and he was satisfied the result would be successful, and that fish could be safely brought from Norway or from any other place within fourteen or fifteen days' sail, and probably a much longer distance. It was pointed out in the year 1840, by M. Berthelot, French Consul at Teneriffe, who quoted from a work published by a Mr. George Glass (who had navigated those seas some 150 years previously) that there was an exceedingly rich and productive fishery along the coast of Africa, from opposite Gibraltar to Senegambia, though it had never been worked except by the natives of the Canary Islands. At this spot, not only was the fish caught in greater quantity and with greater facility than off the coast of Newfoundland, but there were at least a hundred varieties, all edible, which were caught in great abundance on these banks. He believed that a boat's cargo could there be made up in two or three days, and there was also a great advantage in regard to the weather, when compared with the Newfoundland fisheries. He was anxious to draw attention to these fisheries, not only in England but in France, and he was satisfied that by the use of the refrigerating apparatus he had referred to, there would be the means of bringing an immense supply of wholesome food to London and Paris from regions yet unworked; and also of distributing the same

to the large populations in the interior of Europe, He hoped himself to be the agent, before long, of bringing something like a thousand tons a day up the Seine to Paris, and of keeping in a cool chamber a constant supply always on hand, so as to avoid the great fluctuations which were at present the rule in the fish trade. Besides the more powerful apparatus to which he had alluded, M. Tellier had also a modified form, by which he produced a cold atmosphere for a short period of time by the simple evaporation of ammonia.

Mr. Fordred, remarking that the paper had not only referred to the production of extreme degrees of cold, but also to its applicability to various manufactures, said he thought that sugar refining was one which might have been mentioned. A great deal of water was used by the refiners in connection with the vacuum pans for condensing the steam, and the water being furnished by meter, it became a great object to prevent any waste or an unnecessary quantity being used. To this end an apparatus had been invented by a Mr. Schwartz, a sugar refiner, which could be seen in operation in Whitechapel; it consisted of a light frame-work, erected upon the roof of the refinery, formed of galvanized iron, with layers of brush-wood; the hot water was pumped up to the top and distributed in the form of spray over the brush-wood, through which it gradually percolated to a reservoir at the bottom, for use again, becoming cool in the process by the action of the air. This had been found of great use, especially during the dry weather, when the sugar refiners had been put on half-supply by the water companies, and even threatened with a total stoppage for a time, though fortunately the weather changed before this extreme measure was carried out. It was possible that a cheap and simple refrigerating machine, therefore, might be of great service to sugar refiners. With regard to the freezing mixtures which had been alluded to in the paper, he had, some years ago, when in want of such a compound, consulted several works on chemistry in the hope of finding one tolerably cheap and easy of application, but most of them appeared either expensive or complicated, and some both. After some experiments of his own, he had hit upon a very cheap and simple compound consisting of muriate of ammonia and crystallised carbonate of soda (the ordinary washing soda) in the proportion of two ounces of the former and five ounces of the latter, finely powdered, to four ounces of water, which produced ice very rapidly.

In answer to a question as to what would be the cost per pound of bringing meat from Australia or Monte Video by M. Tellier's process,

Mr. Shand said that if M. Tellier's machine were efficacious—of which he entertained no doubt whatever—the cost of working it was so trifling as to add but very little to the expense of freight. Speaking entirely without book, he should think that in a very large vessel the extra cost of the necessary apparatus and appliances for preventing the access of hot air to the cool chamber would be about a thousand pounds; at any rate, the cost would not at all stand in the way. Then they must add the wages of a man to look after the machine, and a few horse-power taken from the engines, which, in steamers of a large class, would not be very material.

Mr. Fordred observed that Mr. Shand had not informed them of the principle on which M. Tellier's machine was constructed, or the materials used, which, he thought, would be interesting.

Mr. Shand said he believed the principle was much the same as that of Harrison's machine. It consisted of a cylinder, very much resembling a locomotive steam boiler, but formed of cast-iron, having tubes running through it, and the air to be cooled was passed through the tubes from end to end, being forced through them by a fan. The evaporating agent by which the cooling was effected was ammonia. If such an apparatus were at hand, it would prevent any difficulty in disposing of large quantities of meat on Saturday evenings at wholesale markets. A drawing which he had seen of Siebe's improved machine, appeared very similar to Tellier's. He would repeat, in conclusion, that when once erected, the cost of keeping it in operation was scarcely worth considering in a question embracing the transport of large quantities of meat or fish in a fresh and wholesome condition.

Mr. Charles Flower being greatly interested in this matter, had come to learn what improvements had been lately made in ice machines. For the last three years he had been using a machine of Kirk's, described by Dr. Paul as a compressed air machine. Mr. Shand had laid claim to the idea of using a cold air chamber, but three years ago he had worked throughout the summer with a cool chamber by the aid of Kirk's machine. He had it erected because a cool atmosphere was of great importance to him in his business of brewing, and it had been considered a great success. When the ordinary temperature was 75°, the cool chamber could be kept at 60° or even perhaps 55°, but the difficulty he found was when the air outside was 60° to get a corresponding decrease of temperature inside. He had no doubt, however, that this would be done before long quite satisfactorily. With him it was a mere question of expense, and as soon as he found a machine which would meet his requirements at a sufficiently moderate cost, he should immediately introduce it, and he believed before long that not only in his own business, but in many others, the use of artificial cold would become quite general. He was glad to see so good a drawing of Mr. Reece's machine, which he had examined, and which seemed to him perfect in theory, but, unfortunately, there had always been some hitch in it when he had been invited to see it at work. He should, undoubtedly, introduce another machine as soon as he found out which was the best, because Kirk's, although simple and excellent so far as it went, was not sufficiently powerful.

Mr. Shand said he believed M. Tellier guaranteed that his machines would produce ice at a cost of 8s. per ton.

The Chairman said he had been much interested both in the discussion and also in the paper itself. Dr. Paul had not proposed to give a history of ice-making machines, but probably the earliest apparatus for this purpose was that described in the second supplement to the "Encyclopædia Britannica," published in 1818, which machine was the invention of Professor Leslie. One gentleman had alluded to the use of the air-pump, and he might add that by its aid any one could readily make ice, the operation being very simple. Under the receiver of the air-pump was placed a cup containing the water to be frozen, and around it either some well-dried oatmeal, or, what was preferable, highly-concentrated sulphuric acid. There might be any number of these receivers, from which the air might be exhausted in succession by the same air-pump. Immediately the action of the pump began to withdraw the air, vapour passed rapidly from the water, and being absorbed by the sulphuric acid or oatmeal, a dry cold air was the result. The more rapidly the vapour was taken off the more rapidly would congelation be effected. Dr. Paul had alluded to the principle, but that he believed was the sole application which had been made of it; it was stated by Professor Leslie to have been discovered by him in 1810. With regard to the application of ice or cold air to the preservation of provisions, he thought it would be very useful in cases of much shorter distances than from Australia or South America. Large quantities of cattle were supplied to England from the Continent, coming principally by way of Harwich, and it was well known that in bad weather any danger that existed was materially increased by the presence of a cargo of live stock, as they sometimes got loose, and produced serious inconvenience. If, instead of importing live cattle, the carcases could be properly prepared for the market, and imported in a cool temperature, there would be an advantage every way, for the meat would be in a much

better condition by the time it reached the consumer. Ice, or the refrigerating effects of the evaporation of ether, had been found of great assistance in dentistry and some surgical operations, in cases where local anæsthesia could be employed. He could not quite concur in the opinion of Mr. Shand, that the use of a ten-horse engine from Australia to England was an unimportant consideration in regard to cost; but from what that gentleman had said, he had no doubt that the desired effect would soon be practically attained. He begged to move a hearty vote of thanks to Dr. Paul, for his valuable paper.

The motion having been carried,

Dr. Paul said he had been in hope that some gentleman who had had practical experience of the working of ice-making machines would have been able to give them more detailed information as to the results obtained, but on that subject little more than suggestions had been made. The remarks had been chiefly confined to the preservation of food by means of ice or a cool atmosphere, and a question had been put in connection with that branch of the subject, as to the cost of the machines, but in his view the prime cost of the machine was a minor consideration, the important point being the cost of working. It was rather difficult to give details on this point, but he would put before the meeting such information as he had been able to gather. An ether machine would require the expenditure of about one ton of coal to produce three tons of ice. With the machine used by Mr. King, to which he had referred in the paper, one-eighth of a ton of coal was sufficient to produce a refrigeration equivalent to a ton of ice. Mr. Kirk's machine, on the other hand, though it possessed a most perfect mechanical arrangement, and was not liable to get out of order, required a large expenditure of power, but he had not been able to learn, either from the makers, or from Messrs. Flower, who had sent him much valuable information, what was the actual quantity of coal consumed. According to the account given by Mr. Kirk himself, he believed that to make a ton and a-half of ice per day, 23 indicated horse-power was requisite, which was a very serious matter in connection with any project for bringing fresh meat any considerable distance by sea. With regard to the ether machine, supposing they were bringing a cargo of ice of a thousand tons in weight from Australia, he thought it would, on a moderate estimate, lose by melting three tons a day, and, therefore, to counteract that and to keep the temperature to a proper degree, a machine capable of producing three tons of ice per day must be employed; and that would require a consumption of something like 100 tons of coal on the voyage, which would probably occupy about 100 days. He did not think, therefore, that the ether machine would be applicable for this purpose. Next came the use of ammonia. He must confess himself guilty of omission in not mentioning the machine of M. Tellier, who he knew used the best material, in his opinion, dry liquid ammonia, but, after hunting all the records of the Patent Office, he had been unable to find any specification, and so could not refer to it. M. Tellier, he believed, used anhydrous liquid ammonia, in the same way as ether was used for the reduction of the temperature by evaporation, and then re-condensed the ammonia by means of mechanical power. It was not necessary to use a pressure of ten atmospheres, provided the temperature of the ammoniacal gas was previously lowered, but in proportion to the lowness of the pressure, must also be the lowness of temperature, so that what was gained in one way was lost in another. There must either be a great previous reduction in temperature, or a great increase in the pressure. With the data he had given as to the tension of ammonia vapour at the freezing point, it was easy for any one to ascertain what would be the amount of power required to condense ammonia over and over again, so as to be constantly used as a cooling agent. With regard to the way in which refrigeration was to be effected, it would vary according to circumstances; air could be cooled as easily as water, and in fact more easily, for 4lbs. of air could be cooled as easily as 1 lb. of water; and while 4lbs. of air occupied 52 cubic feet, 1 lb. of water only occupied 1-62nd of a cubic foot. Therefore, the refrigeration could be applied either directly to the air or to a concentrated solution of brine, as might be most convenient, the latter, of course, being the best form for concentrating the refrigerative power, while the former would be more suitable for distributing the cooling effect over a large area. The plan Mr. Shand had referred to for applying ammonia was of this nature—a current of air being passed through the refrigerator into the chamber to be cooled, instead of a current of brine as in the process for making ice. He believed a cooling effect equivalent to the manufacture of a ton of ice per day might be produced at a total cost, including wear and tear and interest on outlay, of about ten shillings a ton. He believed that estimate was within the mark, and had no doubt but that the practical details would soon be worked out satisfactorily.

Proceedings of Institutions.

Farnham and Aldershot Local Board.—This board held a meeting in Farnham, on Monday evening last, to bid farewell to its late hon. secretary, Mr. Barrow Rule, who is leaving the neighbourhood. Great interest was felt in this meeting, because Mr. Rule is highly esteemed by all members of the board for the active part he has taken in all its transactions for many years past, and for the remarkable success with which he has conducted its business. To record his merits, and to express the deep regret of the members at his removal, a resolution had been passed at the previous meeting of the board, and a copy of it, richly illuminated on a parchment scroll, was presented to Mr. Rule on Monday. A valedictory address, full of hearty feeling, was also given by the chairman, R. O. Clark, Esq., and to this Mr. Rule made a suitable reply. The secretary is now Mr. George Dewdney, B.A.

THE USE OF PRIZES AT INTERNATIONAL EXHIBITIONS.

Mr. E. L. Beckwith, in his Paris Exhibition report on Fermented Drinks, expresses his opinion on the above subject as follows:—

With regard to prizes, I hold medals, certificates, mentions, &c., to be legitimate instruments for good. That they may occasionally subserve the purposes of trade advertisement is a matter unworthy of notice, and one with which the donor at least has nothing to do; but they are of great value as an encouragement to industry and a recognition of merit. I may observe that many judicious friends of education have deprecated the prize system in schools, on the ground that undue emulation is thereby encouraged. Such objections do not hold with regard to trade and manufacture. There emulation cannot be too constant or too vigorous. The community is benefited in the end by increased cheapness and increased excellence.

I would suggest, however, that the better plan in granting would be to award them for special rather than for general merits. Rules much more defined as they affect the conditions of reward should be laid down beforehand, and these rules should be compiled, or at least approved, by a committee of the trade whose performances are under judgment; for such a committee would know better than any stranger could do what was most sought after, what was most difficult of attainment in manufacture, and consequently most meritorious in accomplishment. For instance, adducing my own class as an example, there might be, I think, a gold medal for the cheapest

wine; another for that which showed the greatest properties—stability or "keeping;" a third for that possessing the finest flavour; a fourth for fulness of body; and an extraordinary medal—a jewelled or enamelled one, if that were thought expedient, for the wine combining in itself the greater number of the qualities mentioned above. These prizes might be limited to certain countries or districts, or, on the other hand, they might be thrown open to all the world. As the distribution of rewards is at present conducted, one exhibitor, we will say, obtains a gold medal for the perfection of his product, thus receiving the distinction which he deserved; but if to another exhibitor in the same class is awarded a precisely similar recognition, an appreciable injury must be done to the first-selected party. The distinctive value of the prizes given diminishes in a corresponding ratio to their augmentation in number, until, in the end, the first recipient becomes unpleasantly alive to the conviction that he would have been in a position as good, if not better, had no medals at all been awarded.

Fine Arts.

The Bust of Beethoven.—There is no authentic bust or other portrait of Beethoven in existence, and a sculptor, M. Dantan, jun., set himself the difficult task of producing one. He collected all the existing pseudo-likenesses, consulted several persons who had known or seen the famous author of the "Pastoral Symphony," studied the man in his works and his biographies, and is said to have produced a most remarkable work, full of fire, genius, and character.

Competition for the Building of a Hôtel de Ville at Vienna.—The construction of a new Hotel de Ville in the capital of Austria has been decided on, and the municipal council has thrown the competition open to architects of all countries. The council, in order to reward as far as possible the labours of the competitors, has established twelve prizes, in three series of 2,500, 5,000, and 10,000 francs, which will be awarded for the most meritorious designs, by a jury nominated by the council, and consisting of five members of the council and five architects, Austrian or foreign, with the Burgomaster as president. The plans and specifications are to be seen at the Austrian consulate in Paris, and probably in London also.

Paris Academy of Beaux Arts.—M. Charles Blanc, author of very remarkable works on the fine arts, and formerly keeper of the Louvre, has been elected an honorary member of the academy, in the place of the late Count Walewski; Mr. Perkins, of Boston, has also been elected honorary corresponding member of the academy, in the place of the late Dr. Waagen, of Berlin.

Manufactures.

Enamelling of Iron Vessels.—The enamelling of saucepans and other articles in wrought or cast iron has long been practised, a very fusible enamel reduced to powder being sprinkled over the surface of the iron when heated to redness, but as the mixtures employed consist of highly alkaline silicates the enamel is not very durable, and will not withstand acids or even salt liquids. An improved process has been introduced in France. The metallic surface is brought into contact with the ingredients of ordinary white glass, and heated to vitrification; the iron is said to oxidize by combination with silicic acid, and the glass thus forms one compact body with the metal. The coating of enamel may be laid on as thinly or thickly as desired, but a thin coating is better as regards the effect of expansion and dilatation. Experiments are being made in coating armour plates for ships in the manner above indicated.

Commerce.

Trade of Buenos Ayres.—The government of Buenos Ayres has published a return of the trade and navigation of that country during the year ending the 12th September last. The entries amounted to 355,800 tons, of which 81,987 tons were under the English flag. The states which come next in order of importance are:—France, 62,073 tons; Italy, 49,900 tons; United States, 43,300 tons; and Spain, 39,800 tons. Of the French ports, Bordeaux and Bayonne figure for 25,727, Havre for 17,964, and Marseilles for 5,627. The clearings formed a total of 340,194 tons, of which, from want of return freights, 199,576 were in ballast. The proportion of English shipping was 86,000 tons, of which 38,000 were with cargoes; and of French vessels 60,800, or 49,000 with cargoes. In that respect the French shipowners were more highly favoured than the English. The chief imports into France from Buenos Ayres are to Havre; the principal markets for leather are in the United States and at Antwerp. That Belgian port received also the largest quantity of wool, the imports under that head amounting to 103,000 bales, or double the quantity sent to all France. The exports from Buenos Ayres, compared with the preceding year, show a considerable falling off. There is a decrease of 201,000 hides, 26,800 pipes and 22,500 casks of tallow, and 23,800 bales of wool. The Paraguayan war is the chief cause of this unfavourable position. The restoration of peace would, no doubt, produce a revival of affairs very necessary to the country, which requires a considerable export trade to balance the purchases she is making abroad.

The Adulteration of Wines.—Messrs. R. Symonds and Son, in their *Circular*, say:—"Practices of this description give rise to regrets that such punishment as was inflicted in the reign of Edward III. cannot now be enforced. In "Riley's Memorials of London and London Life in the 13th, 14th, and 15th Centuries" (recently published by order of the Corporation of London), it is stated that John Penrose, having sold red wine 'unsound and unwholesome for man, in deceit of the common people, and in contempt of our lord the King, and to the shameful disgrace of the officers of the City, to the grievous damage of the commonalty, &c,' was condemned to 'drink a draught of the same wine which he sold to the common people; the remainder of such wine shall then be poured on the head of the same John; and he shall forswear the calling of a vintner in the City of London for ever, unless he can obtain the favour of our lord the King as to the same.'"

Steam Ferry on the Lake Constance.—A steam ferry for carrying the railway across the Lake Constance between Freidrichshafen and Romanshorn is now about to be established; a gigantic pontoon has just been launched at Romanshorn for this purpose. It will be driven by steam, and carry sixteen railway carriages, and has been constructed by the well-known engineers of Zurich, Messrs. Escher, Wyn, and Company.

Lignite in Southern Italy.—Numerous traces of lignite are found in Southern Italy, but at present are but little worked, with the exception of some mines at Agnana, near Gerace, in Sicily, and at Gonidoni and Briatico, in Calabria. An important deposit has lately been discovered in the province of Benevento. This lignite is compact, of a brownish colour, and with a slight lustre. The bed, which varies from 20 to 30 centimetres (8 to 12 inches) in thickness, is upwards of 15 kilometres in length, and extends over an area of 150 square kilometres. A company is being formed for the purpose of working this bed. As compared with English coal, the price is in favour of the Benevento lignite, which can be obtained at 17 frs. per ton, whilst the former sells at Naples at from 40 to 45 frs. per ton. Other deposits of lignite are found in the province of Salerno, the most important being at Acerno, extending over 16 square

kilometres. In this bed there are five seams, one of which is 75 centimetres in thickness (2 feet 6 inches), and it is anticipated that under them seams of a greater thickness exist. In the Val d'Ofante also numerous traces of good lignite have been observed, but have not yet been explored.

Agricultural Exhibition at Savigliano.—The agricultural exhibition held from the 1st to 8th November, at Savigliano, in the province of Cuneo, has proved a complete success, and exceeded the expectations of the Comizio Agrario of that town by whom the arrangements were carried out. The total number of visitors during the eight days exceeded 1,500 persons. In the first division, which consisted of cereals, textiles, and plants for dyeing, woods, agricultural machines and implements, there were 103 exhibitors and 218 articles exhibited. The second division, comprising bullocks, heifers, and calves, numbered 34 exhibitors, and the number of head amounted to 84. The third division, consisting of flowers, shrubs, oils, wines, vinegar, spirits, &c., was most extensive, numbering 2,212 articles, and 475 exhibitors.

Russian Animal and Vegetable Productions.—A very curious notice of animal and vegetable productions in Russia, is given in a recent transaction of the Acclimatisation Society. It is remarked there, that in the North and Baltic provinces the bovine race have had for type the animals which Peter the Great had from Holland in the Government of Archangel, and that the race of horses is represented in three varieties. At the beginning of this century herds of wild horses were met with in the great prairies, which are overflowed in the spring by the Dnieper and its tributary, the Kouka. Fur animals constitute one of the riches of the country. In Siberia, certain tribes pay their taxes in skins of sable, ermine, blue fox, minever, &c. This tax in kind is the Emperor's private revenue, so that the most beautiful do not appear in the market. Russia furnishes annually in skins the amount of 80,000,000 francs.

Colonies.

Statistics of Victoria.—According to the official returns the value of the imports and exports, at the port of Melbourne, up to the 3rd October of this year, is as follows:—Imports, £9,401,235; exports, £10,058,984. There is an increase in the value of imports of £1,909,888, and in the exports, of £1,660,876 over the returns of the year 1867. The amount of revenue received during the quarter ended 30th September was £830,846, against £895,901 during the corresponding period of last year; and for the nine months ended 30th September the revenue was £2,906,760, against £3,150,106 in 1867. The total receipts on the Victorian railways, during the year, up to 3rd October, have been £412,277, against £390,147 during corresponding period of 1867. The statement of the Melbourne and Hobson's Bay Company has been published, and the receipts, from July 1st to October 1st, amounted to £30,811 11s. 4d., against £30, 445 15s. 4d in 1867.

Railway Rolling Stock in New South Wales.—Since the first introduction of railways into the colony a large amount of rolling stock has been imported at a great expense, that might have been manufactured of as good quality, and as cheaply, or cheaper, in the colony. But now the Government invite tenders for the supply of the rolling stock of the railways for the next five years, either including the engines or not. This arrangement will enable colonial manufacturers to show what they can do, and it is expected that they will be found capable of competing favourably with the English manufacturers. The carriage-builders of the colony have already shown their ability to serve the public well.

Notes.

Italian Mushrooms.—Mr. Story, in his account of the Piazza Navona, the principal market of Rome, makes the following mention of some of the fungi used in Italy for food:—"In the summer, as we pick our way along, we run constantly against great baskets of mushrooms. There are the grey *porcini*, the foliated *alberetti*, and the orange-hued *ovole;* some of the latter of enormous size, big enough to shelter a thousand fairies under their smooth and painted domes. In each of them is a cleft stick, bearing a card from the inspector of the market, granting permission to sell them; for mushrooms have proved fatal to so many Cardinals, to say nothing of Popes and other people, that they are naturally looked on with suspicion, and must all be officially examined to prevent accidents. The Italians are braver than we are in the matter of eating; and many a fungus which we christen with the foul name of toadstool, and ignominiously exile from our tables, is here baptised with the Christian appellation of mushroom, and is eagerly sought after as one of the cheapest and most delicious of vegetables."—*Story's "Roba di Roma."*

Agricultural Education in France.—The organization of theoretical education in agriculture and horticulture in all the primary normal schools of France is now under the consideration of the Minister of Public Instruction. It is proposed that a piece of ground be purchased or rented in the outskirts of each chief town of a department, to serve at once as a model farm for the farmers, and for the experiments and education of future agricultural and horticultural teachers. The expense will be met in the first instance by a grant from the State, to be eventually reimbursed by the departments.

Hop Leaves used as Fodder.—A farmer in the north of France writes to the *Gazette des Campagnes* that the scarcity of fodder having driven him to try to make use of whatever fell in his way in feeding his cattle, he found hop-leaves a valuable element of food for cows, when mixed with other things. He says that whenever he used the hop-leaves he always obtained more milk, and found his cows thrive better than usual. The leaves must be used soon after they are plucked, as the cows object to them when dried by the sun.

Correspondence.

Industries and Prospects of Natal.—Sir,—On my return to London last night I found a copy of your *Journal*, of the 4th instant, awaiting me. Referring to the report of Dr. Mann's paper on the subject, and the discussion which arose thereon, I find some slight omissions to have been made, in what I am reported to have said, much calculated to mislead those who may read it. Will you kindly allow me space to correct, by supplying the few words left out, as they are very important. Commencing at line 70 is the following:—"The last speaker had stated the amount of capital required at £4,000, but he had planted 100 acres at a cost of £2,000, and fifty acres of it yielded at least forty tons per annum." It should read as follows:—"The last speaker had stated the amount of capital required at £4,000, but he had planted 100 acres at a cost *for planting* of £2,000. Fifty acres would yield this year; the *whole* would yield when in full bearing at least forty tons per annum." With regard to the price of money, I pointed out that twelve to fifteen per cent. per annum were common rates for borrowers to pay (as reported), but I also stated that such rates proved most ruinous to the borrower. Again at line 165:—"He never saw a starving man, or was asked for charity during his nineteen years' residence, except by a sailor." The following words were added but not reported:—"Or some person whose loose and bad habits had brought him to desti-

tution." There are one or two other slight errors, but as they are not important to the English public I will not remark on them. I shall feel obliged if you will publish this in your earliest number, as the statement with regard to the yield of coffee might deceive some intending emigrant or investor.—I am, &c., William Hartley.

19, Charterhouse-square, December 11th, 1868.

MEETINGS FOR THE ENSUING WEEK.

Mon .....Society of Arts, 8. Cantor Lecture. Mr. W. H. Perkin' "On the Aniline or Coal Tar Colours."
Actuaries, 7. Mr. J. Coles, "On Railway Debenture Stock, considered as an Investment for the Funds of a Life Assurance Company."
Society of Engineers, 7½. Mr. Baldwin Latham, Continuation of paper on the "Application of Steam to the Cultivation of the Soil."
Medical, 8.
Asiatic, 3.
London Inst., 6.

Tues ...Civil Engineers, 8. Annual General Meeting.

Wed ...Society of Arts, 8. Mr. Henry Bryceson, "Description of the Electric Organ."
Geological, 8. 1. Mr. G. T. Clark, "On the Basalt-dykes of the Mainland of India." 2. Prof. W. King and Dr. T. H. Rowney, "On the so-called 'Eozoonal' Rock." Communicated by Sir R. I. Murchison, Bart. 3. Mr. T. W. Kingsmill, "Notes on the Geology of China." Communicated by the Assistant-Secretary. 4. Dr. Sutherland, "On the Auriferous Rocks of South-western Africa." With a Note by Sir R. I. Murchison, Bart.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb.

Delivered on 1st August, 1868.

440. East India (Army)—Statement.
458. Railway, &c., Bills—Return.
496. South Sea Islanders (Queensland)—Further Correspondence, &c.

Delivered on 3rd August, 1868.

Foreign Office Agencies—Further Papers.

Delivered on 5th August, 1868.

277. (I.) Shannon River—Index to Report.
348. (I.) Ecclesiastical Titles in Great Britain and Ireland—Index to Report.
384. The Finance Accounts (Great Britain and Ireland)—Parts I. to VII.
425. Grand Jury Presentments (Ireland)—Abstract of Accounts.
427. East India (Oriental Steam Company)—Correspondence.
482. Convicts (Fremantle)—Extracts of Letter.
455. Distillers, &c.—Return.
490. Constabulary (Cornwall)—Return.

Delivered on 6th August, 1868.

486. Police Systems (Scotland)—Lords' Report.
Public Petitions—Supplement to the Thirty-second Report.

Delivered on 8th August, 1868.

203. (6.) Railways Abandonment—Warrant.
203. (7.) Railways Abandonment—Warrant.
403. Postal Communication (Australia)—Correspondence.
439. Queen Anne's Bounty Board—Report and Evidence.
456. Labouring Classes' Dwelling Houses Act (1866)—Return.
480. Public Statues—Return.
492. Friendly Societies (Ireland)—Report.
East India Railways—Report.
Convict Establishments (Western Australia and Tasmania)—Annual Reports.
Post Office—Fourteenth Report of the Postmaster General.
Public General Statues—Cap. 64 to 130.

Delivered on 24th August, 1868.

151. (V.) Trade Accounts (Foreign Countries)—Belgium, Holland, France, and United States.
232. Industrial and Provident Societies—Return.
307. (I.) Lee River Conservancy Bill—Index to the Report.
310. (I.) Local Courts of Civil Jurisdiction—Return.
388. Revenue (Ireland)—Return.
421. County Financial Arrangements—Report and Evidence.
437. East India (Electric Telegraphs)—Return.
444. Naval Savings Banks—Account.
445. Poor Law (in-door Poor)—Returns.
447. Weights and Measures—Second Report of the Warden.
460. Income and Property Tax—Return.
467. Army and Navy Estimates—Account.
468. Isle of Man—Account.
488. Fortifications—Account.
491. Thames Conservancy—General Report.
499. Dogs Regulation (Ireland) Act (1865)—Annual Account.
Exchequer Standards—First Report of the Commissioners.
Marriage Laws—Report of the Commissioners.

Session, 1867.

431. (C. I.) Poor Rates and Pauperism—Return (C).

Delivered on 27th August, 1868.

256. Bill—Prisons (Ireland).
Public General Statutes—Table.
North America (No. 2, 1868)—Correspondence.

Delivered on 29th August, 1868.

104. (I.) Weights and Measures (Metropolis)—Return.
232. (I.) Industrial and Provident Societies—Return.
334. Telegraphic Communication (East India)—Correspondence.
435. (I.) Electric Telegraphs Bill—Index.
452. Public Accounts—Report.
462. Inland Revenue (Defalcations)—Return.
475. Greenwich Hospital—Accounts.
498. Standing Orders of the House of Commons (1867-8).

Delivered on 3rd September, 1868.

119. (VI.) Trade and Navigation Accounts (31st July, 1868).
350. Court of Probate—Account.
398. Aliens—Returns.
441. Married Women's Property Bill—Report and Evidence.
487. Houses of Parliament—Report.
502. Mountjoy Convict Prison—Correspondence.

Delivered on 9th September, 1868.

280. (I.) Sale of Liquors on Sunday (Ireland) Bill—Index to the Report.
344. (A. II.) Poor Rates and Pauperism—Return (A).
354. (I.) Bank Holidays Bill—Index to the Report.
372. (I.) Bristol Election Petition—Index.
393. Extradition—Report and Evidence.
401. Special and Common Juries—Report and Evidence.
432. Scientific Instruction—Report and Evidence.
439. (I.) Queen Anne's Bounty Board—Index.
446. County Surveyors, &c. (Ireland)—Return.
470. Navy (Coating of Ships)—Returns.
483. British Columbia—Correspondence.
505. Highways Act—Return.

Delivered on 12th September, 1868.

402. Sale of Liquors on Sunday Bill—Special Report and Evidence.

Delivered on 14th September, 1868.

151. (VI.) Trade Accounts (Foreign Countries)—Belgium, Holland, France, and United States.
Poor Law—Twentieth Annual Report.

Delivered on 18th September, 1868.

393. (I.) Extradition—Index to the Report.
408. "Garonne" Steamer—Evidence
420. Malt Tax—Report and Evidence.
469. Admiralty Monies and Accounts—Report and Evidence.
481. Committees—Return.
503. Shoeing Horses—M. Charlier's System.
504. Army and Navy Chaplains—Return.

Delivered on 23rd September, 1868.

Established Church (Ireland)—Report of the Commissioners.

Delivered on 26th September, 1868.

392. Grand Jury Presentments (Ireland)—Report.
400. Savings Banks—Return.
407. Merchant Ships—Correspondence.
423. Import and Export Duties (Foreign Countries)—Return.
476. Constabulary (Ireland)—Returns.
479. New Forest Deer Removal Act, 1851—Report, Evidence, &c.

Delivered on 2nd October, 1868.

119. (VII.) Trade and Navigation Accounts (31st August, 1868).
342. Poor Rates Assessment, &c.—Report.
397. Friendly Societies—Report of Registrar.

Delivered on 7th October, 1868.

International Coinage—Report and Evidence.

Delivered on 10th October, 1868.

406. Merchant Shipping—Return.
429. Steam Vessels—Return.
450. Joint Stock Companies—Return.
463. Taxes and Imposts—Return.
486. (I.) Police Systems (Scotland)—Index.

Delivered on 21st October, 1868.

151. (VII.) Trade Accounts (Foreign Countries).
Trade Unions and other Associations—Tenth Report.

Delivered on 23rd October, 1868.

170. (I.) Navy (Health)—Statistical Report.
344. (A. III.) Poor Rates and Pauperism—Return (A.).
420. (I.) Malt Tax—Index to the Report.
421. (I.) County Financial Arrangements—Index.
433. Endowed Charities (County of Bedford)—General Digest.

Delivered on 26th October, 1868.

Colonial Possessions—Statistical Tables, Part XII.

Delivered on 30th October, 1868.

119. (VIII.) Trade and Navigation Account (30th September, 1868).
465. Treasure Trove—Returns.
Trade and Navigation—Annual Statement.

Session 1867.

119. (E.) Poor Rates and Pauperism—Return (E.).

Delivered on 6th November, 1868.

Civil Service—Thirteenth Report of the Commissioners.

Delivered on 10th November, 1868.
344. (A. IV.) Poor Rates and Pauperism—Return (A.)
477. Orders of Removal—Return.
493. Civil Contingencies Fund—Accounts.

Delivered on 13th November, 1868.
Public Reports—Index to Reports.

Delivered on 16th November, 1868.
244. Bill—Tenure and Improvement of Land, &c. (Ireland).

Delivered on 23rd November, 1868.
Agriculture—First Report of the Commissioners.

Delivered on 24th November, 1868.
151. (VIII.) Trade Accounts (Foreign Countries).
401. (I.) Special and Common Juries—Index to Report.
457. Foreshores—Treasury Warrant.
469. (I.) Admiralty Monies and Accounts—Index to Report.
495. Foreign Seamen and Apprentices—Return.

Delivered on 28th November, 1868.
359. Newspapers—Return.
433. (I.) Endowed Charities—General Digest.
481. Railways—Returns.
Agriculture—Appendix, Part II. to First Report.

Delivered on 2nd December, 1868.
119. (IX.) Trade and Navigation Accounts (31st December)
416. Electric Telegraphs—Return.
485. Railways—Return.
505. Highways Act—Return.

Delivered on 11th December, 1868.
417. Merchant Shipping—return.
472. Vessels not Armour-plated—Return.
474. Navy (First-class Boys, &c.)—Return.

Delivered on 12th December, 1868.
251. Pilotage—Return.
344. (A. V.) Poor Rates and Pauperism—Return (A).

Patents.

From Commissioners of Patents' Journal, December 11.

Grants of Provisional Protection.

Alkali, recovery of, from solutions used in paper making—3504—F. O. Ward, W. Ibotson, and A. G. Southby.
Arm protectors—3586—D. S. Merry.
Atmospheric hammers for crushing ores, &c.—3573—H. E. Newton.
Bells, suspending—3533—G. Eguillon.
Bird cages, &c.—3588—G. Baker, jun.
Boilers—3592—E. T. V. Hecke.
Boilers, applying heat to—3593—N. D. Spartali.
Bottles, &c., securing the contents of—3655—J. B. Shillcock.
Buckles—3595—H. Milsted.
Buildings, heating—3612—A. Harris.
Carding engines, &c.—3513—S. Crighton and J. Taft.
Carpets—3614—J. S. Templeton.
Carts, &c., for removing snow—3522—E. H. Bayley.
Cast-iron, treating—3634—J. Heaton.
Cigars—3584—W. R. Lake.
Dyeing and printing—3633—J. L. Norton.
Felted fabrics, manufacturing—3560—W. E. Newton.
Fences—3572—W. Dinwoodie.
Fire-arms—3601—P. Panton.
Fire-arms, breech-loading—3608—H. Pollack.
Fire-arms, breech-loading—3637—W. Soper.
Fire-arms, &c., breech-loading—3622—W. Tranter.
Flowers, &c., preserving—3632—J. Saward.
Games, apparatus to be used in playing—3591—H. Smith.
Gas burners, apparatus to be employed for exhibition purposes in connection with—3477—H. Carter.
Gas regulators, &c.—3581—G. Bernhardt.
Gearing for multiplying motion on a single shaft—3574—H. E. Newton.
Harness, &c.—3364—J. Edwards.
Harvesting machines—3610—W. R. Lake.
Hats—3645—J. Myers and L. L. Morrison.
Haymaking machines—3458—W. N. Nicholson.
Horse collars—3302—C. Kelson.
Hydraulic motive-power—3599—L. Roman.
Indigo blue, &c.—3583—P. Spencer.
Kilns for burning bricks, &c.—3426—G. Wilson, sen., and J. Wilson, jun.
Kilns for burning bricks, &c.—3461—W. Harrison.
Lace machinery, manufacture of fabric in—3530—W. Brookes.
Laces and braids, machinery for making—3606—A. Büsche.
Letter or paper clips—3621—A. M. Clark.
Looms—3585—S. Brook and C. Thompson.
Looms—3611—J. H. Moreland and J. Coulong.
Looms—3620—J. H. Dales and J. F. Maygrove.
Lubricators—3619—W. E. Newton.
Meteorological indicators—3576—B. Solomons.
Motive-power—3555—W. H. Ibbett.
Motive-power—3594—J. Bourne.
Motive-power engines—3580—W. Wild.
Needles, threading—3598—E. Ellenband.
Needles, &c., winder for packing up—3384—M. B. Westhead and C. B. James.
Packing-cases—3587—W. F. Chapman.
Paddle wheels—3609—W. R. Lake.
Palm nuts, &c., machine for cracking—3625—A. Wyllie & J. Latham.
Paper tubes, manufacturing—3553—C. Crabtree and J. Stell.
Pencils for marking linen, &c.—3415—J. Hickisson.
Plate-warming apparatus—3630—W. E. Gedge.
Plough heads, &c., casting—3643—D. Greig and J. Fernie.
Pottery, &c., preparing materials used in manufacturing—3639—J. S. Forbes.
Pressure gauges—3626—H. J. H. King.
Printing machines—3430—A. M. Clark.
Railway trains, communication in—3570—W. Carter.
Railway trains, signalling on—3575—E. R. Wethered.
Railways—3605—C. E. Spooner and G. A. Huddart.
Railways, receiving and delivering mail bags and packages on—3649—A. V. Newton.
Ratchet braces, &c.—3603—J. Sincock.
Reaping and mowing machinery—3615—A. C. Bamlett.
Reaping and mowing machines—3627—J. Cornes.
Sad-irons, &c.—3596—W. R. Lake.
Scarfs, &c., fastening—3597—D. Vogl.
Sea walls and breakwaters—3571—T. Prideaux.
Sewage, utilising—3562—T. Smith and J. V. N. Bazalgette.
Sewing machines—3564—J. E. Phillips.
Sewing machines—3659—H. W. Fuller and I. W. Barnum.
Ships—2864—A. F. Campbell.
Ships, iron, protecting from corrosion, &c.—3226—C. MacMillan.
Shirt-front and collar combined—3657—E. Price.
Silk, &c., washing and dyeing—3618—T. and A. L. Dickins and H. Heywood.
Slide valves—3568—W. G. Beattie.
Springs used for upholstery purposes—3578—J. Parry.
Steam engines—3600—F. Holt.
Steam engines, condensers for—3550—I. Hudson.
Steel—3631—C. D. Abel.
Stone, &c., dressing, &c.—3607—E. T. Hughes.
Superphosphate of lime—3624—E. S. Samuell.
Tortion springs—3342—B. Johnson.
Tug boats—3589—W. E. Gedge.
Umbrellas, &c.—3434—A. A. Hely.
Vegetable fibre, bleaching—3647—J. W. Reid.
Warp-dressing machinery—3623—J. Ingham and I. Butterfield.
Watches—3577—B. Hunt.
Windows, &c., hanging and supporting—3582—T. Craig.
Wool, &c., washing and dyeing—3617—J. Petrie, jun.

Inventions with Complete Specifications Filed.

Gas, manufacturing, &c.—3715—A. B. Bérard.
Railway carriage wheels—3723—W. R. Lake.

Patents Sealed.

1922. J. Gray and R. Weir.
1933. J. Toft.
1938. J. Howden.
1941. J. T. Parlour.
1942. T. H. P. Dennis.
1949. F. Worcester.
1953. C. Humfrey and W. S. Webster.
1956. W. and O. Brooke.
2051. C. Hastings, J. Briggs, and J. Law.
2004. S. Bowen, C. Glover, R. H. Davis, T. Stanford, T. Scott, A. M. Bell, E. Sheldon, W. Farmer, L. Maskall, E. Colburn, and J. C. Cole.
2057. S. S. Maurice.
2068. C. Mather.
2830. C. D. Abel.
2942. C. E. Brooman.

From Commissioners of Patents' Journal, December 15.

Patents Sealed.

1702. J. S. Richard.
1957. W. Rowan.
1965. G. B. Turrell.
1967. T. Comfield, jun.
1968. J. McLeod.
1971. W. and J. Rhodes.
1974. J. and E. Lumley.
1976. A. Cochran.
1979. T. C. Hide.
1980. C. Hengst and H. Watson.
1982. J. Hemington.
1985. J. Perry.
1986. D. and J. Greig.
1988. M. P. W. Boulton.
1989. F. B. Dœring and R. H. Twigg.
1990. A. J. B. P. Thierry.
1991. T. Heppell.
1998. J. Hadley.
2001. J. Bonnall.
2002. J. Shelmerdine, W. Walker, and E. Holt.
2020. J. and A. Douglas.
2029. B. T. Moore.
2037. M. and J. Mackie.
2049. G. T. Bousfield.
2060. F. H. Holmes.
2067. I. Baggs and F. Braby.
2075. J. Morris.
2122. J. H. Johnson.
2126. J. H. Johnson.
2262. T. Kendrick and S. Davies.
2564. W. E. Newton.
2810. H. B. Woodcock.
3017. W. R. Lake.
3086. J. Dewar.

Patents on which the Stamp Duty of £50 has been paid.

3183. E. Morewood.
3185. R. F. Fairlie.
3208. C. K. Tomlinson and C. J. Hayward.
3239. H. W. Miller.
3357. C. F. Varley.
3281. W. E. Newton.
3297. W. F. Cooke & G. Hunter.
3223. G., E., and A. A. Atkin.
3250. C. Blyth.

Patent on which the Stamp Duty of £100 has been Paid.

3130. T. Walker.

Journal of the Society of Arts.

FRIDAY, DECEMBER 25, 1868.

Announcements by the Council.

FINAL EXAMINATIONS, 1869.

Notice to Institutions and Local Boards.

In order to avoid holding these Examinations on the same evenings as those of the Department of Science and Art, it has been decided to hold them, in 1869, on the evenings of

TUESDAY, the 20th **APRIL,**
WEDNESDAY, the 21st „
THURSDAY, the 22nd „
FRIDAY, the 23rd „

From 7 p.m. to 10 p.m., instead of on the 27th, 28th, 29th, and 30th April, as announced in the Programme of Examinations for 1869.

In consequence of this alteration the Previous Examinations must be held earlier, and the Forms No. 2 and No. 4, referred to in par. 6 of the Programme, must of course be sent in a week earlier than the dates there fixed for receiving them.

It is very important that this alteration should be made as public as possible. For this purpose a number of small slips, to be inserted between pages 8 and 9 of every Programme sent out, will be forwarded to each Institution and Local Board. They should also be specially sent to any person to whom Programmes may have already been forwarded.

Large bills, to be suspended on the walls of the Institution reading-room, or in some other public place, will also be provided.

Subscriptions.

The Michaelmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Cantor Lectures.

The concluding lecture of Mr. W. H. Perkin's course "On the Aniline or Coal Tar Colours," was delivered on Monday evening, the 21st inst. The publication of this course of lectures will commence in next week's *Journal.*

Sixth Ordinary Meeting.

Wednesday, December 23rd, 1868; T. N. R. Morson, Esq., in the chair.

The following candidates were proposed for election as members of the Society :—

Bate, John, 16, Northumberland-street, Strand, W.C.
Falcke, Philip, 23, Bedford-square, W.C.
Learmonth, Dr., Clapham-park, S.W.
Smith, Frederick, 23, York-street, Lambeth, S.E.

The following candidates were balloted for, and duly elected members of the Society :—

Fison, E. Herbert, Stoke-hill, Ipswich.
Marchisio, Dr. J. E., 50, Baker-street, Portman-sq., W.
Stallard, J. H., M.D., 7, King's-rd., Bedford-row, W.C.
Sullivan, Thomas Durell, 56th Regiment.
Taylor, Edward James, Shawfield-street, King's-road, Chelsea, S.W.

The Paper read was—

DESCRIPTION OF THE ELECTRIC ORGAN.

By Henry Bryceson, Esq.

Having introduced the electric organ into England during the present year, I could scarcely decline to read a paper before this Society, although I am fully sensible of the position I must occupy, as an organ builder, even in attempting to interest a scientific audience, few of whom, perhaps, comprehend the internal structure of the organ, much less the difficulties which have beset the construction of large instruments.

Before, therefore, I can proceed to explain the nature and advantage of the application of electricity to organ building, I must first notice the ordinary construction of an organ—at least such parts as you will see are affected by the innovation, viz., the sound-board and the action, or train of mechanism connecting the finger-key with the same. The sound-board is that portion of an organ through which the compressed air from the bellows is distributed to the various pipes placed over and around it. Diagram 1 represents the end section of an ordinary sound-board. The lower division runs the whole length, and contains compressed air. Above this are placed grooves, corresponding in number with the compass of the key-board. A separate pallet, held up by a spring beneath each groove, prevents the compressed air from entering till depressed with the key. On the top of these grooves is a horizontal partition called the table; and between this and the upper boards, on which the pipes stand, are the sliders, which are allowed to move backward and forward lengthways, being under command of the drawstop knobs at the keys. Ranks of pipes, called stops, are arranged in lines immediately over these sliders. The holes beneath the pipes are pierced through the upper board, sliders, and table, into the grooves below, but when the slider is moved a little to one end, this communication is cut off by it. Each slider, therefore, is made to control a stop of pipes by admitting or stopping the supply of wind passing through the pallet. The key action is the train of mechanism which is employed to pull open the pallets in the sound-board, and for this purpose backfalls, or levers, squares, rollers, trackers, and stickers are chiefly used to connect the key-board with the sound-board. The drawstop action, which attaches the slider to the knob, usually comprehends levers, trundles or rollers, squares, and connecting-rods, all of a much stouter and stronger description than those employed for key action.

In large organs where many ranks of pipes are placed on each sound-board, the pallets have to be made of considerable size to supply sufficient wind to the pipes when used collectively; and as the pallet in a state of rest has the force of the compressed air acting against the underside, it offers a resistance to the finger of the performer often equal to several pounds weight; this is again increased by the necessity of coupling two or more manuals with their additional springs, till at last playing becomes a matter of physical impossibility. Leverage cannot be gained in the action, neither would it do to

increase the depth of the touch at the key to effect this. This great difficulty has always engaged the minds of the ingenious, and many have been the trials of pallets so constructed that the pressure of the wind would either be counterbalanced, or reduced considerably, by allowing a small portion to enter the groove first, and thus assist the opening of the pallet. Diagram 2 represents the construction of a few of these pallets. The first, known as Barker's, consists of two parts, the one fixed on the back of the other; the main large pallet has a small opening through it, overlaid by the second valve beneath, the link or connecting wire is attached to this and opens it a little way so as to allow the pressure to get on the other side, and, finally, the main pallet is drawn down with it. The second figure is Mr. Holt's pallet. This acts in a similar way, the short piece in front being opened first. The third figure is a pallet patented by Mr. Willis in 1861. The outside resembles an ordinary pallet, but is hollowed out on the top side, leaving only the portion of its surface that laps its seat; the top is covered all over with the usual soft leathern packing. Holes communicate through the outside into its interior, several bars forming a grating are placed inside the groove between the sound-board bars to prevent the leathern packing being blown in by the pressure of air on the underside; on opening this pallet the edges leave their seat first and offer little resistance, the air having passed in in sufficient quantity relieves the pressure on the underside. The fourth figure is a compensating pallet. The small bellows attached to the tail have a communication from their interior with the atmosphere, the compressed air in the sound-board has therefore an inclination to collapse them, and the force expended in this direction counterbalances the pressure against the pallet. Another description of light pallet, patented by us at the commencement of the present year, will be explained in a later part of the paper. There are many other forms and modifications of light pallets which it is unnecessary for me to mention or describe here.

Light pallets have been and still are extensively employed in organ building, but in very large organs they do not fulfil all, or nearly all that is requisite; indeed, they become treacherous when impeded with action work, and until Mr. Barker invented the "pneumatic lever," it was impossible to give full effect in the shape of combination, or avoid defective execution in rapid passages in an organ of magnitude. This application has elsewhere been aptly described: "The pneumatic machine is an intermediatory apparatus, introduced between the finger-board and the pallets, or valves, of the organ, and is composed of as many little bellows as there are keys on the principal finger-board. Each key, instead of acting on the sound-board pallet, acts only on a small and very light valve, which admits compressed air into the corresponding power-bellows; the latter, supposed to be previously in a collapsed state, yields to the pressure of the wind, and in expanding, opens with great rapidity the sound-board pallets with which it is connected. These remain open as long as the finger of the performer retains the depressed key; but no sooner is this latter released, than the valve which admitted the air into the power-bellows closes, and, another valve opening to allow this air to escape, the bellows falls, and the sound-board pallets close immediately by the action of their springs. Now, as by an appropriate disposition of levers the pallets corresponding with each of the sets of keys in a large organ can be brought under the action of the pneumatic machine, it is evident all the ordinary effects of couplers can be produced without increasing in the slightest degree the weight of the touch, and it then becomes easy to introduce other couplers, which give, in addition to the unisons, the octave above and below the note struck. In this way a single stop produces the effect of three stops respectively of 4, 8, and 16 feet." The pneumatic lever, therefore, occupies a most important position. The top figure of Diagram 3 represents the section of a single application on a greatly enlarged scale, in order to show the action of the throttle valve (patented by Mr. Willis in 1853) and the double exhaust valves, and auxiliary spring which closes them with the first motion of the key, instead of being pressed home only by the last, thus ensuring rapidity of action as well as certainty. Many modifications of the original form have been used, but the following explanation will suffice.

The lowest chamber on the right contains highly-compressed air, derived from a reservoir; the lever, carrying the valve which cuts off the communication between this chamber and the one immediately above it, works through an air-tight leathern purse in the centre, and the left-hand end of the lever moves the double exhaust-valves, and is attached at the extremity by a tracker or connecting rod to the tail of the key. On raising this end of the lever the double exhaust-valves are immediately closed, cutting off or preventing the atmosphere from entering the interior of the power-bellows; at the same time the valve at the other end is opened, so as to allow the compressed air to pass through the chamber above into the power-bellows, and so inflate them. As they rise they draw up the throttle-valve, which is attached to the top board, so that on its reaching the seat provided for it, it cuts off further supply of compressed air, and checks the motion of the power-bellows almost noiselessly. This movement of the top-board is communicated to the sound-board pallets by the usual train of mechanism. Immediately the key is released by the finger it is returned to its former position by the spring underneath, the compressed air escapes by the exhaust-valve, and the power-bellows collapse and allow the sound-board pallet to close. These pneumatic power-bellows are usually arranged in a frame of seven or eight tiers, the width of the manuals, and placed as near to them as possible. I will now read you what I have extracted from letters written to us by Mr. Barker himself, and show you the gradual development of his electro-pneumatic patent. I have dwelt at considerable length on the pneumatic lever, because, without it, electricity would have proved too costly to apply to organ mechanism.

It was in 1832 that Mr. Barker, then established as an organ builder in Bath, his native city, was led to reflect on the serious inconvenience arising from the extreme heaviness of touch in all large organs, and more particularly exemplified in that recently constructed for York Minster.

Mr. Barker's persevering studies having revealed to him an efficacious remedy for this defect, by the invention of what has since been called the "pneumatic lever," he wrote in 1833 to Dr. Camidge, then organist of York cathedral, announcing his discovery, and begging to be allowed to give proof by applying it in a temporary way to one of the heaviest keys in the organ. Dr. Camidge's reply was, "For such an instrument as ours your invention would certainly be very important, especially where four organs have to be played occasionally by one set of keys, and I shall be most happy to recommend its adoption. Mr. Hill, of the late firm of Elliott and Hill, has erected our organ, and I assure you the playing of it is no sinecure; indeed it is most laborious work to go through a chorus or last voluntary with the whole power of the organ. Such a difficult touch as that of York cathedral organ is doubtless sufficient to paralyze the efforts of most men, and with all the energy I can rally about me I am sometimes inclined to make a full stop from actual fatigue, in a very short time after the commencement of a full piece."

Notwithstanding Dr. Camidge's wish and recommendation, financial difficulties stood in the way of Mr. Barker's invention being adopted in York, and he was not more successful in his propositions for applying it to the Birmingham Town-hall organ, opened in 1834 or 1835. About this period the eminent French builder, M. Cavaillé, was occupied in building a colossal organ for the Royal Church of St. Denis, near Paris, and it was already sufficiently advanced to convince Mr. Barker that for heaviness of touch it would rival, if not surpass, the

York Minster or Birmingham organs; indeed, it was doubtful if any organist of acknowledged talent would risk his reputation by attempting to play upon it. Mr. Barker immediately wrote to M. Cavaillé to propose the introduction of his pneumatic lever, accompanying the letter with a certificate from his late lamented friend Mr. Merrick, who had played on a small instrument fitted up for demonstration, each key of which presented a resistance of several pounds—this was in 1837. M. Cavaillé wrote a polite letter in reply, and engaged Mr. Barker to come over to France and examine as to the possibility of applying the invention to his magnificent organ. Mr. Barker acceded to this request, and the pneumatic application was decided on under his immediate superintendence.

However, in order to establish priority as the inventor, and at the same time protect his interests before doing anything more in the matter, Mr. Barker took out a French patent, in 1839, and soon after the pneumatic lever was applied with the greatest success, and, for the first time, to the St. Denis organ. After having entered into an agreement with M. Cavaillé to grant him licences under the patent, the application was introduced at St. Roch, La Madeleine, St. Vincent de Paul, and St. Clotilde. Mr. Barker's connection with M. Cavaillé then ceased, and he was led to undertake the direction of a large organ building establishment, recently formed in Paris by a company under the name of Doublaine and Callinet, where he had frequent opportunities of introducing his invention.

This company having been dissolved in 1845, Mr. Barker undertook to carry on the business for M. Ducroquet, simply a capitalist who had purchased it, and built for him, among other important instruments, that of St. Eustache, and also the small but very complete organ which appeared in the French Deparment at the Great Exhibition, 1851, and for which M. Ducroquet received, in addition to the English prize medal, his nomination as Chevalier of the Legion of Honor from the French Government.

Here Mr. Barker notices two English organs in the Great Exhibition—that built by Mr. Willis, of London, presenting, for the first time, a complete specimen of the application of the pneumatic lever to the key-boards, although not made to act on the manual couplers as in the French organ; this large organ also offered the first example of the same principle applied to the drawstop action and combination movements, not reckoning a partial application of that nature to an organ in Bordeaux by Mr. Barker himself. Mr. Hill's organ had the pneumatic lever applied to the drawstop action too, but acted upon by positive and negative key-boards on either side of the manuals, in place of the usual drawstop knobs. The pneumatic lever was not applied to the key action, as light pallets of peculiar construction were introduced instead.

From the time of the Great Exhibition, 1851, English builders in general began to appreciate the advantage of the pneumatic system, and the more readily because it had appeared at the Exhibition with the required character of a foreign importation; in fact, workmen who had been familiarised with the construction of the lever in the shops of M. Cavaillé lent their aid and assistance, so that when Mr. Barker proposed to take out—alas! too late—a patent in England, he found he would only be bringing coals to Newcastle.

Mr. Barker further observes that the claims of priority which have been put forth by others must not be passed over in silence. In the first place, that of the late Mr. Joseph Booth, organ-builder, of Wakefield, who, it is alleged, introduced a contrivance of this nature at Brunswick Chapel, Leeds, in 1827: there is no reason to doubt the statements made to this effect by both his brother and son, but what remains to be proved is the identity and efficacy of his apparatus. Mr. Barker is not aware that there exists other than very imperfect data; a small bellows called a "puff valve" is said to have been placed in connection with one of the double grooves of the sound-board, and by its inflation by one of the pallets it acted automatically on the second. If this description is correct there would be evidently here the germ of the pneumatic lever, just as in the early trials of Papin was contained implicitly that of the steam-engine, perfected later by Watt, Stephenson, and others. But, in the one as in the other, how great is the distance which separates the elementary fact from its ultimate result; how great the difficulties to be overcome! While I am free to admit that Mr. Booth was in possession of a fruitful idea, he certainly kept his light under a bushel, that, sterile in its consequences, no one heard of it till 24 years after, when it had long ceased to exist. Mr. Barker denies all previous knowledge of this or any other attempt in the direction of his pneumatic lever, which, as constructed and employed by him, is well known to constitute a motive power directed by the finger of the performer to all the mechanical parts of the organ.

The foregoing remarks are in part equally applicable to the pneumatic apparatus of Mr. Hamilton, but with this difference, that he does not substantiate any claim to an application anterior to 1835, two years later than Mr. Barker's correspondence with Dr. Camidge. In the great Paris Exhibition of 1855, Mr. Barker was admitted an exhibitor on his own account, and independently of M. Ducroquet, who was then on the point of retiring from business, but for whom he had built for the last time and for this exhibition, an organ of twenty stops, three manuals, and separate pedal organ. In this instrument the pneumatic lever was turned to good account, and it enabled Mr. Barker to place all the powerful reeds of the great organ in a swell box, and so to obtain an unusually effective crescendo. At the close of the exhibition Mr. Barker was honoured with a first-class prize medal, and, moreover, nominated as Chevalier of the Legion of Honor.

Mr. Barker afterwards remained with M. Merklin, the successor of M. Ducroquet, till 1860, and then commenced business on his own account, in partnership with M. Verschneider, an excellent voicer, who had given proof of his talent in the harmonisation of the grand organ at St. Eustache, then considered one of the best in Paris. It might seem, in presence of the comparatively satisfactory results obtained by the pneumatic lever, that, as a means of facilitating execution on large instruments, nothing better could be wished for. This, however, is not so absolutely the case as might be inferred at first sight, as will fully appear from the following considerations:—The great defect of the organ, and especially large instruments with several key-boards, is the number and excessive complication of its mechanical parts, all of which, however accurately adjusted, are, from their nature, particularly subject to the effects of atmospheric influence; thus, under the effect of damp, the long trackers shorten, the various levers swell, and move with difficulty on their bearings; the solid framing which supports the sound-boards, by its variation adds to the general disorder; and continual "cypherings" are the unfortunate result. Every organist is aware that in summer the touch of his instrument is reduced to zero, and often totally inadequate to open the pallets sufficiently for the necessary supply of wind to the pipes, and by this means the organ is rendered out of tune, and, consequently, painful to the ear. To remedy as far as possible these serious inconveniences, the mechanical parts, or "action," of the instrument, are provided with regulating screws, to adjust such deviation, but how many difficulties have to be encountered in this delicate and tedious operation, rendered still more so by the introduction of the pneumatic lever and its couplers. No one except a skilled workman is capable of restoring perfection, and in many places such attention becomes expensive and troublesome.

It occurred to Mr. Barker, as it had already done to others, that, seeing what had been accomplished in tele-

graphy—by which the most delicate movements are transmitted to indefinite distances with rapidity and precision—it might be possible to apply the same principle to the organ. This he has actually accomplished, in the presence of repeated and uniform failure on the part of his predecessors, who entirely overlooked the most essential condition in the electric transmission—that is, either to diminish the resistance of the sound-board pallets to a minimum by means of an entirely new construction, or to attack them by the intervention of the pneumatic lever, reduced to a simple inflated bellows, commanded by the smallest possible disc-valves, and disembarrassed of all the usual accessories in the shape of couplers, which can all be now effected electrically. This particular form of pneumatic lever, adapted every way to the requirements of the electro-magnet, Mr. Barker has patented both in France and England.

It is now about five years since Mr. Barker made his first experiments for the application of electricity to the organ, and upon the favourable report of the commission charged to examine this new mode of construction, he proposed to apply it to the large organ he had just received orders to construct for St. Augustin's Church, Paris. This electric organ, containing three manuals, forty-two sounding-stops, and eight couplers, although not opened till June in the present year, has been erected in the new edifice more than fifteen months, and, consequently, subjected to great vicissitudes of temperature and damp, nevertheless the key-boards have not presented the slightest derangement or variation of touch. The commission having made another and final report in most favourable terms, Mr. Barker is now charged with the construction of another large organ for the new church, St. François de Xavier, Paris, and which is to be built on the electric principle, making, with those of St. Augustin, Salon. and Montrouge, the fourth application of the new electric system in France made by Mr. Barker.

Dr. Gauntlett, who had done much towards the introduction of the German or CC compass of organs in this country, now universally adopted, I believe may claim to be the first who conceived the idea of applying electricity to organ mechanism. The following notice occurs in the *Orchestra* of March 28th, 1868:—"The using of electricity as a motive power in organ building was first mooted about 20 years ago by Dr. Gauntlett, who at the time of the Great Exhibition of 1851 proposed a scheme for playing all the organs in the place at one and the same time. The plan met with great opposition, and nothing was done; but on the announcement of the Crystal Palace Company, Dr. Gauntlett met the Provisional Committee, and proposed the erection of *facsimiles* of the eight most celebrated organs in Europe, and playing them altogether or separately in the centre of the building. The original prospectus of the company put forth the exhibition as one of still life, and one which might be grasped in one view. All such exhibitions fail unless accompanied with music, and Dr. Gauntlett's proposition was to supply the place with a continual stream of music at an outlay much less than that for the maintenance of an orchestra. Messrs. Anderson and Fuller, two gentlemen of the committee, met the proposition with a decided negative. 'Dr. Gauntlett,' said Mr. Fuller, 'you will never hear a note of music in the Crystal Palace; the exhibition is intended for far higher purposes. We do not want music and we shall never have it!' And thereupon Dr. Gauntlett departed, but not without telling the committee that without music the whole affair would become bankrupt. Dr. Gauntlett patented his speciality in 1852, and in 1863 another plan was patented by Mr. Goundry. It is far from impossible to put a key-action under the dome of St. Paul's Cathedral, by which all the organs in London and its suburbs could be played at once, and if the clergy could be brought to celebrate the service in one time so that all the singing could be made to begin together, and one set of tunes could be found to satisfy all tastes, then the one organist in St. Paul's Cathedral would be fully sufficient for the Sunday psalmodic power of all London."

Dr. Gauntlett's patent of 1852 comprehends playing organs, both finger and barrel, as well as seraphines and pianofortes, through the electrical agency. For organs he proposed placing a powerful electro-magnet immediately beneath each pallet, and fastening the armature on the end of the pallet itself, an arrangement which would require too much space and an expenditure of electric force requiring an enormous battery to supply a sufficient current. He certainly mentions that an apparatus known as the "pneumatic lever" may be worked with the electro-magnets and armatures, but he does not describe any form of arrangement. The drawstop and swell action are also alluded to, but there is no explanation as to how they are to be accomplished. Dr. Gauntlett's contact at the key had the disadvantage of not acting till the key was quite down, and, being simply a touching contact, would become rapidly oxidised.

In 1863, Mr. Goundry, also an amateur, patented a very elaborate electric system, chiefly in connection with the introduction of the enharmonic scale, which requires forty sounds to the octave. He describes several known forms of light pallets, and proposes to open them direct by the electro-magnet in a similar manner to Dr. Gauntlett. The pneumatic lever is also mentioned, and a form given for its application. Mr. Goundry shows a very elaborate arrangement for coupling purposes, and also for throwing up the melody. In his drawstop action he proposes that a spring should pull the slider in, and that it should be drawn by a pneumatic power-bellows, actuated by an electro-magnet, around which the current of electricity would be passing all the time the slider remained drawn, thus involving a great consumption of battery power.

No organ-builder embarked in either of these patents, and no illustrations were attempted, probably because so many difficulties had yet to be overcome to render a success probable, and, moreover, the application required considerable knowledge of a science quite foreign to the trade. It is not surprising, therefore, that these patents, and also a notice which occurs in the preface of "Hamilton's Catechism of the Organ," published in 1865, excited no interest or attention, although, in the later publication, direct mention is made of Mr. Barker's St. Augustin organ as being electric, and that the choir organ was finished, and "played almost daily by different organists, who express themselves in most favourable terms."

During the Paris Exhibition of 1867, Mr. Augustus L. Tamplin called our attention to the St. Augustin organ, then nearly completed, and we at once recognised the impending revolution in large instruments, and finally arranged, on Mr. Barker's completing his patent in England early this spring, for the grant of sole concession in this country. In the meantime we determined to introduce the system successfully in England. Subsequently, at Mr. Barker's urgent request, we gave up the sole concession, as he afterwards thought, by being only in the hands of one firm, it would delay the general adoption for all large work, and, consequently, yield him less profit during his lifetime than if he were to grant concessions to whoever might require them, although we retained the full use of his patent.

Mr. Barker's English patent, taken out in January of the present year, protects his special arrangements of the following applications, which, with the exception of the drawstop action, are based on his actual experience, gained in the construction of three electric organs, which he had already erected in France.

1st. His arrangement of the electro-pneumatic action to the keys and pedals, including a method of making the contacts by means of immersing copper points in mercury cells.

2nd. A contrivance for coupling the various rows of keys as well as the pedals, either in unison or in octaves.

3rd. An arrangement for drawing the stops.

4th. The manner of commanding the large valves in wind trunks, known in England as ventils.

5th. An automatic system for suspending all waste of electrical agents in the battery when not actually in use.

Diagram No. 4 is an enlarged copy of the drawing attached to Mr. Barker's English patent, dated January 28, 1868. It represents the end section of a divided sound-board, such as would be used when two different pressures of wind are required, or where the number of stops is so great as to require two pallets to supply a sufficient quantity of wind. The chamber in the wind-bar is supplied with compressed air, and is continued the whole length of the sound-board. This is to supply the pneumatic power-bellows, which are all fixed externally on the bottom side of the sound-board, one of these power-bellows being provided beneath each pallet. Immediately below the air-chamber and upon the fixed table of the power-bellows is a small double-action disc-valve attached to a vertical rod. In a state of rest, as shown in the drawing, the top disc-valve is closed, cutting off the compressed air, and the lower one is open, so as to establish a communication from the interior of the power-bellows with the atmosphere, and allowing the sound-board spring to hold the power-bellows shut. The disc-valve is actuated by the armature of an electro-magnet placed below, and attached to the vertical rod, so that when the electro-magnet becomes excited by the current of electricity, and, therefore, attracts the armature, the position of the disc-valve is reversed: the lower one being shut and the top one opened, it allows the compressed air from the chamber above to rush in and inflate the power-bellows, which, being attached to the sound-board pallet, immediately pulls open the same. Directly the electric current ceases the armature is of course released, the disc-valve returns to its former position, the compressed air is cut off, the sound-board spring collapses the pneumatic power-bellows, and the air escapes by the bottom disc or exhaust valve, which is now open again.

The drawstop action for each slider in the sound-board consists of two large pneumatic bellows, acting alternately in opposite directions, the inflation of which is governed by two double-action disc-valves, worked again by small accessory power-bellows and two electro-magnets, acting positively and negatively.

A sound-board, therefore, with its electro-pneumatic power-bellows applied to both pallets and sliders, requires no train of moving mechanism to connect it to the key-board and drawstop knobs, however distant, but simply the necessary number of insulated copper wires to conduct the electric currents from the console, or stand, which holds the manuals, pedals, &c. The console, thus detached from the main body of the instrument, contains a vast amount of accurate and beautifully-arranged work. Its dimensions may be compared to those of a large harmonium; and, besides holding the various key-boards, it contains, first, the rocking-lever beneath each key, which, being furnished with copper points, plunges them in mercury cells directly it is depressed, and so establishes the electric current; secondly, the various couplers, which are bars of wood, on which are screwed copper springs for each note; when drawn by the knob these metallic springs press against corresponding copper-plates, and so cause the electric current to divide and actuate the additional electro-magnets and pallets at the same time; thirdly, the drawstop knobs and traces, to which contacts of a similar nature are attached, and which likewise complete the circuit of the electric current to their respective positive and negative electro-magnets; fourthly, all combinations which act mechanically upon the drawstop traces, and other accessory movements and pedals, &c.

To prevent the waste or destruction which would take place in a powerful and active battery if the electrodes were left immersed in the exciting liquid, it is necessary to lift them out of their cells when the organ is not in use, and as this operation would probably often be forgotten, the last provision of Mr. Barker's patent refers to a self-acting arrangement. For effecting this object, he places the jars containing the liquid on the top of a wind reservoir supplied from the main bellows, and suspends the electrodes in a frame above them; when the bellows are blown the reservoir becomes inflated, raising the cells so as to immerse the electrodes; when the wind ceases the reservoir gradually collapses, and the jars sink down, leaving the electrodes suspended dry above. Mr. Barker also protects the reverse action, the cells remaining stationary, and the electrodes being made to descend into the liquid; this is effected by the same agency, and amounts to the same thing. Mr. Barker does not patent a battery of his own, having found his requirements satisfied by modifications of more than one already known and in common use. The battery is not placed within the console, and close to the keys, as some have supposed, but in any convenient position within or near the organ itself.

From what I have already explained to you with regard to electric key action, you will have perceived that two intermediate agents are employed to make the depression of the key open the pallet in the sound-board, viz., electricity and pneumatics, and it will probably strike many at first sight, that such an arrangement would tend to cause a certain amount of delay or slowness in its operation. This, however, is not the case in actual practice; the velocity of electric currents requires no comment, and, in the short circuit we employ, electricity performs its work simultaneously with contact being made at the key. The pneumatic power-bellows, unlike those employed in a mechanical organ, where they have to be large enough to pull open several pallets at once, besides moving long trains of action, are now only required powerful enough to open one pallet, and are therefore so small that very little compressed air is sufficient to inflate them; moreover, their small and sensitive valves are not impeded by mechanical attachments. The practical result is, that no perceptible difference of time can be discovered between the depression of the key and the speech of the pipe. This is best proved by the excellent repetition touch obtained; in this it far surpasses any mechanical action.

It was, however, obvious that a great advantage and saving of work would be gained if, as Mr. Barker suggested, a perfectly new form of pallet could be contrived which would offer no resistance in opening, and admit of being acted on direct by the electro-magnet instead of being attacked by the intermediate pneumatic lever as heretofore. To effect this, we turned our utmost attention, and at length succeeded in constructing a pallet fulfilling all our requirements.

Diagram 5 is an enlarged copy of the drawing attached to our patent, dated April 6th, 1868, and shows the complete arrangement of our new pallet as applied in a single and double palletted sound-board; diagram 7 being further enlarged to show a section of this pallet I will first refer to it in order to explain the construction and method of working. The pallet consists of a small diagonal bellows, formed with top and bottom boards attached to each other by flexible leathern ribs. The upper side of the top-board is covered with soft leather, and forms the valve which beds close against the underside of the sound-board bar—it is kept in this position when at rest, by a common spring pushing upward from the fixed bottom board. The back or tail end of the bottom board is hollow, and is fitted into a square mortice in the wind-bar, through which a channel is continued to a chamber on the other side. The front end of the bottom board is fixed sufficiently below the top-board, so as to distend the leathern ribs nearly to their full extent. On the other side of the wind-bar are two chambers. The upper one runs the whole length of the sound-board, and contains compressed air of the same

pressure as is supplied to the sound-board. The lower chamber is the one in communication with the interior of the pallet; it is partitioned off separately for each note, and contains a double-action disc-valve fixed on a vertical rod. The position of this valve determines the communication with the chamber above containing compressed air or the atmosphere below outside. In a state of rest the top disc-valve is open so that the compressed air from the chamber above is inside as well as around the pallet, and of course by its pressure holds the top-board firmly against the sound-board bar—indeed, if the wind could always be kept in there would be no necessity for a spring at all, which is only to keep up the top board till the pallet is inflated. The lower disc-valve is now closed, and prevents the escape of the compressed air. If the position of the disc-valve is altered and reversed by raising the vertical rod by means of the armature of an electro-magnet, the compressed air is at once stopped from entering the interior of the pallet, and the pressure on the outside of the leathern ribs collapses them, and they draw down the upper board and allow the wind to enter the groove of the sound-board, and thence, if the sliders are drawn, supply the pipes above. The air in the interior of the pallet is allowed to escape into the atmosphere through the lower disc-valve, which is now open. When the vertical rod is released by the armature of the electro-magnet, the disc-valve returns to its original position, the escape-valve is closed, the compressed air again enters the interior of the pallet and shuts it firmly against the sound-board groove. In cases where it may be considered necessary to open the pallet very wide, as in pedal sound-boards, &c., a third chamber, running the whole length of the sound-board, from which the air is exhausted, could be placed beneath the lower disc-valves instead of allowing them to open direct into the atmosphere; the top-board would then be drawn hard down on the bottom-board, which can be fixed at a greater distance, and thus secure either a horizontal or diagonal opening to provide a great supply of wind to the sound-board groove for distribution to the pipes.

Our new pallet may appear to some to resemble a form known for many years, and I believe used in several instances by both Messrs. Gray and Davison and Mr. Willis for pedal sound-boards, but in reality it differs widely in its condition and mode of action, inasmuch as it is held closed by the pressure of wind in its interior, and opened by the disc-valves allowing this wind to escape or exhaust, so that the pressure around it is enabled to force in the ribs of leather, which in yielding actually pull the top-board away from its seat against the sound-board bar, whereas the old form of pallet just alluded to had ribs sufficiently distended only to counterbalance the resistance of the wind, and was pulled open by a connecting link in the same way as an ordinary or common pallet. Neither disc-valves nor attenuated air were used in conjunction with it, and the interior was in communication with the atmosphere instead of being filled with compressed air when in a state of rest. In our pallet we gain the advantage, that when closed it has the full force of the wind to press it soundly against its seat, and thereby prevents any tendency to leakage, a fault common to all other compensating or balanced pallets, which must be closed by strength of the spring. Again, the ribs of our pallet, being distended to their full length when at rest, present the most favourable position for being acted upon by the compressed air in the sound-board directly the escape-valve is opened, at which time the first movement of the pallet from its seat requires most force to be expended. Any single pallet can be easily taken out for repair by raising it from the fixed rail in front, and pulling it out of the mortice in the wind-bar, as no pull-down, link, or connecting rod is attached to it, and guide pins are unnecessary. These very frequent causes of derangement are thus entirely avoided. The dimensions of our pallet can be varied from that required for the smallest treble note to the largest necessary for any pedal sound-board. It is equally available for mechanical and non-electric action, in which case a spring would have to be introduced just sufficiently strong to return the key and action; this would constitute all the resistance presented to the finger of the performer. The cost, as well as the space required, is less than when the ordinary pallet is employed with a separate pneumatic power-bellows placed externally.

In most cases where organs already built are to be reconstructed on the electric system, the old arrangement of the sound-boards will prevent our new pallet being conveniently used; we have therefore found it best to apply externally a pneumatic power-bellows beneath each original pallet, similar to Mr. Barker's arrangement, but placed in two tiers, to get them in in the length of the sound-board. These we have worked with exhaust or attenuated air instead of pressure, for the following reasons: — The ribs or sides of pneumatic power-bellows, if not made very rigid, and lined with cardboard, are subject to being overstrained and inverted when inflated, and thus either locked open or destroyed. If made stiff enough to be secure from this defect, they will not work as freely as desirable in the treble or smaller sizes. By the use of exhaust instead of pressure, no stiffening for the ribs is necessary, the cost of manufacture is reduced, and greater durability and freedom from noise are attained. I am not aware, nor can I hear, that exhaust or attenuated air has been proposed or applied for pneumatic power-bellows by anyone but ourselves. I should mention, however, that Mr. Willis took out a patent almost simultaneously with our own, in which exhaust and pressure are proposed to be employed alternately for actuating what he terms a "floating valve" in connexion with a novel arrangement of drawstop action. From the way in which provisional patent specifications are lodged it is impossible either of us could be aware of the conclusion arrived at by the other; and it is a singular coincidence, that a new principle in organ-building, which is likely to be of great service for intermediate purposes, should have been thus introduced for the first time. We were led to adopt exhaust for reasons already stated, and because the saving effected in a single power-bellows, however small, was a great consideration in the aggregate or large number employed in electric organs.

Diagram 6 shews the section of two electro-pneumatic arrangements, as patented by us, for moving the sliders. In large organs, where highly-compressed air is used for supplying certain stops of pipes, as well as exhaust-bellows for working the pneumatic key-action, we have used the arrangement shown in the left-hand figure, and the method of its action is as follows:—A large pneumatic power-bellows, connected by a lever and trace to the slider, is fixed on a table, and at the back of this table are three chambers. The top one is supplied with compressed air, and the bottom one has the air exhausted from it. The middle chamber communicates with the interior of the power-bellows, and also with either the top or the bottom chamber, according to the position of a large double-action disc-valve. The drawing shows the top chamber cut off by the valve being closed, and the bottom or exhaust chamber in communication. The power-bellows are therefore collapsed, and the end of the lever drawn to the right-hand. When the double-action disc-valve is reversed the exhaust-chamber is cut off, and the communication opened with the top or pressure chamber; the compressed air rushes in and inflates the power-bellows, causing the end of the lever to be moved to the left-hand. To gain rapidity of action it is necessary that the ports covered by the double-action disc-valves should be of considerable size, and also that the valve itself should have a movement of at least one-quarter of an inch. As this would require a very powerful electro-magnet, and great expenditure of battery power, it is found advantageous to introduce a small accessory pneumatic power-bellows.

These are placed immediately under and attached to the rod carrying the large disc-valve, and its position will be determined by their inflation or collapse. These accessory power-bellows are commanded by a very small double-action disc-valve attached to a vertical rod connected to the double armature of two electro-magnets; the chamber above this small double-action disc-valve is supplied with compressed air. The drawing shows that the left-hand electro-magnet was last used. It attracted its end of the double armature and the little double-action disc-valve, admitting the compressed air to inflate the small accessory power-bellows. When the right-hand magnet is actuated the small double-action disc-valve will be drawn down, the compressed air will be cut off from, and allowed to escape by, the bottom valve from the accessory pneumatic power-bellows, which will immediately collapse. The two electro-magnets are connected to the positive and negative contacts of the draw-stop trace in the console by insulated copper wires. In organs, when highly-compressed air is not required for other purposes, we avoid the expense of constructing such bellows expressly for working the drawstop pneumatic power-bellows, and obtain both the on and off movements from the exhaust alone. For this purpose we have employed the arrangement shown in the second figure, diagram 6, and we find it acts most satisfactorily. Two large pneumatic power-bellows are coupled together with a connecting rod in such a way as to ensure the expansion of one on the collapse of the other. Three chambers are placed between their fixed tables; the centre chamber has the air exhausted from it, the top chamber is in communication with the left-hand power-bellows, and the bottom chamber with the right-hand one. The communication of these chambers with the middle one is alternate, and governed by two double-action disc-valves, arranged similarly to the one in the first figure already explained. These are also commanded by small accessory pneumatic power-bellows and two electro-magnets in the same way as before described; therefore, as the contact is made at the console, the corresponding power-bellows is collapsed, drawing the slider in the desired direction. As combination pedals are not used in France but only ventils, which cut off and introduce the wind to certain groups of stops by means of pedals, we have, therefore, had to provide in our patent for an elaborate system of combination movements when required, as in England these most useful accessories for changing the stops are held in high estimation by our organists. I must, however, pass over what would otherwise take some time to explain, and only remark that electricity is most favourable for the extension of combination movements in novel ways. No insurmountable difficulty stands in the way of opening the swell louvres by means of an arrangement of electro-pneumatics, but as it is necessary for the purpose of gaining a gradual crescendo effect to employ more than one electro-magnet, and as the electric current would have to be in circulation around them during the long intervals that the swell is locked open, it becomes an expensive arrangement as far as battery power is concerned. We have, therefore, adopted a hydraulic means of communicating the motion of the swell pedal at the console to the swell louvres at the organ. To effect this we use two small brass cylinders, one placed immediately under the pedal, and the other beneath the connecting-rod of the swell louvres. These two cylinders are connected together by a small lead pipe filled with water. When the plunger at the pedal is depressed, the one under the swell is raised to a corresponding degree,—the motion being as much under the control of the player as if a connecting-rod was carried through, and of course with far less friction in long distances. The principle has been used with success in connection with the steering of vessels: we do not therefore claim it in our second patent as an invention, but as a new adaptation to the organ.

In the first organs we built on the electric system, we were unable to overcome a certain difficulty connected with the drawstop action, which did its work perfectly, except under the following circumstances:—If the knobs at the console were moved at a time either before the blowers had commenced or after they had ceased, no corresponding movement of the sound-board slider could of course take place, therefore the organist would be misled as to the real position of the sliders. It was also possible to move the knob so rapidly that the large pneumatic power-bellows had not time for inflation, before the momentary contact had again broken. I am glad to say, however, these shortcomings no longer exist, as we have invented an arrangement which provides that, however quickly the knobs are moved either singly or collectively, the contact will be prolonged to any length of time found necessary to ensure the inflation of the large pneumatic power-bellows, and also on the bellows being filled every slider will be moved so as to correspond with the position of the knob to which it belongs, although these may have been moved during the time there was no wind in the organ. I cannot now explain how these important improvements are accomplished, as they are not yet protected, and it would be therefore unfair to ourselves to do so until they are patented. They render the electric drawstop action as certain as the simplest form of a mechanical one.

I have now explained in detail, somewhat minutely, the construction of an electric organ, as regards the sound-board, key and drawstop-action, combination movements, method of opening the swell box, automatic battery attachment and console; the grouping of these parts so entirely depends on the nature and extent of the organ which is to be built, that it is impossible to present any diagram which will show properly the relative positions they will occupy as an entire instrument.

Before dismissing the matter of construction, it will be as well to observe that the battery employed is simple, inexpensive, and easily replenished by any careful person. It will not require attention more than four or five times a year. There are no grounds for supposing electricity to be a treacherous or uncertain agent. It is well known that chemicals of the same quality will, under similar circumstances, give the same result in their action. Ample notice of any decline in the power of the battery is given by the galvanometer placed in the console for that purpose, which serves as well to show whether or not the wind is in the organ, as indicated by the immersion of the electrodes. Thunder storms, or the electric condition of the earth, have no effect on an electric organ, as earth currents are not employed as in telegraphy. The adoption of electricity and insulated wire to replace or supersede the mechanical action in large organs is not merely a new process to attain the same end, but, independently of the suppression of a multitude of moving parts, many new advantages are presented otherwise unattainable. The touch is more delicate, rapid, uniform, and invariable. The durability is increased owing to the absence of wear and tear. The key-boards can now be placed at any required distance from, and quite irrespective of, the relative position of the organ; therefore the organist may choose a position where he can hear the effects he produces, and the voices he leads or accompanies, without in any way increasing the complication or proportionate liability to derangement. Many positions can now be utilized with the grandest effect that were formerly utterly impracticable. Powerful west-gallery organs may be played from the east end of the church, entirely through a cable of insulated wire an inch in diameter, or attached to additional manuals provided for that purpose at a mechanical organ placed close to the choir. Again, in Catholic churches, an altar organ, to accompany the priests, can be similarly played from the west-gallery organ, and thus one organist will be able to accomplish the duty performed by two, as in

foreign churches. Many other novel dispositions and architectural arrangements suggest themselves now as perfectly practicable.

The electric principle is applicable to the reconstruction of organs already built, in which case all existing mechanical action is thrown away, and consequently it becomes more expensive than when applied in new organs. The cost must necessarily exceed that of ordinary construction, unless similar conditions are imposed, in which case comparison will be favourable, although in addition much more valuable and imperishable materials are employed in the electric organ, and the larger it is the less the proportionate cost of the application, besides the greater the advantages gained. I do not consider that the mechanical or ordinary organ is likely to be superseded up to a certain size, that is, not until it becomes too large and heavy to play with ease, or its position requires the removal of the manuals to a distance, although the new system could be applied to smaller instruments with equal success. Should the manuals not require removal, but occupy the ordinary position, close to the organ, an electric key-action, to ensure a light touch, may be employed with a mechanical or common drawstop-action, and so save expense.

Our first electric organ was built for Her Majesty's Opera, Theatre Royal, Drury Lane, carried on there on account of the destruction of the old house in 1867. This organ, erected within three months of the time we obtained the concession from Mr. Barker, was placed behind the scenery on the O.P. side, fifty feet away from the key-board, which was in the orchestra, where the organist could see the conductor and instantaneously realise his suggestions and directions. It was first publicly used the 25th of last May, and continued in operation till the end of the season without the slightest derangement or requiring attention. We then erected it in the Polytechnic Institution, Regent Street, where it has been performed on twice daily ever since. This was the first organ which had an electric drawstop-action and a cable of insulated wire through which it was played. No such example yet exists in France.

The next was built for Christ Church, Camberwell. It contains two manuals and independent pedal organ, twenty sounding stops and five couplers. It stands above the vestry, in a chamber on the south side of the chancel, and the console is on the opposite side amongst the stalls for the choir; fifty-five feet of cable intervenes, and runs beneath the encaustic tiles, passing through a drain pipe provided for it. Exhaust is used for the key pneumatics, and exhaust and pressure for the drawstop-action. This organ was previously erected for the Festival, Gloucester Cathedral, Sept. 7th, during the present year. We have nearly completed the reconstruction of the large organ in St. Michael's, Cornhill, and the swell organ of twelve stops has already been in use since the re-opening of the church last November. This fine instrument contains three manuals and independent pedal organ, thirty-seven sounding-stops, and seven couplers. The console is opposite, and facing the organ at a distance of thirty feet, thus placing the choir between the organist and organ. The cable contains 336 insulated wires and measures $1\frac{1}{4}$ inch in diameter; it is carried through a small drain pipe under the chancel floor, and this constitutes, with the exception of the lead pipe for the swell cylinders, the only connection between the organ and the console. Exhaust is used for the key pneumatics, and exhaust only for the drawstop-action. We shall shortly finish a large electric organ for St. George's Church, Tufnell-park, to be placed over the west door, and we have others in course of construction for St. Augustine's Church, Highbury, and Her Majesty's New Opera House, Haymarket, all on the electric system.

From what I have put before you it will readily be admitted that during the ten months which have elapsed since the concession was obtained from Mr. Barker, we have had many difficulties to surmount both in the matter of construction and as to the successful introduction or establishment of an entirely new system. I see, however, no reason to doubt its ultimate adoption for all grand organs, simply for the reason that it presents so many advantages without a single drawback or limit to the application. I have not experienced the prejudice against the innovation which I contemplated. So little did I expect the prompt acceptance accorded, that, in addition to the work I have before enumerated, we actually made the sound-boards of a large electric organ of forty-two sounding-stops and ten couplers, simply to illustrate the system. On obtaining actual orders this was of course thrown aside. Enough has been said to show what electricity has already accomplished in its application to organ building, and it is only reasonable to suppose that it will gradually develope new and far greater resources to be placed at the disposal of the organist.

In conclusion, I would only remark that the unfavourable comparison often made between English and foreign organs is entirely owing to the different conditions under which we are placed. Abroad, the churches or cathedrals are comparatively few but large, and the organs are costly and slowly built; whereas in England the reverse is the case. The positions assigned us by most architects are decidedly bad, and it is a great mistake to suppose that, by increased pressure of wind and loud voicing, the tone of an organ can be forced from some obscure chamber, or position, because it was built for, or may be convenient to receive, the organ. There is little doubt but that the old west-end or screen positions are, after all, the finest and most central for allowing the waves of sound to traverse the whole building, with the least obstruction. I am sure other organ-builders will endorse these assertions as difficulties we all labour under alike. Moreover, the present mode of ordering organs through committees and competition often results in the selection of the specification which contains the greatest number of pipes, or else the lowest tender for a scheme which has been previously proposed; the result is the production of wooden organs, more like Dutch clocks than of the type of time-piece or chronometer. From the great variety of construction employed in organs, the mechanism cannot be produced by machinery or in large quantities, and, with the increase in the cost of labour, a liberal price must be paid, if a fine organ is really desired. There are several English builders who can produce organs equal or perhaps superior in tone to those abroad, but the truth is they seldom get the chance of free action and a good building to place the instrument in.

I have said much about Mr. Barker and ourselves this evening, but it must be remembered that up to the present time the electric organ has been only in his or our hands. I could not therefore draw on other experience. I have endeavoured to show that Mr. Barker has twice created an era in organ-building, and to him our organists are indebted for the luxurious ease with which they can now manipulate the most gigantic organ. Although Mr. Barker has received the decoration of the Legion of Honour—a decoration he could not have hoped for had he remained in this country—he has not received the more substantial recompense deserved by one who has spent a life-time in advancing art in a branch of industry too little understood to be appreciated as it deserves.

I must record my best thanks to Sir Charles Wheatstone for many hints and suggestions; to N. J. Holmes, Esq., for his valuable assistance and advice; and to H. Bramber, Esq., for questions of chemistry in connection with the production of electricity. I am afraid that the day of the week, and its close proximity to Christmas, have prevented many organists from being present, but I trust there may be some here who will offer their experience or put forward any doubts they may entertain in their own minds as to the application of the electric system to organ building.

DISCUSSION.

Mr. Forster (of Hull) wished to correct a few errors Mr. Bryceson had made in the historical portion of his paper. The first light touch-valve was made by Sebastian Erard, in 1827, and exhibited by him in Paris, in 1830; it was jointed like a backbone, and had several springs.* For the pneumatic movement there were two claimants, viz., the late Mr. David Hamilton, of Edinburgh, and Mr. Barker, who each brought out the movement in the same year (1830). Mr. Hamilton applied it to an organ in Edinburgh, in 1835, and read a paper on the subject before the British Association in 1836. The round or mushroom valves were used by Mr. Hamilton in his original model, which he (Mr. Forster) had in his possession sixteen years since. With regard to the electric organ, he was afraid Mr. Barker's principle, as shown in the drawings, would not be easily applicable, inasmuch as the pneumatics, being placed side by side, would extend the sound-board to nearly sixteen feet in length, a space that would never be given in English churches or chapels. The pneumatic drawstop-action was too complicated, required a double pneumatic, would be too expensive, and not always certain in its action. This fault applied both to Mr. Barker's and Messrs. Bryceson's patent. The sound-board valve, shown in Mr. Bryceson's patent, was not altogether new; it was described in principle in Roret's "Encyclopédie," also in Professor Töpfer's "Organ Manual," and was called the box-valve. The exhaust of the valve he (Mr. Forster) considered new and a really good thing. Much credit was due to Mr. Bryceson for the trouble he had taken in this matter, and his perseverance ought to be rewarded, though he feared the great cost of the electric movement, which was admitted to be 25 per cent. over and above the ordinary organ, and also the great continuous after cost of keeping the movement in order, might be a bar to its introduction.

Mr. Cooper inquired whether he had rightly understood Mr. Bryceson, that an electric organ would only require attention about four times a year?

Mr. Bryceson said he had spoken with as much accuracy as he could on this point. Of course the answer to such a question would depend on the amount of practice. Allowing for Sunday services and a fair average amount of practice, he believed his statement would be found substantially correct. He knew that there were strange rumours current that an electric organ required daily or weekly attention, but such was not the case. Mr. Barker had an organ under his care at a small country town near Marseilles, which he only attended to once in six months, when he tuned it. The electric organ had not been introduced into England long enough to enable him to speak from any extended experience of his own.

Mr. Cooper, as an organist, was delighted to hear of any improvement which would give ease and facility in playing, but he was informed, by a pupil of his, that on going one Sunday to St. Michael's, Cornhill, when the hymn was given out, the organ would not speak.

Mr. Bryceson said the simple explanation of that circumstance was that the men did not blow the bellows, and in proof of that assertion he could refer to either of the churchwardens. The console was only a temporary one, and was not furnished, as usual, with a galvanometer or wind indicator, so that the organist could not discover that the wind was not on. As to the expense of maintaining the battery power, he might mention that the organ at the Polytechnic, which was played upon twice daily, cost about 24s. per annum for electric power. In order to set that question at rest, he might add that in any electric organs which he built he would undertake to include the expense of replenishing the battery in the ordinary charge for tuning. It should be remembered, however, that these organs were not proposed as particularly suitable for small places, or where there was no money, although the system was applicable even to a single stop, and a suggestion had in fact been recently made to him for producing a particular effect, by placing one stop of an organ in a part of a church at a considerable distance from the rest of the instrument. The larger the organ the greater would be the proportionate economy.

Mr. Cooper said that having to play a large organ with 48 stops, which it would be extremely convenient to have commanded by a key-board in the chancel, he had naturally felt a great interest in the subject, and he was happy to say that the answers given to his inquiries had been quite satisfactory.

Mr. Beer asked permission to put a few questions, which he did, as follows:—What other final result was obtained by Messrs. Bryceson's new pallet or pneumatic obturator, as described in Figs. 1, 2, 3, of their specifications, which was not fully attained by Mr. Barker's arrangements and the ordinary pallet? True, a slight simplification was effected, but was not this advantage more than compensated for by the difficulty of access to the disc-valves and electro-magnets, which were all enclosed in air-chambers, where they could not be regulated under the pressure of the air, and where they could not be got at without first letting the wind out? Was it not a considerable advantage in Mr. Barker's construction that the two pneumatics, with their single disc-valve and electro-magnet were all placed externally, and could be easily regulated, or even detached from the sound-board, if necessary, in less than a minute? Was not the introduction of the exhausting bellows an additional expense? As it did not preclude the necessity for a high pressure bellows for certain stops, did not Mr. Bryceson's arrangement necessitate a peculiar construction of the sound-boards, which would require a complete reconstruction in applying electricity to any existing organ? With respect to Messrs. Bryceson's electrical drawstop-action, as shown in figures 4 and 5 of their specification, was there not an enormous consumption of electrical current (such as few batteries could supply) occasioned by the way in which the electro-magnets acted on the disc-valve of the pneumatic? For example, a given position of the drawstop-slide could not, he believed, be maintained without the constant action of the current on the corresponding electro-magnet; and did not this involve the simultaneous existence of as many currents as there were stops in the organ? Would not the expenditure of electric power be greater in this case than that for all the manuals united?—and was not Mr. Barker's plan preferable, which, by the aid of an escapement, only required the momentary action of the current? In the drawstop-action (shown in fig. 5 of specification) the introduction of the old "puppet" movement to a certain extent obviated the difficulty, on condition, however, of the stop not being too quickly drawn, as the action of the current must be maintained until the pneumatic became inflated or discharged;—but must not the current be constantly maintained in the electro-magnets of the indicators—at least for one position of the slider, either in or out? The puppet-movement, again, was not generally considered by organ-builders as very sure in its action. In the drawing figs. 4 and 5 of drawstop-actions there existed a kind of appendix attached to the principal pneumatic, near the hinge (of which no mention was made in the specification) which would seem intended to maintain the disc-valve, upon which the electro-magnets acted, in a fixed position, independently of the keeper, with a view to dispense with the continuous passage of the current; but, as shown in the drawing, this would paralyse the action of the keeper-valve, by preventing its being drawn down by the keeper when the magnet came into action.

Mr. Limpus said that as allusion had been made to an accident which had occurred at St. Michael's, on a recent occasion, it was only fair to Messrs. Bryceson for him to state that, on that very morning, the two men who were, or should have been blowing, had acknowledged that they were asleep on the occasion referred to.

* See Roret's "Encyclopedie," published in Paris, 1854.

Mr. Forster wished to add to his former remarks on the history of the matter, that the late Herr Schultze, the clever German organ-builder at Paulinzella, was the first to apply electricity to organs and pianofortes.

Mr. Gern would like to know what was the difficulty in connecting the key-board of an organ with the pipes, by mechanical means, at any distance. With regard to the exhaust, that was not at all a new thing; he knew an instance in a church near Toulouse where it was applied.

Mr. Hoyte said he was the organist of All Saints, Margaret-street, where the organ was worked on the pneumatic principle. Part of the organ had been divided and removed to a distance of 90 feet; but the touch was remarkably accurate, and not heavier than that of an ordinary grand pianoforte. This was not an electric organ.

Mr. Botly desired to add his testimony as an amateur to the opinion expressed in the paper, that the western gallery was the best place for an organ; some time ago, when churchwarden of St. Thomas', Salisbury, one of the finest parish churches in England, he had successfully opposed an attempt which was made to remove the organ from that position; and he believed that, generally speaking, no better position could be obtained, either considered acoustically or architecturally.

Mr. Bavin said that he had recently had an opportunity of trying the organ at St. Michael's, Cornhill, and would like to know how it was that when he held down eight or ten keys he only heard six or seven tones, and that the pedal note only came in about a second after the pedal had been depressed. The same delay in the speaking of the notes, but in a less degree, was noticeable in the manuals.

Mr. Bryceson, in replying to the observations and questions, said, with reference to Mr. Forster's first observation as to the length of the sound-board, that this would depend entirely on the arrangement of the pneumatic levers. It was quite possible to put them in two or three rows, when they would not require a very long sound-board. In foreign organs there was generally plenty of room, and therefore Mr. Barker had probably not paid so much attention to this part of the subject. As to Herr Schultze being the inventor of the electric organ, he had only to say that he had prepared the paper from the best information which he could obtain from Mr. Barker. It was totally impossible for him to say what suggestions or experiments had been made, but the question was, had Herr Schultze produced any tangible result? He had already referred to the keeping their organs in order, as to which there was no difficulty; but he might remark that fears of this kind were not to be wondered at, considering the great ignorance which prevailed in the public mind as to the nature and properties of electricity. With regard to Mr. Beer's first question, Mr. Barker's arrangement might be founded on an intermediate application of the pneumatic lever, and then the resistance of the pallet remained; and in cases where electricity was applied to existing organs this arrangement was followed in order to make use of the existing mechanism. Mr. Barker himself, however, alluded to the necessity, or desirability, of attacking the pallet directly by the electric current, and for that object their new arrangement was designed. Although the pallet was within the sound-board, it was got at in the same way, and quite as easily as the ordinary pallet; the fall-board being taken off, the pallet could be taken out or put in with the finger and thumb. Of course, the pallets being within the sound-board, would be less likely to be damaged than in the ordinary arrangement. As to the questions relating to the drawstop action, he must remark that Mr. Barker's organ at St. Augustine's had not an electric drawstop-action, and that gentleman's arrangements for this purpose were based simply on theory and imperfect experiments; when these arrangements came to be carried out in English organs they met with the difficulties to which he had alluded in the paper, and, as he had there stated, they had succeeded in overcoming them by an arrangement which he had purposely omitted explaining in detail. Mr. Barker proposed a positive and negative electro-magnet with two armatures, one catching into a notch in the other; but it was found in connection with the opera organ that with this plan, if the valve were regulated tight, the armature sometimes missed, whilst if it were made loose, there would be an escape of wind through the disc-valve, which, though not of much importance in a small organ, would be a serious matter in a large one, and occasion a heavy pressure. Mr. Barker also proposed two accessory power-bellows, arranged in a very curious manner, and his (Mr. Bryceson's) aim had been to simplify matters and cheapen production as far as possible. He also believed that the action of the double armature was more certain than that of the two single ones catching one into the other. He had told them honestly what he knew, and was very glad to hear the observations which had been made; but several of them were occasioned, as he had previously remarked, by his purposely abstaining from going into details as to their newly-invented electric drawstop-action. The sound-board did not require to be of an extraordinary length, as had been suggested, and his improved pallets could be made of every size from a $\frac{1}{4}$ of an inch upwards. The current of electricity was not always on in the new drawstop-action, and in fact there was no waste of material in connection with it, but he could not go into particulars much beyond that statement; and, in fact, the subject would require a whole evening to itself to explain fully. The defects Mr. Limpus had spoken of arose from the mechanism at St. Michael's not yet being complete, there being at present only a temporary console. In reply to Mr. Gern, he could only say that it was a question of position. If, as in the case of Mr. Hoyte's organ, the trackers ran in a direct line, although the distance was 90 feet, there was no difficulty, only the mechanism would often require regulating, but where the organ was so placed that the mechanism would have to be carried round corners in various directions, the difficulty would be almost insurmountable. In an electric organ, on the other hand, distance and position were not of the slightest consequence. Mr. Bavin complained that the pipes did not always speak; he could only say that as the organ was not yet finished, men were constantly at work upon it, which might account for this failing. He hoped all those who were interested in the matter would notice when the organ was opened, and he should be much pleased to afford them any further explanation.

The Chairman then proposed a vote of thanks to Mr Bryceson, which was carried unanimously.

The diagrams used by Mr. Bryceson to illustrate his paper will be reproduced as woodcuts, and issued with a future number of the *Journal*, on a separate sheet, which should be bound with the volume.

Proceedings of Institutions.

Birkbeck Institution, Southampton-buildings.—The prizes awarded at the last examination of the Society of Arts, and also other prizes in connection with this institution, were distributed by Mr. Reverdy Johnson, the American Minister, on Friday evening, the 18th instant. Having presented the prizes, Mr. Johnson said,—I highly appreciate the honour the trustees of this institution have done me by requesting me to preside on this occasion. For one as far advanced in life as I am, having seen so many vicissitudes among those who have not had means of education at their disposal, it is exceedingly pleasant to witness how you have

availed yourselves of the opportunities which have been offered to you. Having been in my own country a witness of the results of many examinations, I can say that I have never seen any which gave me more delight than the present. It is peculiarly interesting to me to find that the competition is not confined to one sex. The lady—fairest of God's creation by a great deal—was not only designed to be a comfort to man, but was endowed with faculties amply sufficient to attain every variety of knowledge, in order that she might supply his intellectual wants, if he had any, as well as fulfil her more homely duties. I am delighted to see that among those to whom prizes have been awarded the highest honours have been taken by the fair sex. The men, indeed, might be uneducated if the women were, and the country would get on; but if the men are educated and the women are not, the country might get on, but what sort of a "get on" would it be? What kind of a home is that which a scientific or literary man has when he finds that his helpmate has no sympathy with his labours and pursuits? He might as well have married a savage. What can she do towards the relief of his anxious hours of toil? What assistance can she be to him when, poring over his books, he finds himself at a loss? But if, on the contrary, his wife were educated, how she would refine his home; what purity she would communicate to the atmosphere of his fireside; and what temptation would he then have to wander from the fairest, happiest place assigned him by the providence of God? I come here from a scene at which I was present an hour or two ago in a school of a very different description. There I saw some 600 boys and girls taken from the very poorest of the poor of the metropolis, in the charge of men who do all they can to save them from the crime into which they would certainly be led if education was not afforded them. All these boys are learning to read and write. Even the poor shoeblack, who wanders up and down your streets in the hope of finding some dirty boot and with it a penny, is being educated, and so beneficial has been that education that these boys have, by the pennies they have gained as the result of their apparently menial services, saved among themselves the enormous sum of £9,000. They have the good fortune to have presiding over their institution a nobleman by nature as well as by birth—one who has a grant of nobility from a higher source than kings or queens can command,—a nobility which is to be found in the heart. I refer to the Earl of Shaftesbury. He has devoted himself with untiring zeal to that institution, and it was delightful to me, as I sat beside him while he spoke a few words to those 600 children, to observe how happy he seemed. He felt that whatever good he might possibly do in the House of Lords as one of the legislators of this great realm, he was doing much more good by bringing up the children of the metropolis by thousands and hundreds of thousands to know their duty to men and to their God. A great man and a good man is ever a man of delicacy. I, therefore, forebore to speak what I thought of him before his face, because I knew that that delicacy would be wounded; but I will say here, without calling in question the acts of any others among the nobles of the land, that every Englishman must wish that all the peers of the realm were of the type of the Earl of Shaftesbury. The founder of this institution, as you all know, was Dr. Birkbeck, a medical man of great skill, and also accomplished in every department of science and literature. Having gained by his profession a handsome sum of money, he resolved to discontinue the amassing of wealth, and to see what he could do to educate the people of his country. How his memory has been honoured for that resolution. The mightiest hero who ever led armies to victory, and earned glory by wading through seas of blood, might envy the inscription which might and ought to be written on a monument to the memory of Dr. Birkbeck. But he was not alone in his undertaking; he had a coadjutor sufficiently powerful by title and position to do everything necessary to further the accomplishment of his purpose. It was he who said the pen was mightier than the sword, and that whatever Powers might be abroad threatening the freedom of England and of the world, a mightier power on freedom's side was gaining strength day by day, for the schoolmaster was abroad. Need I name Henry Brougham, literally at one time the tribune of the people, speaking in the House of Commons and in the House of Lords a bold, eloquent language which even made a would-be king tremble, and forced the peers to acknowledge his power, and act in obedience to his advice? It was his speech, among others, which induced that high body to sanction the first Reform Act; it was his speech, with the speech of Denman, that caused the Lords to tremble at the idea of convicting an injured Queen, and forced from them the words "Not proven." With such a founder and such an assistant what doubts could have been entertained of the success of this institution? If any such doubts have been entertained in the past, what we have witnessed to-night must make doubting impossible for the future. Conducted by the able men in whose hands the institution is now placed, it will continue to prosper until it has reached a height as great as human effort and ability can place it on. And now let me say a word to you who are pupils here. Your teachers have told you and have told us that you are deserving of all honour; they have borne testimony to your excellence, moral and intellectual. Never forget it; carry the remembrance of this night with you in after-life, and you will find that if at any moment you are disposed to stray from the path of absolute integrity, your steps will be arrested by the thought of how pained your teachers would be if they supposed you were on the point of giving way to temptation.—A vote of thanks to the Society of Arts for the benefits it has conferred upon institutions of the Birkbeck description, was carried on the motion of Mr. Locke, M.P., seconded by Mr. Gilpin, M.P., and was acknowledged by Lord Henry Lennox, M.P., chairman of the council of the Society. Thanks were presented to the examiners on the motion of Mr. Charley, M.P., seconded by Mr. Garland. Thanks were also presented to the gratuitous teachers, on the motion of Mr. Cole, C.B., who, however, objected to gratuitous services, and strongly urged the council to apply for assistance to the Science and Art Department, as, on the principle of payment by results, the institution was fairly entitled to a grant of upwards of £100 per annum. A similar compliment was paid the governing body of the institution. Responding to a vote of thanks for his services in the chair, Mr. Reverdy Johnson said,—I have come among the young this evening to see whether they are animated by the same feelings towards my country as characterize all those in England who are not young, with the exception of one or two or more. With regard to those one or two exceptions, I may say in a language which I find is understood by some of you here—*De minimis non curat lex.* To suppose that war is possible between the two countries is to suppose that those in whose hands the destinies of the two countries are placed are mad; and as I know that those in whose hands the destinies of my country are placed do not belong to that class, and as I know with equal certainty that the man in whose hands the destinies of your country were placed a week or two ago, and he in whose hands they are now placed, are anything but madmen, we have a sufficient guarantee that the friendship between us will never be disturbed. It is trite to refer to the similarity of our institutions, but it is a fact which should ever be borne in mind when we are talking of the possibility of hostilities between the two countries. Our institutions are almost identical; and one element in the case which should not be lost sight of is this—that our ancestors learned them from you, and have not forgotten to teach them to us. We have found that those institutions are soundest which rest on the public feeling of the people, and our experience has taught us

that if, at any time, in either country a Government should go against that public opinion after it has been thoughtfully formed, the days of that Government are numbered. The best way of securing such a public opinion is that of establishing a liberal system of education. We are not guilty of the mistake of not paying our teachers; the teacher with us, to say nothing invidious, is paid a great deal better than some of your curates; and when we find a place destitute of education, we tax the people to make good the defect. Then, not only are our institutions identical, but we have the same language, and although we speak it better than you do, we understand each other, and by and by you will be able to speak the language as well as we do. With a common origin, glorying in the same renown, and proud of the same great men, we are resolved that we will at no time permit our free institutions to be taken from us.

Union of Lancashire and Cheshire Institutes.—*Bolton New Mechanics' Institution.*—The new building is in the Italian style of architecture, with slightly Gothic character in the detail, the exterior being of brick, with stone doorways, strings, and other dressings. In the basement are a number of rooms for the elementary classes, the heating chamber, store-room, and porter's residence. The reading-room, which is on the ground-floor, at the right of the entrance, is 43 feet by 23 feet 6 inches, and is boldly treated, the wall space being divided by pilasters, with enriched caps, while the ceiling is in panels, formed by the beams which support the floor above. On the ground-floor are also a library, 33 feet by 18 feet, the committee-room, secretary's room, and conversation room. Four entrances are provided on this floor. The male and female departments, except to the officers of the Institution, are kept thoroughly distinct. The principal staircase to the lecture-hall is of stone, finished with handsome iron balustrading and oak hand-rail. On the first-floor is the lecture-hall, 60 feet long by 33 feet wide. The walls of the room are divided into bays by panel pilasters, with enriched caps, and the ceiling by the transverse beams carrying the floor above. Near the platform is a lecturers' ante-room, with lavatories, &c. There is also on this floor a large class-room for female students, which is so arranged as to be available for a ladies' ante-room, with cloak-room adjoining. On the upper floor is the mechanical drawing-class room, which extends over the full area of the lecture-hall beneath, and has a large lantern light. The remainder of this storey is appropriated to female class-rooms, with lavatories, &c. The whole of the rooms are lofty, well lighted and ventilated, and heated by Messrs. W. and J. Cole with hot water, the pipes being so arranged that the different departments of the building may be warmed separately. The building has already cost £6,000, and it is estimated that £1,500 more will be required to complete it. To realise this sum the committee of the Institute determined to inaugurate the new building by a fine-art and industrial exhibition. A meeting of the principal friends of education in the town and neighbourhood was convened in June last, and the scheme submitted by the committee met with unanimous countenance and support. The opening ceremony was performed in the lecture-hall, on Monday the 7th December, by A. Trollope, Esq. The hall was densely crowded. Addresses were delivered by Mr. Trollope; Mr. Alderman R. Harwood, President of the Institution; Mr. Barlow, Mayor of Bolton; Col. Grey, M.P., and Mr. Hick, M.P., the borough Members; Mr. C. D. Darbyshire, &c. In the afternoon there was a luncheon at the Co-operative Hall, when the attendance was numerous.

MEYRICK COLLECTION OF ARMOUR AT SOUTH KENSINGTON.

The collection of armour and arms formed by the late Sir Samuel Meyrick has, with the consent of the present owner, Colonel Augustus Meyrick, been sent up to London, in order that the public may have the advantage of viewing it during the term of its loan to the South Kensington Museum. The gallery in which space has been provided for the exhibition of this interesting historical collection is one of those occupied for the past three seasons by the National Portrait Exhibitions, on the ground-floor. The public generally will perhaps remember this gallery better if it is described as the lower east refreshment room of the Exhibition of 1862. The collection will be open to the public on Saturday, the 26th December.

Containing, as it does, an immense number of arms of all periods and varieties, it may not be out of place, especially at the present holiday season, to glance cursorily round the collection, and, in as short a space as possible, to specify, according to the bays to each of which one period of the manufacture of armour has been assigned, the more important specimens which it is believed are worthy of particular notice. The arrangement of the collection has wisely been entrusted to Mr. J. R. Planché, and is strictly chronological. Although to the uninitiated the first bay of arms and armour may not appear so attractive as many others lower down, still there can be no question that the ancient British gilt bronze buckler, or as it is technically termed, "the gilt bronze covering of an ancient ysgwyd (an imitation of the Roman scutum) is archæologically the first specimen in the collection. As a specimen of *repoussé* ornamentation, the crispness of the work is well worthy of the critical examination of living artistic metal workers. Examples of this specimen of work are in the possession of the Royal Irish Academy in Dublin; unfortunately, except by dint of persuasion and importunity, the public are not able to inspect them at present. The two circular shields or targets in the same case as the buckler are remarkable for the excellent condition in which they are. The series of Etruscan and Roman helmets in the glass case is curious, but to the public generally will not prove so interesting as that of the tilting helmets. The most remarkable one, placed the second in the set arranged on the shelf at the back of the bay, belonged to Sir Richard Pembridge. Notice should be given to the small battle-axe placed at the lower side of the central group of maces, &c., on the wall. This battle-axe is said to be the earliest one extant. The handle consists of a barrel: about half-way up the handle is a small touch-hole. The date assigned to this arm is 1440, and it is described by Skelton as a "Battle-axe with gonne." The trophy of shields and saddles, &c., forms a capital centre to the bay. The saddle of carved bone is German fifteenth century work, and represents two lovers in the costume of the period. The legend surrounding the bas reliefs is as follows:—

Woman. Ich pin hie, ich ways nit wie,
Ich var von dawn, ich waus nit wan.
Nu wohle auf mit willen unvergessen.

Man. Ich var, ich har, ye lenger ich har
Me gresser nar
Dein ewigleich land ierigen varn.

Woman. Me den krg. ent.

Man. Ich frei mich all zeit dein.

The translation of the above is—

Woman. I am here I know not how,
I go hence I know not where,
Well a day! willingly that art never forgotten.

Man. I go, I stop, the longer I stop
The more mad I become;
Thine for ever the world o'er, your betrothed!

Woman. But if the war should end?

Man. I should rejoice to be always thine.

At the back of the trophy is a formidable looking weapon, called a "Demi holy-water sprinkler." The upper circular portion, bristling with dangerous looking points, conceals four barrels, which can be loaded and fired off when the spike at the top is removed. This implement was used in the time of Edward IV., and the present one is an excellent specimen, well preserved. Before entering the next division, note should be taken of the ship's swivel-gun, fished up off the coast of Boulogne.

A stand of bills, spetums (a blade with lateral projections, fixed to a long wooden handle), morning stars (balls studded with spikes and connected to the handle by a chain) and holy-water sprinklers, is the division between the first and second bays. In this latter bay, the chief object of attraction is a mounted figure, in a complete suit of armour, delicately fluted—temp. Henry VII. At the back of the bay, is the largest tilting helmet in the collection. An arrangement of bucklers, maces, engraved swords, one particularly deserving study, engraved by Albert Durer, representing the Conception and St. Barbara, on one side of the blade, and on the other St. George and St. Christopher, forms a well disposed background. To the front of the rack of halbards, glaives, &c., separating the times of Henry VII. and Henry VIII., is a gorgeous court suit of armour, puffed and ribbed, and damascened. The gold work, unfortunately, of the enriching ornaments is worn away considerably. This bay—the third one—contains several excellent examples of armour. Amongst the mounted figures is a rather quaint and evidently cumbersome black, German *cap-a-pie* suit, on the breast-plate of which, in engraved and gilt-work, is a representation of the Virgin and child. The horse armour of this figure is very good and complete. The horse's bit is a work of some artistic merit—the enamelled bosses are interesting. Two of the simplest suits of armour, unornamented almost, are in this bay; they are fluted, and of bright steel. On the champfront of the horse armour belonging to the second one of these two figures, is a curious inscription:—

NIXVN
WA
YERSVOC
HI

The work is from Nuremberg. Of the standing figures, almost the best one is a suit for a demi-lancer, with a bright floriated steel design in relief, of Genoese work; temp. Henry VIII. Next in interest is a knight of St. George, the armour being painted black, and the centre of the breast-plate bearing a conspicuous red cross. This third bay contains early examples of engraved armour, of which the best specimen probably is the complete suit on a standing figure, of work of about 1570.

Ranged along the shelf, at the foot of the trophies of arms fixed on the wall, are a number of fine breast-plates. The first one without any point in it, and the last of the set, with a strongly-defined point, with the intervening ones, each one having a varied position for the point, show how the pointed form of breast-plate originated. Some very fine double-headed swords, surrounded by glaives, maces, halbards, &c., are conspicuous objects. Before leaving this bay, visitors should inspect an interesting jester's cap in iron.

(*To be continued.*)

BUDGET OF THE CITY OF PARIS.

The prefect of the department of the Seine has just published his annual budget for the city of Paris, and the adjoining arrondissements of St. Denis and Sceaux, from which we extract the following items:—

It appears that the effect of demolition and reconstruction during the last twelve months has been to increase the number of houses by 1,921, and that of apartments by 14,460 in the whole of the twenty arrondissements within the fortifications. The increase is, however, confined principally to the outskirts, or what is now the outer circle of the city. In the Bourse quarter, the number of houses has been diminished by 33, and the number of apartments by 916; in the two adjoining quarters of the Pantheon and the Luxembourg, the reduction amounts to 73 houses and 1,592 apartments.

The direct taxes, that is to say, land-tax, house, window, and door taxes, and trade licences, amount for the whole department of the Seine to 43½ millions of francs, or £1,732,295, or about one pound per head for the entire population. Of the 43 millions, upwards of 40 are derived from Paris itself. Only a portion of these taxes go to the city, the rest, about half, belong to the State.

The total of the expenses of Paris, ordinary and extraordinary, but exclusive of the special budget, amounts, it appears, to rather more than 24½ millions of francs, or £987,109.

The budget for 1869 is very nearly the same as was originally that of 1868, since increased to the extent of twenty per cent. by supplements.

The following are amongst the most important facts presented by the account of operations during the current year:—The number of primary schools has been increased by thirty-three, of which eleven are public, the total number being at present 1,892. In addition to these there are 254 adult schools, or rather classes, and 200 asylums. The number of pupils at the primary schools is not given, but the whole number of persons attending the various schools and asylums is given as 255,145, or rather more than one-seventh of the entire population.

The document concludes with a congratulatory paragraph on the great change which an abundant harvest has made in the price of bread, as compared with last year, thus relieving the city from the onus of regulating the bakers' prices.

Fine Arts.

Art Decoration of Theatres.—An unusually artistic character has been given to the decorations of the new Gaiety Theatre, only just opened, the most noticeable feature being the frieze over the proscenium, designed and painted by Mr. H. S. Marks,—30 feet long by 4 feet 6 in. deep. It represents a king and queen of mediæval times, with surrounding courtiers, watching a masque which is being performed before them. On either side this frieze, over the proscenium boxes, are lunettes in the arches—the one to the left represents lyric, and the other epic poetry—designed by the same artist. These pictures, which are really fine works of art, have been painted by Mr. Marks with a view to their forming a part of, and, in a measure, being subservient to the general scheme of decoration. The coloured decoration of the auditorium and the lobbies was executed by Mr. George Gordon, and partakes somewhat of the early Romanesque character. The same artist has also painted the Act Drop, which, unlike that at most theatres, is intended not as a scene or a picture, but as a part of the decoration of the theatre. It may be mentioned that the lessee of this theatre is Mr. John Hollingshead, well known as an author, who has been a contributor to the Society's *Journal*, and who wrote the introduction to the Illustrated Catalogue of the International Exhibition of 1862.

Reading-room at the National Gallery.—The acquisition of Sir Charles Eastlake's art library, recently purchased by the National Gallery, and the removal of the library of the Royal Academy to Burlington-house, have induced the trustees to form a collection embracing every attainable work relating to the fine arts, and to establish a library of reference and reading-room for the

use of students, and accessible for the public under certain regulations.

Monument to the Memory of Rossini.—Not long since Mdlle. Esther Le Clerc, in the name of her late brother, Achille Le Clerc, presented a sum of money to the Academy of the Beaux Arts of Paris to found a prize of a thousand francs for a work of art; the other day, on the occasion of the annual meeting of the academy, it was announced that the first subject for the Le Clerc prize would be a monument consecrated to the memory of Rossini. The competition is divided into two stages:—First, a sketch, which is to be sent in on or before the 28th of the present month; and, secondly, a model, to be sent in by each of the successful competitors in the first trial. The final competition is fixed for the 30th of March, 1869.

International Exhibition at Munich.—The Minister of Public Instruction has been instructed, by the King of Bavaria, to make the necessary arrangements for the holding of a grand exhibition of national art at Munich next year. It is expected that the collection of works of art will be a very large one. The date for the opening of the exhibition is not yet announced, nor are the conditions, which will doubtless be similar to those of other exhibitions of the like character.

Manufactures.

Exhibition of Industrial Art, Paris.—The Union Centrale des Beaux Arts, which has several times been mentioned in the columns of the *Journal*, and whose proposed college of applied art is, it is said, only deferred, not abandoned, has determined to hold another extensive exhibition of applied art, which is announced to open in the Palais de l'Industrie, on the 10th of August, 1869, and to be closed on or after the 10th of November. The programme contains six groups, designated as follows:—1. All kinds of works of art executed with a view to industrial reproduction. 2. Productions of art manufacture. 3. Models and productions of artists and manufacturers taking part in the ordinary competitions of the society. 4. The works of the pupils of all the schools of design of Paris, and the departments, who are invited to take part in the exhibition. 5. Collections of objects of all kinds of decorative art of past times adapted to the instruction of the artists and art-workmen of the present day. 6. Original drawings and models for industrial purposes and decoration left by the old masters in applied art; and a gallery of portraits of past times exhibited with a view to the history of costumes. The exhibition will, therefore, like its predecessors, be both retrospective and contemporary, and there is little doubt that it will even surpass in importance the former very brilliant collection previously brought together in the same building by the same society.

Commerce.

Cultivation of the Caucasus.—A company, which has recently obtained for sixty-five years a grant of a large tract of land in the Caucasus and on the Persian frontier, is about to raise a capital of twelve and a-half millions of roubles in shares. This capital is to be employed in the following manner:—Eight and a-half millions in works of irrigation necessary for preparing the lands for the production of wheat and other cereals, madder and cotton; three millions in the construction of factories and works much required in the Caucasus; and one million in making loans to proprietors of land, and in the establishment of a bank which it is proposed to found at Tiflis.

Wine Adulterations.—The following is from the *Produce Markets Review*:—"History relates that among the many rages of the fashionable world, in the early part of this century, there figured an incomparable salad-dresser, who used to spend the whole day in driving round in his chariot from one customer to another, mixing salads, for each of which he demanded and obtained the modest fee of two guineas. In our modern days the successful but harmless salad-dresser has, according to a weekly Paris journal, *L'Eclipse*, been succeeded by a much more objectionable class, who go round amongst the few dishonest growers and merchants, wine-doctoring, and whose charges our contemporary gives in an amusing article, which, translated, runs as follows:—'The public is aware that wines are adulterated, but it is ignorant, we think, to what an extent this is done, nor is it aware how curiously the wine industry is organised, and how each kind may be imitated by means of ingredients utterly innocent of any trace of the grape. We think, however, that nothing similar to the perfectly authentic document which we copy here, and which is printed and circulated in the trade, has yet been published.

	Fr.	c.
For giving new wines the colour of old (per 230 litres)	1	50
For giving wines the taste and perfume of old Burgundy (per 230 litres)	3	0
For colouring in rose-colour and in red (per 230 litres)	4	50
For imitating with *vin-ordinaire*, Madeira, Marsala, Muscatel, Malaga, Alicante, Vermouth, Port, Lacryma Christi, Greenache, Sherry, Tokay (per 20 litres)	5	0
For imitating the taste of Beaune (per 230 litres)	3	0
For imitating Chablis (per 250 litres)	2	50
For giving white wines the taste of champagne (per 230 litres)	5	0
For giving corn-brandy the taste of Cognac (per 100 litres)	6	0
For imitating the colour of Curaçao and Bitters (per 100 litres)	2	0
For imitating Rum, Kirsch, and Absinthe with alcohol (per 50 litres)	6	0
For imparting to beetroot-brandy the taste of *armagnacs* (per hectolitre)	4	0

The above will show how easy and profitable is the trade in wines. We dedicate these few facts at once to hard-drinkers, and to those who, careful for their health and for their purse, desire wine or some natural liquid in return for their money.'"

Silk Trade between Italy and France.—The exports of silk from Italy to France, from 30th September, 1867, to 30th September, 1868, show a considerable increase on those of the previous year, and were as follows:—

	Kils.	Value Frs.
Grains (eggs)	4,900	623,400
Cocoons	119,900	2,975,350
Raw silk	219,000	14,679,300
Worked silk	868,000	85,100,200
Floss silk	1,050,400	17,083,450
Total value of exports		120,461,700

The imports from France to Italy during the same period have greatly diminished, being about two-thirds of those of previous years.

Imports to Italy from France.

	From Sept. 30, 1867, to Sept. 30, 1868, Francs.	From Sept. 30, 1866, to Sept. 30, 1867, Francs.
Printed foulards	1,458,568	1,542,197
Plain stuffs	9,161,724	14,780,872
Worked stuffs	724,662	1,084,777
Mixed stuffs	1,786,457	2,601,546
Fringes and trimmings with gold and silver	351,935	671,150
Do. do. all silk	373,355	289,710
Do. do. silk	574,070	1,016,514
Ribbons	1,204,070	1,900,377
Tulle	870,625	941,125
	16,505,466	24,828,268

Colonies.

Land in Victoria.—In the colony of Victoria there were, in January last, upwards of 40,000,000 acres of land not yet alienated from the Crown, nearly half of which will be immediately available for agricultural settlement, on the principle of free selection, in areas of 20 to 100 acres, on very easy terms; while the other moiety is likely to be thrown open on similar conditions in the year 1870. This land affords accommodation for nearly half a million immigrants, who would enjoy the right of selecting a farm over at least one half of the colony. For the beneficial occupation of 100 acres the immigrant would have to pay £10 per annum for three years; and then, if he had meanwhile proved his *bona fides* as a settler by cultivation or other permanent improvements, he would be entitled to receive the fee simple of his land on the payment of something less than £1 per acre.

Acclimatisation in Victoria.—The Angora goats introduced into the colony have thriven and increased. The society has a flock of 150 ewes, and 70 pure-bred rams are now distributed over the colony to improve the common breed of goats. The fine woolly hair will, ere long, be an important article of export and manufacture. The common honey bee was introduced only a few years ago, and large quantities of honey and wax are now produced in various districts. The silkworm has also been introduced, and from the recent extensive plantations of the mulberry, silk will soon be numbered among the staple products. The camel is also established in the colony, and its perfect adaptability to the Australian climate is now proved. Not wanted within the bounds of Victoria, it will be invaluable as a means of transport over the sandy and arid districts of the interior.

The Northern Territory of Australia.—The efforts to form a settlement at Burke Town, in the northern territory, have been very successful. The livestock has increased during the first three years to 1,500 horses, 50,000 head of cattle, and 200,000 sheep; whilst the trade of the place showed, for one year—exports to other colonies, £8,118; and imports from other places, £15,582, which was irrespective of shipments to and from the ports of Queensland.

Notes.

The Brindisi Route.—The service between Brindisi and Alexandria, and *vice versa*, is now carried on with great regularity by the Adriatic and Oriental Company's steamers, one of which, the *Principe Tomaso*, in her last voyage from Alexandria to Brindisi, made the passage in 74½ hours.

International Exhibition at Hamburg.—In the beginning of September, 1869, there will be an International Exhibition at Hamburg, for the purpose of giving all those who are interested in the science of horticulture, and in the various machinery connected with it, an opportunity of becoming acquainted with the immense progress and wonderful development in gardening; they will also be able to exhibit their own inventions and improvements, and the result of their labour. The exhibition will be divided into three principal classes:—1st, cultivation; 2nd, architecture; 3rd, horticulture and its productions. These three great classes will be divided into special classes, in each of which prizes will be awarded.

Gas Lighting at Bari.—Bari, one of the most important towns of Southern Italy, was lighted with gas for the first time on the 19th September. The number of public lamps was 650.

Steam Ship for the Sultan.—A fine steamer, of 1,000 tons burden and 300 horse-power, was launched on the 30th November, at Trieste, from the ship-building yard of S. Marco. She was named the *Wassitai Tigiard*, and is the property of the Sultan of Turkey.

The Mont Cenis Tunnel.—During the second half of the past month (November), the progress made at the Mont Cenis tunnel was 62·10 metres, of which 32·40 metres were driven at the Italian side, and 29·70 metres on the French side. The position of these works up to the 30th November was as follows:—

Length driven at Modane.....	3·756·60
Length driven at Bardonnèche	5·319·40
Total length of tunnel driven	9·076·00
Total length remaing to be driven..	3·144·00
Total length of tunnel	12·220·

Correspondence.

Italian Mushrooms.—Sir,—Having passed many years of my life in Italy, I am able to corroborate Mr. Story's account* of the variety of fungi eaten and relished by the natives, the only one they generally refuse being the common English mushroom, which they call the "pratolino," because it usually grows in meadows. Their objection is that it is dangerous, from its similarity to the common toadstool, none of which they ever touch. Certainly the "ovolo" as described by that gentleman is the prince of mushrooms, and is so named in Tuscany because it is always eaten while still undeveloped, or in the state of button, and is often as large as a goose egg. When quartered for cooking, it exhibits those beautiful deep orange and yellow colours, though snow-white outside. A very similar mushroom—in appearance, at least—grows plentifully in some of our fir plantations; but I have never attempted to eat them in this country. When in Italy I have partaken of all the various kinds usually eaten, including many species of tender boleti, without feeling the slightest inconvenience. I should except, however, a boletus they call "*Spianta-Famiglie*," which is sometimes poisonous, though it is occasionally eaten by the natives notwithstanding its dreadful name. On one occasion I happened to have the top of a large tree reversed on my premises as a chopping block, the stumps of the three principal branches forming the legs. I was surprised by finding several large boleti growing in the fork, of course, head downwards; and wishing to know if they were edible, I made inquiries, and was told that as the tree was a white mulberry they were safe. I had them cooked, and they turned out very good, and I had a second and third crop before the wood got too dry. The only time I ever felt any inconvenience was from eating what we called morells, in Australia. For about an hour after the meal myself and my companion were convulsed with irrepressible laughter without any apparent cause, but no headache or other bad symptoms followed.—I am, &c., Henry W. Reveley.

Reading.

Artificial Refrigeration.—Sir,—In the paper read by Dr. Paul, on Artificial Freezing, he stated that "The merit of having put to the test of practical trial the idea of applying ice-making machinery to direct refrigeration, is due to Mr. King, the engineer of Messrs. Truman and Hanbury's brewery; and it is to his enterprise that those interested in the subject of artificial refrigeration are indebted for the working out of this problem." I was present at the meeting, but did not catch the meaning of Dr. Paul's words, which I heard indistinctly. Had I understood them as reported in your *Journal*, I should have challenged their accuracy at the time, as I have applied a powerful ice-making machine to direct refrigeration for the past three years,

*See last *Journal*, p. 78.

and in 1867, took out a patent for such application, which patent, according to Dr. Paul, must be infringed by Mr. King, who came down to Stratford to see my apparatus in September, 1867.—I am, &c., Charles E. Flower.

Stratford-on-Avon, Dec. 22nd, 1868.

MEETINGS FOR THE ENSUING WEEK.

Tues ...Royal Inst., 3. Prof. Odling, "On Carbon." (Juvenile Lectures.)
Thur ...Royal Inst., 3. Prof. Odling, "On Carbon." (Juvenile Lectures.)
Sat .....Royal Inst., 3. Prof. Odling, "On Carbon." (Juvenile Lectures.)

Patents.

From Commissioners of Patents' Journal, December 18.

Grants of Provisional Protection.

Animal charcoal, apparatus for burning—3750—J. Bolton.
Bits and bridles—3754—W. Griffiths.
Boilers—3684—H. Kinsey.
Bones, &c., treating—3761—W. S. Jackson.
Bottles, &c., cleaning—3656—S. A. Daniell.
Boxes for transmitting patterns, &c., through the post—3502—W. P. Nash.
Brick-making machinery—3672—P. Hooker.
Bricks, &c., manufacturing—3746—S. S. Anderson.
Bridges, &c., roadways of—3744—G. P. White.
Buildings, constructing, &c.—3680—J. H. Banks.
Capsules for bottles, &c.—3653—W. Betts.
Carbonate of lime, treating—3368—J. H. Johnson.
Carding engines—3658—J. H. Johnson.
Cartridges—3709—J. Abraham.
Cataract lenses, &c.—3678—W. Pugh and J. Field.
Chairs—3674—E. W. P. Taunton.
Cigars and cheroots—3753—A. G. Goodes.
Coke, manufacturing—3718—A. Homfray.
Cotton, &c., opening and cleaning—3648—W. E. Newton.
Cotton, &c., piecing cardings of—3665—T. Warburton, jun.
Crucibles, &c., manufacturing—3739—G. Cooper and J. Cotterill.
Cultivators—3735—T. Speir.
Driving bands—3543—I. B. Harris.
Electric telegraph cables—3661—C. S. Rostaing.
Envelopes, manufacturing—3666—E. Hely.
Fabrics, &c., bleaching, &c.—3712—D. H. Paterson.
Fences, &c.—3725—T. Kennan.
Fire-arms, breech-loading—3734—R. B. Roden.
Fire-arms, breech-loading—3769—H. Carter and G. H. Edwards.
Fur and hair, dyeing—3700—E. Francillon.
Furnaces—3681—J. Littler and J. H. Banks.
Furnaces, economising the consumption of fuel in—3737—T. Lancaster.
Furnaces, supplying with fuel, &c.—3701—J. A. Fawcett.
Gas burners—3273—W. E. Gedge.
Gig mills—3706—E. K. Dutton.
Girders for bridges, &c.—3668—H. N. Maynard.
Grain, &c., grinding—3755—J. Norman.
Gullies, &c.—3697—F. Beech.
Harrows, &c.—3705—H. Denton.
Horse shoes, appliances to be adapted to—3768—T. Holder & G. Dover.
Horse shoes, &c.—3721—E. Simons.
Horses, &c., clipping or shearing—3664—J. Tidmarsh.
Houses, &c., constructing—3772—F. Walton.
Houses, &c., roofing—3763—C. E. Brooman.
Iron, &c., manufacturing—3330—A. Munro and W. B. Adamson.
Kilns—3710—J. Holmes.
Kilns for calcining limestone—3699—J. R. Swann.
Kilns for calcining limestone, &c.—3740—C. P. Cotton & J. L. Lyster.
Knitting machines—3686—W. R. Lake.
Knives, &c., sharpening—3613—E. Stevens.
Lace fabrics, &c., cutting off the superfluous threads from devices made on—3743—J. Ball, jun.
Locks for bags, &c.—3638—L. Pfeiffer.
Locomotives—3370—J. Samuel.
Looms—3729—H. A. Bonneville.
Lubricating apparatus—3685—W. Simpson and J. Hutton.
Metal, &c., machines for cutting strips of—3748—F. Meadows.
Metals, shaping—3446—B. P. Walker.
Mines, ventilating—3767—R. Waygood.
Motive-power, obtaining—3719—J. Ridley.
Oil cans, &c.—3692—J. G. Rollins.
Ordnance, breech-loading—3720—A. Krupp.
Ores, &c., crushing—3701—R. Girdwood.
Organs—3640—T. Hill.
Paraffine, treating and purifying—3698—A. C. Sterry, F. Lambe, and J. Fordred.
Paving blocks or slabs of wood—3673—A. M. Clark.
Peat, &c., drying—3693—W. G. Ainslie.
Perspective drawings, instrument for facilitating the execution of—3629—W. E. Gedge.
Photographic apparatus, &c.—3722—W. R. Lake.
Photographic prints, washing, &c.—3695—H. L. D. Marsden.
Ploughs—3679—W. E. Gedge.
Presses for compressing metal, &c.—3551—E. T. Hughes.
Printers' formes, &c., locking—3675—D. Dorrity.
Printing in colours, &c., machinery for—3751—J. Parkins.
Railway breaks—3635—W. Naylor.
Railway carriage wheels, &c.—3702—B. Hunt.
Railway signals—3667—J. Alexander and J. Hill.
Railway signals—3745—W. Baines.
Railway trains, communication in—3636—G. S. Brown & E. Turner.
Railway trains, communication in—3733—O. Reynolds.
Railways, preventing collisions on—3738—F. W. and G. Moss.
Reaping and mowing machines—3683—R. Hornsby & J. E. Phillips.
Reaping machines—3770—P. Kotzo.
Reflectors—3671—T. B. Hubbell.
Roots, cutting edible—3687—W. R. Lake.
Rotary propellers, pumps, &c.—3694—M. P. W. Boulton & J. Imray.
Rudder pins, &c., preservation from corrosion of—3644—N. and R. G. West.
Salt-stones, manufacturing—3281—W. E. Gedge.
Sawing machinery—3703—D. Thomson.
Sewage, &c., treating—3714—A. M. Clark.
Sewing machines—3436—P. J. Livsey.
Sewing machines—3590—W. E. Gedge.
Sewing machines—3757—W. G. Manwaring.
Ships—3660—J. Grindrod.
Ships in dock, adjustable blocks for supporting the keel and bilge of—3747—J. T. Parlour.
Shuttles—3756—W. H. Platt.
Sketching and drawing instruments—3682—C. H. Chadburn.
Spinning and twisting frames—3766—J. Pickles, E. Ramsbottom, S. Haggas, S. Foulds, J. Shackleton, and W. Berry.
Spinning machines, &c.—3579—R. Lakin and W. H. Rhodes.
Stays, &c., fastenings for—3370—S. Pallant.
Steam boilers, setting—3762—I. Smith and J. F. N. B. Simons.
Steam cultivators—3711—B. Fowler, D. Greig, and R. Burton.
Steam engines—3708—A. Masson.
Table expanders, screw boxes of—3732—J. Fitter.
Thimbles—3690—R. Charles.
Tiles, material for making—3642—A. M. Clark.
Type composing and distributing machinery—3728—A. Mackie.
Umbrellas, &c.—3741—W. H. Pottle.
Velvets, &c., weaving—3669—S. C. Lister.
Washing machines—3540—C. Smith and J. Macfarlane.
Watches—3730—W. J. Thicthener.
Weavings, manufacture of—3742—J. Kirk and J. Kirk, jun.
Wood, ivory, &c., imitations of—3651—J. H. Johnson.
Yarns, dyeing—3689—S. Hirsch.

Inventions with Complete Specifications Filed.

Measuring distances, &c.—3759—H. A. Bonneville.
Motive-power apparatus—3804—H. A. Bonneville.

Patents Sealed.

1983. E. R. Kaulbach.
2000. C. H. Murray.
2006. R. and W. K. Austin.
2008. E. T. Hughes.
2009. E. T. Hughes.
2015. G. Taylor.
2018. C. M. H. Downing.
2024. P. and B. Brown.
2025. C. T. Burgess.
2073. H. Large.
2079. S. Hannah.
2202. J. N. Willis, jun., and S. Judd, jun.
2317. W. S. Harrison.
2610. B. Walker & J. F. A. Pflaum.
2633. H. Ground.
2908. S. Fox.
3087. J. Dewar.

From Commissioners of Patents' Journal, December 22.

Patents Sealed.

2021. C. Johnson.
2034. J. Mitchell.
2035. S. Owens and T. Patterson.
2043. J. Briggs.
2044. J. Jack.
2047. J. G. Garrard.
2053. T. Dodd.
2054. M. Burke.
2055. T. Winder.
2056. R. Clough.
2059. A. Thomson.
2061. L. Thomas.
2063. T. C. Blanchflower.
2071. G. McCulloch.
2078. W. R. Lake.
2081. W. Baxter, D. Waring, and J. S. Wooller.
2082. R. Shaw and J. Clayton.
2084. A. V. Newton.
2088. W. R. Lake.
2098. G. Alder.
2101. W. Brookes.
2102. W. Brookes.
2103. W. Brookes.
2117. E. Pavy.
2119. A. M. Clark.
2120. A. M. Clark.
2131. M. Henry.
2140. A. M. Clark.
2194. T. Travis, W. H. Prince, and J. Tomlinson.
2274. E. Beanes.
2375. E. Herring.
2716. W. C. Green.
2838. J. Edmondson.
2869. J. H. Johnson.
2877. H. Vansittart.
2970. J. Gregory.

Patents on which the Stamp Duty of £50 has been paid.

3267. H. C. Ensell.
3247. G. Warriner.
3269. R. A. Brooman.
3265. C. Liddell & R. S. Newall.
3290. J. Martin.
3319. G. T. Bousfield.
3300. H. A. Bonneville.
3306. G. Hawksley.
17. H. Hirsch.

Patents on which the Stamp Duty of £100 has been Paid.

3197. J. Redfern.
3177. J. M. H. A. Taurines.
3183. E. Stott.

Journal of the Society of Arts.

FRIDAY, JANUARY 1, 1869.

Announcements by the Council.

FINAL EXAMINATIONS, 1869.

Notice to Institutions and Local Boards.

In order to avoid holding these Examinations on the same evenings as those of the Department of Science and Art, it has been decided to hold them, in 1869, on the evenings of

TUESDAY,	**the 20th APRIL,**
WEDNESDAY,	**the 21st ,,**
THURSDAY,	**the 22nd ,,**
FRIDAY,	**the 23rd ,,**

From 7 p.m. to 10 p.m., instead of on the 27th, 28th, 29th, and 30th April, as announced in the Programme of Examinations for 1869.

In consequence of this alteration the Previous Examinations must be held earlier, and the Forms No. 2 and No. 4, referred to in par. 6 of the Programme, must of course be sent in a week earlier than the dates there fixed for receiving them.

It is very important that this alteration should be made as public as possible. For this purpose a number of small slips, to be inserted between pages 8 and 9 of every Programme sent out, have been forwarded to each Institution and Local Board. They should also be specially sent to any person to whom Programmes may have already been forwarded.

Large bills, to be suspended on the walls of the Institution reading-room, or in some other public place, will also be provided.

Subscriptions.

The Christmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Food Committee.

The Committee met on Wednesday afternoon, 9th December. Present—Mr. Benj. Shaw (in the chair), Mr. G. F. Wilson, F.R.S., and Mr. Edward Wilson.

William Shand, Esq., of St. Cloud, attended to give information to the Committee relative to an invention for the preservation of meat, fish, &c., by means of refrigerated air.

Mr. Shand said—The object of my visit to-day is to bring under the notice of the Committee an invention with which I am connected, which it is proposed to apply to facilitating the supply of fish, more particularly, to the great markets of Europe. The principle on which this invention is based is that of the refrigeration of the atmosphere by artificial means, which I will describe hereafter. The invention is, I think, an important and interesting one as being decidedly applicable to the preservation of meat as well as fish; but as I believe that question is before the Committee in some other form, I will not enter upon it, but will confine myself chiefly to the question of fish. I may here mention that this matter did not present itself to my mind in the first instance with respect to the preservation either of meat or of fish. The refrigeration of the air presented itself to my mind in connection with steam navigation, particularly through tropical latitudes, where, as you are aware, steam navigation is carried on under great disadvantages to many persons who are employed in it, particularly the engineers and stokers, as well as the passengers and crews in general. The refrigeration of the atmosphere as well as the ventilation of ships under such circumstances, is, therefore, a matter of great importance. In the application of the invention to the purpose I have just mentioned, I have given it the title of "A Special Climate." We propose to refrigerate the atmosphere to any degree that may be required, by means of which vessels may navigate the tropics with a temperature of air in the cabins and sleeping apartments at once cool and refreshing to the occupants of them. But the particular question with respect to which this Committee, I apprehend, is chiefly interested, is that of facilitating an increased supply of fish to our markets. During my residence in France, I have observed that the fish market at Paris is very irregularly supplied. In the course of the investigations I made on this subject, I came to the conclusion that a very great advantage would be conferred not merely upon France, but upon the inhabitants of Europe generally, if we could apply this invention for the refrigeration of the air to the transport and preservation of fish. I find that in France all the fish, and in England the great bulk of it, is brought to market by railway, a very advantageous mode of carriage when you require great rapidity, but expensive. I found also that there was sometimes a great loss of fish in consequence of the difficulty and expense of transit, and the necessity for packing in ice for conveyance to market. It was stated in evidence before the British Parliamentary Commission, that in 1863 some of the fishing vessels threw away ten tons of haddocks per day in the North Sea, because they had not a sufficiency of ice, and the cost of ice was too great to make it worth while to bring them to the market. The supply of fish to Paris is sent entirely by railway. Water communication is not at present in a state to allow of fish reaching Paris in that way, but I propose to apply this invention to steamers on the Seine, so as to bring up fish at a cheap rate. I found there were certain other advantages to be gained in carrying out that idea, the principal of which was this—You have at the market on one day a large supply of fish, and on other days, when the weather is bad, there is little or no fish at all at market. In consequence of that state of things in Paris, and to a large extent in London also, I believe that the consumption of fish generally is very much reduced. Sometimes it is not to be had, whilst at others a larger quantity of fish than the market can take up is thrown upon it. There is often a great loss of fish, no doubt, through its getting bad at the time of such gluts, before it can be consumed by the population. On the other hand, when the supply is very scanty, the price runs up to such a figure that it can only be obtained by the wealthy classes. I therefore propose, in connection with my refrigerating apparatus, not merely to transport the fish from the localities where it is caught in steamers to which

this apparatus should be applied, and which could be brought up the Seine, the Thames, the Rhine, and other rivers, but also to form depôts at certain spots—as, for instance, on the quay of the Seine, close to the wholesale market in Paris, where I could retain my stocks of fish when I found that the supply was beyond the requirements of the market, and where I should be able to keep it until it could be sold to advantage. That I regard as a collateral advantage of the refrigeration as applied to the preservation of fish. It is applicable, as I have already stated, not only to fish, but to meat, butter, eggs, and many other articles of food, of which the supply in the markets is occasionally very large, and altogether beyond the requirements of the public, and at others is deficient. I go on to observe that I have studied the subject in another important aspect. The opinion is decidedly held in France, amongst those who have studied the question, that the coast fisheries are being exhausted. Perhaps I may be allowed (continued Mr. Shand) to make a few very short remarks upon the history of these sea fisheries. The sea fisheries of Europe took their earliest development in the Mediterranean, the Gulf of Lyons, and the sea coast around Marseilles—all once famous for their enormous wealth of fish. There has been a gradual decrease in the take of fish on these shores. Down to the present day the fish is continually decreasing; the population dependent on fishing for a living is decreasing; and, in point of fact, the fisheries are being exhausted. The same state of things may be distinctly predicated of many other parts of the coast. The report of the British Fisheries Commission shows that the fish upon our coast—the immediate shore of the country—are decreasing, so much so, that fish which were formerly caught by lines cannot now be so taken in any quantity, and the great bulk of fish is now taken by the trawl further at sea. The trawl fishers maintain that that system does not destroy the fish, but, on the contrary, more fish come after their nets, from their stirring up the bottom, and supplying them with more food. That may be the case; and as the Commissioners report, the necessity for the supply of fish is so great, they cannot stop trawl fishing, because there are no other means sufficiently efficacious of obtaining it. The effect of trawl fishing in the Mediterranean (which is the original seat of trawl fishing, where it has its own peculiar fashions) has been unquestionably to destroy the fishery along that coast, and the French authorities—not only scientific but practical men—are united in opinion that the fisheries are being worked out everywhere on the coast. The same causes which have operated in the Mediterranean equally apply to the North Sea. Seeing, then, there is this decided opinion on the part of the French authorities, that the existing fisheries are being exhausted, the invention I am speaking of will, I think, come in to facilitate the working of valuable fisheries at greater distances, from whence, without some such means as these, you could not possibly transport the fish in a fresh state. I will now, with the permission of the Committee, proceed to describe what this particular apparatus is we propose to apply for facilitating the transport and conservation of fish. It is just simply this—instead of employing ice, we have an apparatus for refrigerating the air. We reduce the temperature of the air down to about freezing point by a special apparatus, and we maintain the air at that particular point by the action of the apparatus, at the same time preventing as much as possible the infiltration of heat into the chamber refrigerated. It is proposed to apply this refrigerating apparatus to ships specially constructed for the transporting of fish. You enclose the space in which you wish to put the materials to be preserved by walls as impervious as possible to the infiltration of heat, and you may work your refrigerating machine either inside or outside this chamber, and by that means you constantly keep up a cool temperature in it. The fish may be laid in baskets, piled one above another, or in the case of meat the carcases may be hung up and they will remain good I cannot say how long. I may state that in Paris we have kept fresh fish for three weeks without deterioration. Legs and other joints of mutton have been hung from seven to nine weeks without the smallest appearance of decay, and after their removal from the chamber they have been kept for thirty-six hours in the air before being cooked without experiencing any deterioration whatever. Fish which had been kept for a fortnight was cooked at a restaurant in the Palais Royal with other fish bought at the day's market and there was no perceptible difference between the one and the other. The apparatus is in itself a very simple affair, consisting of a cylinder of cast-iron, very much resembling the boiler of a locomotive steam-engine, cast-iron answering the purpose, as the pressure is not very great. There are tubes running through the centre of the cylinder, similar to the smoke tubes of a locomotive engine. A pump is applied to it to exhaust the vapour of the volatile liquid which is placed inside the cylinder. M. Tellier, the inventor of this apparatus, places within his cylinder liquid ammonia, although, I believe, he gives the preference to methylic ether, of which, if he is not the discoverer, he claims to be the only person actually preparing it, but in consequence of the objection of insurance companies to the use of ether on board ship, he has employed ammonia instead. There are other liquids which can be used for the same purpose, provided they are volatile. The liquid placed within the cylinder passes naturally into a state of vapour. The action of the pump withdraws that vapour, as it is produced, on the one side, and condenses it—that is, applies pressure to it—on the other side, within certain pipes, which convey it, while it is under compression, through a worm, like that of a still, when it returns to the liquid state. As the ammonia, or other volatile substance, is restored to the liquid state, it passes back again to the cylinder, and not a drop of it is wasted. The same liquid is applied over and over again. The only power required is that necessary to work the pump, and a ventilator or fan to give motion to the air in course of refrigeration. M. Tellier's mode of application of the apparatus to the hold of a ship, or a room, or a cellar fitted for the purpose, is by means of two tubes, one passing the air into the chamber at the bottom, the other withdrawing the air at the top. Between the withdrawal and the return the air passes through the cylinder by means of the tubes. During its passage it parts with its heat to the ammonia within the cylinder, which absorbs it. The motive-power required is something very small, but dependent, of course, upon the quantity of air you want to refrigerate. All the power required is that which is sufficient to work the pumps, and to keep up the motion of the air through this chamber. These are the general features of the invention. By means of this arrangement I propose not only to bring large quantities of fish to Paris, but to distribute it into the interior of Europe. I consider we have in this invention not only the means of bringing fish from the coast of Africa, where there are the richest known fisheries in the world, but also of transporting it to South America, where it is largely consumed by the Roman Catholic populations, or to New York, or the West Indies, where fish is much in demand, and by this means a large field is opened for the supply of a very valuable article of consumption.

Mr. E. Wilson—Does this operation differ much in its mode of action from that employed in the manufacture of ice?

Mr. Shand—M. Tellier has an apparatus for producing ice. I was in Paris and wished to carry out my process, and M. Tellier was recommended to me as a person who was likely to facilitate my views. I found that in addition to machines for the production of ice he had also one for the refrigeration of water, as applicable to the cooling of the liquor in breweries. I believe one of these is in operation at Bass's Brewery, at Burton-on-Trent, by means of which the liquor is rapidly cooled to the required temperature.

The Chairman—Are you aware of the proposed Australian process of conveying meat inside cylinders, and reducing the temperature by the evaporation of ammonia?

Mr. Shand—I have heard of it within the last few days; but I understood the plan there was to freeze the meat.

The Chairman—They propose to reduce the temperature artificially to the freezing point, free from contact with ice.

Mr. Shand—I have received a communication from M. Tellier, in which he gives the price of his apparatus. He informs me that for a machine to cool 200 cubic metres of air per hour he charges the price of 3,500frs., and for 400 cubic metres per hour 4,500frs. I have understood from M. Tellier that he considers you should have a machine of sufficient force to cool the air every hour—that is, whatever space you require to cool you should have force sufficient to reduce the temperature of all the air within that space once every hour from that of the surrounding atmosphere to the degree of cold required. The price of the apparatus for 8,000 cubic metres per hour is 27,000 frs. The mechanical power required for the first size, or 200 cubic metres, is half-horse power, and so on up to 12-horse power for the largest size machine. The only expense of conducting the operation is the wages of the men in attendance, coal, and the repairs of the machine. The ammonia is used over and over again, requiring no renewal, so that the cost of that is a bagatelle. I may state that M. Tellier has already fitted up an apparatus for a vessel intended to navigate the Amazon River in connection with the transport of fish.

The Chairman—Can you reduce the temperature to the freezing point by means of this apparatus?

Mr. Shand—I have no doubt we can reduce it much lower than that. The temperature is proposed to be kept about freezing point, but M. Tellier has assured me he can get a much lower degree of temperature than freezing point. If it were desirable to freeze the meat it is quite possible to do so by these means; but seeing that the freezing of meat is detrimental to it, we have not gone to that extent of refrigeration. We do not desire to go beyond the point necessary for perfect conservation. The experiments of M. Tellier with fish, &c., extended over two months. I believe a vessel is at present being fitted with the apparatus for bringing meat from Monte Video to London.

The Chairman suggested that members of the Committee would be glad to have an opportunity of inspecting it, and

Mr. Shand replied, he should be happy to introduce them to M. Tellier's agent in London. He expressed an opinion highly favourable to the success of this process in the bringing of meat from long distances.

In reply to a question by Mr. E. Wilson, as to the probable cost of fitting up spaces for the application of the refrigerating process,

Mr. Shand stated—I wrote to M. Tellier for information on that subject, and as he has not enjoined me to secrecy, I will state what the purport of it is. I inquired of him whether there were any peculiar arrangements with regard to the isolation of the chamber, in reply to which he informs me, that in fitting up the forecastle of a ship for the purpose of this process, he introduced a layer of melted resin between the planks forming the chamber in which the articles are to be deposited, and the chamber would be completely closed, except the hatches, which gave access to it. Why he employs the layer of resin I do not know, except as an excess of caution. In America, in the carriage of meat by railway, it is isolated by charcoal in zinc receptacles. A box of ice placed in the railway van to cool the air would, I imagine, be sufficient for a few hours' journey of meat, &c. M. Tellier, as I have already stated, has machines for the production of ice which he can manufacture at something like 8s. per ton. M. Carré restores the vaporised ammonia to a liquid state by availing himself of its affinity for water, and, consequently, he has to go to greater expense to recover the ammonia to be used again. Tellier uses the ammonia perfectly pure, and water is not used to recover its vapour. I observe that there are several patents for refrigerating processes. One of them is Harrison's patent, to which Tellier's appears to me to bear some resemblance.

The Chairman, on behalf of the Committee, thanked Mr. Shand for his attendance, and for the interesting information he had given them, and the Committee adjourned.

Cantor Lectures.

"On the Aniline or Coal Tar Colours."

By W. H. Perkin, Esq., F.R.S.

Lecture I., Delivered Monday, December 7th.

Coal Tar, Benzol, Nitrobenzol, Aniline, and Aniline Purple or Mauve.

In this short course of lectures it is my desire to bring before you a somewhat condensed history of the artificial colouring matters, generally known as the "Coal Tar Colours." By this designation it is not meant to imply that colouring matters actually exist in coal tar, and may, therefore, be extracted from it, but that coal tar is the source of certain products which, when changed by various chemical processes, are capable of yielding coloured derivatives. You will thus perceive that it is important for us to consider the various means employed to obtain the raw materials before giving our attention to the colouring matters themselves. We will, therefore, at once proceed to the consideration of "coal tar;" its formation and constitution.

Coal tar consists of the oily fluid formed by the destructive distillation of coal, and is obtained as a secondary product in the manufacture of coal gas. Originally, coal tar was a great nuisance to the gas manufacturer, and it was often a problem to him what he should do with it. I need scarcely say that this state of things is now changed. In the gas works the coal is distilled in large retorts, sometimes 25 or 30 feet in length. They are made of fire-clay or iron, and several are arranged in one furnace, or oven, as it is usually termed. Each retort is fitted with an iron mouth-piece, from which a vertical tube rises, the mouth-piece also having a door fastened with a cross-bar and screw.

When in use these retorts are rapidly filled with coal by means of a proper scoop, and then the doors luted and fixed so as to be air-tight. Distillation commences immediately, as the retorts are constantly kept red hot. The gas and other products which form pass up the front vertical pipe (connected with the mouth piece), through a bend, and down into a long horizontal tube, called the "hydraulic main." Here most of the oily products condense, and as they accumulate pass on with the gas down the general main, and flow into a tank provided for their reception. These oily products constitute "coal tar." The coal gas, leaving this tar behind, passes on to the condensers, and deposits a second but smaller quantity of tar, and is then purified and stored in the gas holders. The gas, however, does not interest us now.

I am here distilling some coal in a small glass retort, the beak of which is inserted into one of the openings of a three-necked receiver. The second opening is connected with the tube, so that the gaseous products may be examined, whilst the third and lower one is fitted to a small bottle, in which you see we have already obtained a quantity of an oily fluid. This is our coal tar.

Having now seen how coal tar is produced, we will consider of what it consists. Coal tar is by no means a definite body, but contains a great number of different substances, as a glance at the following table will show:—

Table I.—Products of the Distillation of Coal.

Name.	Formula.	Boiling point. Centigr.
Hydrogen	HH	..
Marsh gas (hydride of methyl)	$(CH_3)H$	..
Hydride of hexyl	$(C_6H_{13})H$	65
Hydride of octyl	$(C_8H_{17})H$	106
Hydride of decyl	$(C_{10}H_{21})H$	158
Olefiant gas (ethylene)	C_2H_4	..
Propylene (tritylene)	C_3H_6	..
Caproylene (hexylene)	C_6H_{12}	55
Œnanthylene (heptylene)	C_7H_{14}	99
Paraffin	C_nH_n	..
Acetylene	C_2H_2	..
Benzol	C_6H_6	80·8
Parabenzol	C_6H_6	97·5
Toluol	C_7H_8	110
Xylol	C_8H_{10}	139
Cumol	C_9H_{12}	148·4
Cymol	$C_{10}H_{14}$	170·7
Naphthalene	$C_{10}H_8$	212
Paranaphthalene (anthracene)	$C_{14}H_{10}$	..
Chrysen	C_6H_4	..
Pyren	$C_{15}H_4$	..
Water	$\left\{\begin{matrix}H\\H\end{matrix}\right\}O$	100
Hydrosulphuric acid	$\left\{\begin{matrix}H\\H\end{matrix}\right\}S$	..
Hydrosulphocyanic acid	$\left\{\begin{matrix}H\\(CN)\end{matrix}\right\}S$	..
Carbonic oxide	CO	..
Carbonic anhydride	CO_2	..
Bisulphide of carbon	CS_2	47
Sulphurous anhydride	SO_2	—10
Acetic acid	$\left\{\begin{matrix}H\\(C_2H_3O)\end{matrix}\right\}O$	120
Carbolic acid (phenol)	$\left\{\begin{matrix}H\\(C_6H_5)\end{matrix}\right\}O$	188
Cresylic alcohol (cresol)	$\left\{\begin{matrix}H\\(C_7H_7)\end{matrix}\right\}O$	203
Phlorylic alcohol (phlorol)	$\left\{\begin{matrix}H\\(C_8H_9)\end{matrix}\right\}O$	..
Rosolic acid	$C_{12}H_{12}O_3$	..
Brunolic acid	..	..
Ammonia	$\left\{\begin{matrix}H\\H\\H\end{matrix}\right\}N$	—33
Aniline	$\left\{\begin{matrix}(C_6H_5)\\H\\H\end{matrix}\right\}N$	182
Pyridine	$(C_5H_5)'''N$	115
Picoline	$(C_6H_7)'''N$	134
Lutidine	$(C_7H_9)'''N$	154
Collidine	$(C_8H_{11})'''N$	170
Parvoline	$(C_9H_{13})'''N$	188
Coridine	$(C_{10}H_{15})'''N$	211
Rubidine	$(C_{11}H_{17})'''N$	230
Viridine	$(C_{12}H_{19})'''N$	251
Leucoline	$(C_9H_7)'''N$	235
Lepidine	$(C_{10}H_9)'''N$	260
Cryptidine	$(C_{11}H_{11})'''N$	256
Pyrrol	$(C_4H_5)'''N$	133
Hydrocyanic acid	HCN	26·5

This list, however, does not indicate all the constituents of coal tar, but only those which chemists have up to the present time succeeded in separating from it; moreover, when we consider how greatly coal differs in composition, and also that the products vary according to the temperature to which the coal has been submitted, it is evident that coal tar must be an almost endless source of chemical products. Many would perhaps consider this list a perfectly hopeless jumble of names impossible to impress upon the memory; but, fortunately, chemists are able to classify their products, so that this formidable array of substances may be grouped under three or four different heads only, and, therefore, their relationship being once understood, little difficulty is experienced in remembering their names.

Amongst these products, and at the lower part of this table, you will observe a substance called "aniline." This substance is of great interest to us, being one of the principal sources of the coal-tar colours. Aniline was discovered by Unverdorben, in 1826, amongst the products of the distillation of indigo, and from its property of forming crystalline compounds with acids was called "crystalline." Afterwards Runge obtained it from the distillation of coal, and, because it gave a blue colouration with a solution of chloride of lime, called it "kyanol" or blue oil. Fritzsche, still later, obtained aniline by the distillation of indigo with hydrate of potassium, and gave it its present name, derived from anil, the Portuguese for indigo. About this time Zinin discovered a remarkable reaction, by which he obtained aniline from a substance called nitrobenzol; he called it, however, benzidam. The products obtained by these different chemists were not at first known to be identical; and it was not until Dr. Hofmann investigated the subject that they were all shown to be the same body, aniline.

Zinin's process for the conversion of nitrobenzol into aniline consisted in treating the nitrobenzol with an alcoholic solution of sulphide of ammonium; this was greatly improved upon by Bechamp, who employed a mixture of finely-divided iron and acetic acid, in place of sulphide of ammonium.

This is a brief sketch of the history of aniline up to the time of the discovery of the mauve dye; it was then purely a laboratory product, and was prepared in very small quantities at the time, and only when required for scientific research. Chemists have always been desirous of producing natural organic bodies artificially, and have in many instances been successful. It was while trying to solve one of these questions that I discovered the "mauve." I was endeavouring to convert an artificial base into the natural alcaloid quinine, but my experiment, instead of yielding the colourless quinine, gave a reddish powder. With a desire to understand this peculiar result, a different base of more simple construction was selected, viz., aniline, and in this case I obtained a perfectly black product; this was purified and dried, and when digested with spirits of wine gave the mauve dye.

You will perceive that this discovery did not in any way originate from a desire to produce a colouring matter, as is sometimes stated, but in experiments of a purely theoretical nature.

After showing this colouring matter to several friends, I was advised to consider the possibility of manufacturing it upon the large scale, and was, eventually, induced to make the experiment, though, I must confess, not without considerable fear of the result, especially as my chemical advisers set before me anything but encouraging prospects. In starting this manufacture, the first difficulty was to decide upon the source from which aniline could be obtained at a sufficiently low price. It was at once evident that indigo was by far too costly a product for this purpose. Attention was therefore directed to the extraction of aniline from coal-tar, but after very numerous experiments, it was found that the difficulty of purifying it was so great, that it was not practicable to prepare it at a reasonable price from this product. There was, therefore, but one source left, namely, nitrobenzol; but to prepare aniline from this body necessitated the establishment of a new manufacture; nitrobenzol at that time not being a commercial article, and although it could be produced in small quantities without much difficulty, yet when tons were required at a limited cost many obstacles presented themselves.

Having spoken of nitrobenzol, it will be necessary, before proceeding further, to tell you something of the body it is prepared from, and also how it is made in quantity. Nitrobenzol is produced from a derivative

of coal-tar called benzol—you will see it mentioned in the list of coal-tar products. It is composed exclusively of carbon and hydrogen, and is therefore called a hydrocarbon.

Benzol was discovered by Faraday, in 1825, one year before aniline by Unverdorben. Its existence in coal-tar was first pointed out by Dr. Hofmann, in 1845 and afterwards Mansfield showed that an almost unlimited supply might be obtained from this source. Benzol is a volatile oil, boiling at a temperature of 80·8° C., nearly twenty degrees lower than water, and is also very inflammable, burning with a smoky flame. When ignited it cannot be extinguished by water, as it floats upon its surface. Its vapour, when mixed with air, is explosive. It is also very dense. This I can easily show you by decanting a small quantity of benzol vapour several times from one vessel into another, and then igniting it. Instances have been known, when distilling benzol in large quantities, and some leak in the apparatus has occurred, so that its vapour has escaped, that it has run along the ground, and been ignited by a furnace situated thirty or forty feet distant, and instantly run back to the apparatus. To illustrate this I will pour some benzol vapour into the top of a slightly inclined trough, fourteen feet long, at the lower end of which is placed a lamp. The vapour will be seen to run gradually down till it reaches the lamp, where it ignites and instantly rushes back to the top of the trough. One of the most remarkable properties of benzol is, that when cooled down to nearly the freezing point of water, it solidifies to a beautiful crystalline mass. This property of benzol is sometimes taken advantage of when it is required in a very pure state, as the impurities which accompany it are fluid, and do not freeze when cooled with ice.

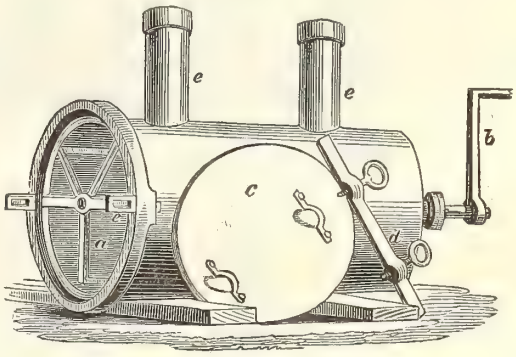
Benzol is often sold under the name of benzine collas, for the purpose of removing grease from wearing apparel. But let us consider how benzol is separated from the great number of products with which it is associated in coal-tar. The first operation consists in distilling the coal-tar, just as it comes from the gas-works, in large stills, holding one or two thousand gallons each; these are often made of old steam-boilers; at first very volatile and light oily products come over, and are collected until their density increases to such an extent that they no longer float upon water. These constitute crude coal-tar naphtha. The distillation is then carried on, and heavy, or, as they are technically termed, "dead" oils, are collected, a residue of common pitch being left in the still. This pitch is generally run out, and cast into blocks; but sometimes the distillation is carried on after the dead oils have been obtained, when a mixture of solid oily products distils, nothing but a kind of cake being left behind. These latter substances, however, do not interest us now.

The light oil, or crude coal tar naphtha, is then purified by one or two alternate distillations with steam and treatments with concentrated sulphuric acid. It is thus rendered a colourless fluid. Thus purified, coal tar naphtha contains, besides benzol, at least four or five other bodies. These, however, mostly differ from benzol in being less volatile; therefore, the naphtha is again distilled, the first, or more volatile, portions only being collected for benzol. By repeating this process of fractional distillation several times commercial benzol is obtained. Some manufacturers employ stills of a peculiar construction, which enables them to obtain a good product by a smaller number of distillations. Benzol, when treated with fuming nitric acid or aquafortis, undergoes a remarkable change. At first the two fluids mix and become of a dark brown colour and slightly warm, in the course of a few moments red fumes appear, and the mixture enters into ebullition. During this violent action the colour of the liquid becomes lighter and ultimately changes to orange. If water be now added to this product, the benzol, which is such a light body, will be seen to have completely changed into a dense yellow oil sinking in water. This oil is nitrobenzol. Nitrobenzol was discovered in 1834, by Mitscherlich. It solidifies into a crystalline mass at a temperature of about 3° C.; its odour is like that of the oil of bitter almonds, and before the introduction of coal tar colours it was made in small quantities, and sold under the name of essence de Myrbane, for the purpose of scenting soap.

From the energy with which benzol is attacked by fuming nitric acid, nitrobenzol at first appeared to be a most difficult product to manufacture on the large scale, and this difficulty seemed the greater when it was found necessary that it should be made at a moderate cost. Moreover, at the time I am now referring to, fuming nitric acid, sp. gr. 1.5, could not be obtained in the market, or only at such a cost as almost to preclude its use. Under these circumstances, two mixtures were experimented with instead of the nitric acid in a very concentrated condition. The first was a mixture of nitrate of sodium and sulphuric acid, the second a mixture of ordinary nitric acid, sp. gr. 1.3, and sulphuric acid. The mixture of sulphuric acid and nitrate of sodium was preferred, and employed on the large scale.

The first apparatus used in the manufacture of nitrobenzol, for the preparation of aniline for the mauve dye, is shown in Fig. 1. It consisted of a large cast-iron

Fig. 1.



cylinder, *a*, fitted with a stirrer, *b*, and closed with a door, *c*, fastened by a cross-bar and screw, *d*. This cylinder was capable of holding between thirty and forty gallons. It was provided with two necks, *e e*, one for the introduction of the benzol and sulphuric acid, which were supplied through a syphon tube; the other for the exit of nitrous fumes. This last was connected with an earthenware worm, to condense any benzol which might be volatilised by the heat of the re-action. The nitrate of sodium was always introduced into the cylinder before the door was fastened up and luted. Until the preparation of nitrobenzol was understood, there was a great amount of uncertainty in its manufacture, and several explosions occurred, but fortunately without causing any injury to the workmen attending the apparatus. These explosions originated generally from the liberation of too much nitric acid from the nitrate of sodium, by the sulphuric acid, before the formation of nitrobenzol had begun, so that when it started, the chemical action set in with such energy that an explosion ensued. After a few of these unpleasant occurrences, however, sufficient experience was obtained to get the manufacture under control. Apparatus of a much more extensive character has since been substituted for the cylinders. In Figs. 2 and 3 you get a view of the apparatus now used in England for the manufacture of nitrobenzol.

This apparatus consists of large cast-iron pots, *a a a*, about 4 feet 6 inches deep, and 4 feet 6 inches wide; they are arranged in rows, and provided with stirrers, worked from a shafting by means of bevel wheels. This arrangement will be seen from the section, fig. 3; the covers of

Fig. 2.

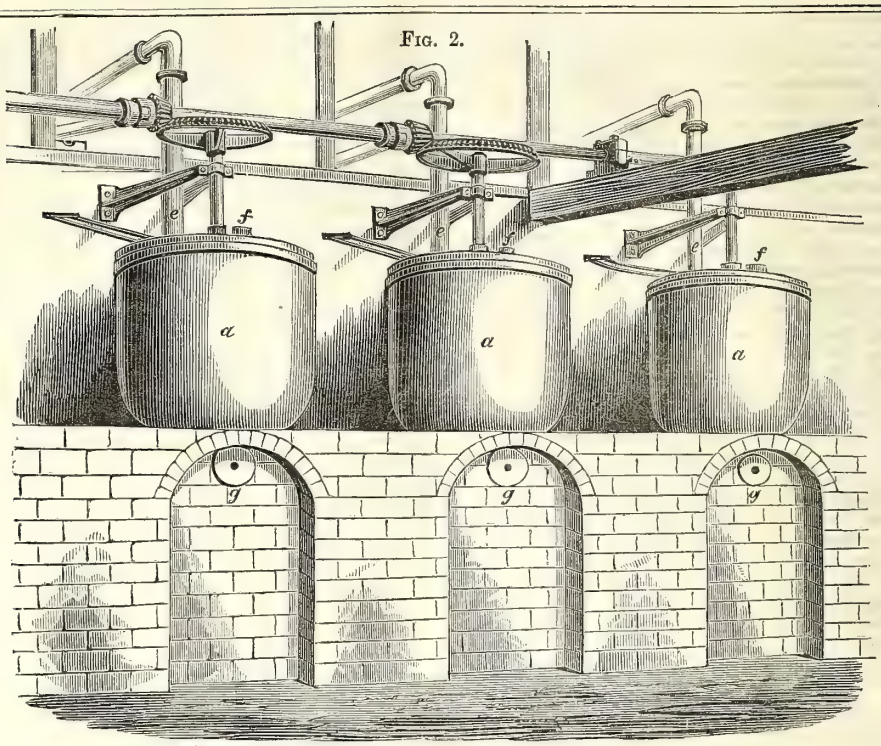
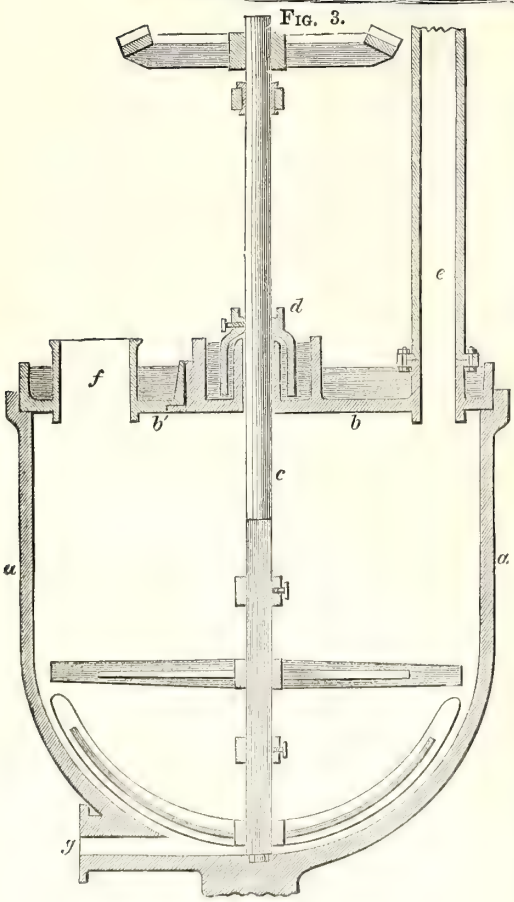


Fig. 3.



these vessels are also made of cast-iron, and are in two pieces *b b'* (Fig. 3) of unequal size, provided with a tall rim, and so arranged that cold water may be kept circulating over their surface; this assists in condensing the benzol, which would otherwise distil away by the heat of the reaction. Through the larger half of the cover the spindle of the stirrer, *c*, passes, and on account of the difficulty of keeping a stuffing-box in order when using the powerful chemicals necessary in this manufacture, a kind of water-joint has been substituted. It is necessary that it should be deep and rather capacious, as seen at *d*. Instead of filling this joint with water, which would absorb the nitrous fumes, and produce an acid solution, which would soon destroy the apparatus, the joint is filled with nitrobenzol; a cast-iron tube, *e*, passes through the lid to carry nitrous fumes; this is also cooled, so as to condense any benzol vapour which may have escaped the cooling action of the lid; small pipes are introduced through another opening for the purpose of supplying the necessary chemicals. Besides these, there is a large opening, *f*, in the smaller half of the lid, for the purpose of introducing any of the products, which may be added in large quantities at a time. At the bottom of these large vessels are openings for running out the finished product.

The process of preparing nitrobenzol with a mixture of sulphuric acid and nitrate of sodium in place of nitric acid, may be carried on very well in this apparatus, provided sufficient sulphuric acid be employed to produce an acid sulphate of sodium, as this will be found quite fluid at the close of the operation, and can be freely run out at the small outlet. A mixture of strong nitric acid and sulphuric acid is now usually employed for the conversion of benzol into nitrobenzol. In working by this latter method the entire charge of benzol is first introduced though the large opening in the lid; this is then closed and the stirrer set moving; the nitric and sulphuric acids are then cautiously run in through the small pipes, care being taken not to add too much nitric acid, until the red fumes begin to appear. After all the charge of acids has been added, and the reaction has

perfectly ceased, the product is drawn off. At first a mixture of sulphuric and nitric acids runs out, and then the nitrobenzol; this is collected separately and purified, first by agitation with water, and then rendered perfectly neutral by means of a dilute solution of soda. Should it contain any unconverted benzol this may be distilled off by means of steam. On the Continent manufacturers do not appear to have succeeded well in manufacturing nitrobenzol; when it first became a commercial article, their difficulty appears to have arisen from the fact that they experimented in earthenware vessels, which are both dangerous and unsuitable, and it was not until information was obtained from England, I believe, that they were able to produce this body at a moderate price.

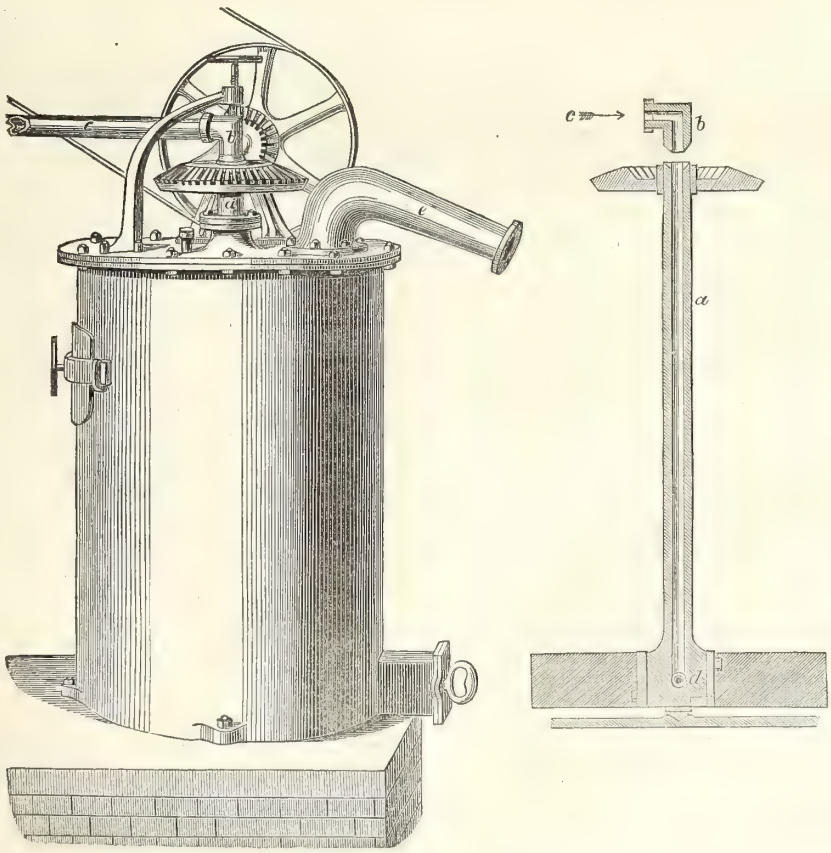
We will now pass on to the processes for converting nitrobenzol into aniline. I have already mentioned that Zinin was the first who discovered that nitrobenzol could be converted into aniline, or, as he termed it, benzidam. His process consisted in treating an alcoholic solution of nitrobenzol with ammonia and sulphuretted hydrogen; but, although the discovery of this process was one of great importance from many points of view, still it was very tedious. Bechamp, however, found that by employing a mixture of acetic acid and finely divided iron instead of ammonia and sulphuretted hydrogen, the nitrobenzol was very rapidly converted into aniline, and this process has been found the best yet proposed for manufacturing aniline in large quantities. Many other reagents have been suggested, as arsenite of sodium, powdered zinc, &c., but none of them have been found so advantageous as iron and acetic acid.

In carrying out Bechamp's process, cylinders like those used for nitrobenzol (Fig. 1) were originally employed. The cylinder was set in brickwork, and heated by means of a small furnace, iron borings were first introduced, and the door fixed in its place air-tight. One neck was connected to the upper extremity of a cast-iron worm by means of a pipe called an adapter; the second neck being fitted with a syphon-tube, for the introduction of the nitrobenzol and acetic acid. In working on the large scale it is necessary to add the nitrobenzol and acetic acid in small quantities at a time, otherwise the reaction is so violent as to almost burst the apparatus: by working carefully, however, there is no need to fear any difficulties, especially if the stirrer is well used. By the time all the charge has been introduced, a quantity of fluid will have distilled over; this is returned into the cylinder and the fire lit, and the aniline distilled off.

The principal change which has taken place in this process consists in using high pressure or superheated steam for the distillation instead of fire, and working the apparatus by means of a steam-engine instead of by hand. In Fig. 4 is shown a sketch of the apparatus now generally employed for the preparation of aniline.

You will observe that the stirrer, which is worked by bevel wheels, has a hollow shaft or spindle, *a*, as seen in the section. This is ground to an elbow, *b*, connected to the steam main, *c*, and held down by a screw, so that when the steam is turned on, it passes through the hollow elbow down the shaft, and then blows out at the bottom, *d*, among the products; and in this manner the aniline is volatilized, and passes with the steam through the neck, *e*, and is condensed by a worm, not shown in this drawing. Aniline thus obtained is generally redistilled,

Fig. 4.



and sometimes with a little lime or caustic soda, for the purpose of decomposing a body called acetanilide, which is often produced in the manufacture of aniline, especially if the operation is conducted over a fire instead of with steam.

Commercial aniline generally appears of a pale sherry colour; when chemically pure, it is colourless, but if kept long it becomes quite brown. It possesses a peculiar odour, which is slightly vinous when the aniline is pure. It burns with a smoky flame, but is not very inflammable; its boiling point is 182° C. One of its most characteristic re-actions is its power of producing a blue or blue violet colouration with chloride of lime, to which I shall again have occasion to refer. Aniline differs entirely from benzol and nitrobenzol, being perfectly soluble in dilute acids. This is owing to its being an organic base, and forming compounds with acids. Thus with hydrochloric acid, it forms hydrochlorate of aniline; with sulphuric acid, sulphate of aniline, &c.

We will now, in a very rapid and general way, glance at the chemical changes which take place in connecting benzol with nitrobenzol and aniline.

Benzol, as I have already stated, is a hydrocarbon, *i.e.*, a body composed of hydrogen and carbon only; it is represented by

$$C_6 H_6$$

This is treated with nitric acid, which contains

$$H N O_3$$

The nitric acid acts upon the benzol and introduces its nitrogen and part of its oxygen, at the same time removing hydrogen and forming water.

$$\underbrace{H N O_3}_{\text{Nitric acid.}} + \underbrace{C_6 H_6}_{\text{Benzol.}} = \underbrace{C_6 H_5 N O_2}_{\text{Nitrobenzol.}} + \underbrace{H_2 O}_{\text{Water.}}$$

Nitrobenzol, when treated with iron and acetic acid, is converted into aniline by the influence of hydrogen gas, in what is termed the nascent state, or the peculiar condition in which it is when being liberated from a compound.

This hydrogen unites with the oxygen of nitrobenzol and removes it as water, and at the same time two atoms of hydrogen combine with the deoxygenated nitrobenzol, forming aniline.

$$\underbrace{C_6 H_5 N O_2}_{\text{Nitrobenzol.}} + H_6 = \underbrace{C_6 H_7 N}_{\text{Aniline.}} + 2 H_2 O$$

Having now seen the various operations which require to be performed for the production of aniline from coal tar, we are prepared for the consideration of its coloured derivatives. We will, therefore, commence at once with the first of the coal tar colours, "the mauve dye." I have already given you the history of its discovery; I will now tell you how it is made.

First of all aniline and sulphuric acid, in the proper proportions for the formation of sulphate of aniline, are mixed in a large vat with water, and boiled until perfectly dissolved. Bichromate of potassium is then dissolved in a second large vat. These two solutions, when cold, are mixed in a third and still larger vessel, and allowed to stand one or two days. In this way a large quantity of a fine black precipitate is formed; this is collected upon shallow filters, well washed with water, and then dried. When dry it is a most unpromising sooty-black powder, and contains various products besides the mauve; the most troublesome of these is a brown, resinous product, soluble in most of the solvents of the colouring matter itself.

At first this resinous substance was removed by digestion with coal tar naphtha previously to the extraction of the colouring matter, which was afterwards effected with methylated spirits of wine, and the solution thus obtained when distilled left the mauve as a fusible bronze-coloured mass.

When digesting the black precipitate with naphtha or strong spirits of wine, the operation had to be performed in closed vessels under pressure or in connection with a condensing arrangement, otherwise large quantities of these valuable solvents would have been lost, and great difficulty was experienced in getting apparatus perfectly tight, on account of the "searching" character of these fluids. Substitutes had also to be found for the ordinary materials employed by engineers for making good manhole joints, and a number of other matters which are apparently of but small importance, but it is remarkable the amount of difficulty and annoyance they caused. The method of extraction has, however, been materially improved upon by substituting dilute methylated spirits of wine for strong, as this weaker spirit dissolves only a small quantity of resinous matter but all the colouring matter, so that the digestion with coal tar naphtha is now found unnecessary.

The solution of the colouring matter in dilute spirit is placed in a still and the spirit distilled off, the colouring matter remaining behind in aqueous solution; this is filtered and then precipitated with caustic soda. It is afterwards collected on a filter, washed with water, and drained until of a thick pasty consistence, and, if necessary, dried.

The solid mauve dissolves very freely in spirits of wine, forming an intensely coloured solution; it is also soluble to a small extent in water, but the aqueous solution on cooling forms a kind of jelly.

The formation of the mauve or aniline purple by the action of bichromate of potassium upon sulphate of aniline is a process of oxidation, and since the publication of the original specification at the Patent Office a great number of patents have been taken out for the preparation of this colouring matter, in which the bichromate has been replaced by other oxidizing agents, as peroxide of lead, permanganate of potassium, peroxide of manganese, chloride of lime, ferrocyanide of potassium, chloride of copper, &c.; but I need not make any special remarks upon these various processes, as experience has shown that bichromate of potassium and a salt of aniline, the reagents first proposed, possess advantages over all others, and are now nearly universally employed for the preparation of aniline purple. The next best process appears to be that of Dale and Caro, in which chloride of copper is employed.

The affinity of aniline purple for silk or wool is very remarkable, and if I take some wool and pass it through a solution of mauve, you will see how rapidly it absorbs it, even from a very dilute solution. Aniline purple is sent into the market in three different conditions, in paste, in solution, and in crystals; but the latter are very rarely employed, as they are very expensive and do not offer corresponding advantages to the consumer.

The mauve is the most permanent coal-tar purple known, especially with respect to its power of resisting the action of light.

I will now endeavour to give you some idea of the approximate amount of the various products we have considered obtainable from 100lbs. of coal, and for this purpose I have arranged them in the following table with their respective weights:—

	lbs.	ozs.
Coal	100	0
Coal-tar	10	12
Coal-tar naphtha	0	8½
Benzol	0	2¾
Nitrobenzol	0	4¼
Aniline	0	2¼
Mauve	0	0¼

You see the smallness of the amount of colouring matter obtainable from coal or coal tar; but there is fortunately one thing which, to some extent, compensates for this, and that is the wonderful intensity of this colouring matter. I will illustrate this remarkable fact. I have here a large carboy containing nine gallons of water, and will now add to this a solution containing one grain of mauve, and illuminate the liquid with the

magnesium lamp, and you see the single grain has coloured this large bulk of water. A gallon of water contains 70,000 grains, therefore nine gallons contain 630,000 grains. This solution, then, contains only one part of mauve to 630,000 of water.

I have now shown you the manifold operations which have to be performed before we can derive the mauve from coal tar, and have also mentioned a few of the obstacles which had to be overcome before its manufacture on the large scale could be accomplished. We have thus laid the ground work of our subject, and in our next lecture I hope to tell you a little more about mauve, and then give an account of the many other colouring matters of which it may be considered the parent.

Proceedings of Institutions.

City of London College Evening Classes.—The meeting for distribution of prizes and certificates gained at the annual examinations of the College, the Society of Arts, and the Government Department of Science and Art, was held at eight o'clock on Monday, December 7th. Mr. Alderman and Sheriff Cotton distributed the prizes. The Rev. Charles Mackenzie moved a vote of thanks to the Society of Arts, for the liberal encouragement received at their hands. Mr. Edward Clarke, barrister-at-law, seconded the motion. Votes of thanks were moved to the honorary examiners, to the College, and to the Rev. the Principal. A vote of thanks to Mr. Alderman and Sheriff Cotton, for presiding, brought the proceedings to a close.

THE MEYRICK COLLECTION OF ARMS AND ARMOUR.

(*Continued from page* 92.)

The targets in the upright black glazed case, placed at the commencement of the space allotted to the reign of Queen Elizabeth, are wonderful pieces of work. The two lower ones are of leather, and the two above them are of metal. It is much to be regretted that the former possessor of the collection, anxious to preserve these fine art-works from the bad effects of rust or damp, employed varnish, with which the targets have been thickly coated, greatly to the detriment of the engraved work. The target edged with silver and silk fringe belonged to Charles V., and is of Italian work, 1550, A.D. The surface is covered with numerous representations, consisting of the signs of the zodiac, illustrations of events in the Bible, classical and mythological subjects, and historical incidents of the reign of Charles V. The other, a steel target, is in low relief, probably from a design of Giulio Romano or Primaticcio, the subject of the design being the retreat of the British army under the Duke of Suffolk, 1523. Before quitting this case notice should be given to the aperture in one of the embossed leather targets, made to permit light from a lamp to be thrown upon an attacking foe. Three mounted figures in the bay devoted to the reigns of Edward VI. and Philip and Mary, are the most prominent objects. The first one is peculiarly interesting for the simplicity and almost ungraceful appearance of the various parts of the suit. The very high martonière is striking; but this form appears to have been the one adopted at this time, as other helmets and martonières at the back of this bay show. The brass fittings to the horse's bit and stirrups are unusual. The second figure is in a suit of armour known at the period as a suit of "Splints." It is of bright steel, studded with nails, and indentated. A most gorgeous suit is the last one of these three figures. Groupings of musical instruments, arms, human figures, and other devices, interlaced with arabesques, render the decoration of this suit most rich and refined. The work is Italian, 1560. It may be here interesting to remark the transition from the round knob at the butt of pistols at this period to the pear-like form given to them about the time of Charles I. The trophy of pistols in this, the 4th bay, contains many examples of the round form of butt. On the walls are fixed halbards, glaives, &c., which, unlike the ancient "spetums" and "morning stars," were chiefly for use on state occasions, pageants, &c. The pikes and poleaxes placed in the stand of halbards, &c., show one of the kinds of portable weapons employed in Edward VI.'s reign. A very noticeable, but unfortunately incomplete, set of engraved and damascened steel armour, mounted on a red board, is exhibited against the wall. The gauntlet belonging to this set is said to be of immense value, chiefly on account of its rarity in size and form. There are many excellent examples of Italian repoussée work placed on the wall, particularly a breast plate and champfront. Attention should be given to the beautiful engraved suit of Nuremburg work in this bay, and in fact to the numerous excellent specimens of engraving which abound almost throughout the whole of the collection.

At the head of the division, between the fourth and fifth bays, is a case containing some exquisitely-carved hunting "prodds," below which is a series of fine Italian high-combed morians. The two on the right are splendid examples of the repoussée and damascened arts. Probably the principal feature of the portable arms belonging to Elizabeth's reign is the rapiers and rich ornamentally-pierced hilts which prevail in all the arrangements of arms on the wall. Of shooting arms there is a handsome ivory cross-bow, with the original red silk tufts attached, a good sprinkling of hunting prodds; at one end of the bay an awkward-looking gun, weighing upwards of 20lbs., and at the other a "dag," with the barrel totally disproportionate to the butt—at least according to modern ideas of muskets. The halbards of this period are finely engraved. "Military forks" were introduced about this time, and there are a few examples of them in the stand of bills and pikes. The lasting properties of leather are exemplified in the bay, by the one or two original sword-hangers, still in good preservation; these portions of military equipment are rarely to be met with. The present ones, in addition to their artistic interest for the connoisseur of stamped leather, have an attraction for the *curioso* as well. The morians, some with high combs and helmets, of this period are excellent. In a flat glass case, at the back of the bay, are some fine works of art, especially the pierced stirrups, an embossed breast-plate, and a portion of horse armour to fit on the tail—"a croupier." In the second half of the bay, on the wall, are some stilettos and small daggers, the blades of which can be provided with poisonous matter. These are called "misericordes." A sword, with a small firelock and barrel at the hilt, said to have belonged to a Doge of Venice, is exhibited at the centre of this bay. The semicircular arrangement of rapiers, radiating from a shield in repoussée work, is striking, and forms a good trophy with the elaborately inlaid pistols, dags, &c., in the case below. Of these latter, one with a hideous dragon's head at the muzzle (from which originated Dragoon Guards), and the "Demi Haque," with wheel lock, are perhaps the most curious. The mounted figures, two of which are in jousting suits, and, in fact, represented as tilting or jousting at a tournament, may be taken as the three representatives of armour belonging to the Elizabethan time. The "vambraces," or shoulder guards, on the two tilting figures are very curious, and appear to be of an exaggerated size. The "vambrace" of the second figure —a Bavarian suit of armour—is particularly remarkable, on account of the coarse ribs, which are the leading feature of the Bavarian arms, as well as being an additional protective property to the piece of armour. The "manefere" on the first horse is of open work steel, and a band of twelve bells is hung round the neck of the horse. The third figure is in an extremely finely-engraved and gilt suit. The bit of the horse is or-

namented with brass bosses; and the stirrups and muzzle, similar in work to some shown on the wall, are of pierced-work, which is an effective mode of decorating the trappings. Leaving this bay, the most important artistic works, namely, the "Ferrara" suit and another one, both of the finest repoussée work, demand the greatest attention. The shape of these pieces of armour, admitting as they do, with great advantage, of a fine display of the highest decorative art, is, however, very poor when compared with the earlier breast-plates, helmets, &c., particularly those already mentioned of the reign of Henry VIII. Some authorities attribute the work of the gilt suit to Benvenuto Cellini, but for this statement there is no authentic reference known. To furnish an accurate description of these fine works would occupy the space of several columns in this *Journal* if dealt with from an æsthetic and critical point of view. It will be sufficient perhaps at present to call the special attention of visitors to these suits of armour, not omitting the damascened steel baton at the foot of the case. The damascened work consists of ten columns of minute figures, and the baton itself is hollow, to contain the muster-roll of an army. It originally belonged to the famous Duke of Alva.

(*To be continued.*)

Fine Arts.

Fine Art Exhibition at Bordeaux.—The exhibition of works of fine art is announced, by the Bordeaux Society of the Friends of Art, to take place in March next, and the committee adds to the announcement of the coming exhibition an acount of the results of the past. Last year, it appears, the Emperor presented the society with the sum of a thousand francs; the Conseil Général of the Department of the Gironde voted 1,500 francs; and the municipal council of Bordeaux, 3,000 francs, besides placing the gallery at the disposition of the society. The society has organised seventeen exhibitions, and counts more than seven hundred members, who have subscribed in all one thousand and ten shares of one pound each. The last exhibition, open from 21st March to the 23rd May, 1868, contained 636 works, of which 187 were purchased for the sum of 89,321 francs, or nearly £3,573. The total cost of the purchases made since the establishment of the society, that is to say at the seventeen exhibitions, has amounted to 821,900 francs, or £36,876. Thirty-four of these purchased works, costing nearly four thousand pounds, have been placed in the museum of Bordeaux.

Electrotype Ornaments. — The galleries of Greek and Roman sculpture in the Louvre have been largely increased and embellished of late, and amongst the ornaments introduced are a number of bas-reliefs, round bosses, and allegorical figures, covered with a coating of metal, the work of M. Cossinus. The effect of these electrotype bronzes is extremely rich, while the cost is trivial compared with real bronzes.

Manufactures.

Proposed Dutch International Exhibition.—On Tuesday, the 29th December, a deputation waited upon the Lord Mayor at the Mansion-house, for the purpose of bringing before him the subject of an international exhibition of domestic economy, which is proposed to be held at Utrecht in August and September next. The deputation consisted of Baron Mackay, from the Hague; M. Everwyn, Chargé d'Affaires, and Mr. J. W. May, Consul-General of the Netherlands; the Rev. William Rogers, rector of Bishopsgate, and Mr. Le Neve Foster, Secretary of the Society of Arts. The Netherlands Society of Manufactures and Industry have undertaken the conduct of the matter; and the Netherlands government has requested its chargé d'affaires in this country to use his best endeavours to further the objects in view. The principal aim of the exhibition is to bring to the knowledge of working men such articles of household use, furniture, dress, food, work, and instruction of different countries, as at low prices combine usefulness with solidity, so that they may be enabled by judicious economy to improve their condition. Articles of luxury as well as of elegance strictly so called will be excluded, and in this point of view it is thought the exhibition will derive great advantage from the countenance and assistance of co-operative association in the collection of reports, statutes, and regulations of different societies for promoting the well-being of the working classes. A central committee has been organised at the Hague, having for its president Baron Mackay, who is now in London, promoting the objects of the proposed exhibition. With that view he has attended a meeting at Manchester, presided over by the Mayor, and also at Glasgow, at which the Provost was present, and much success has thus resulted in making known the objects which it is hoped to attain in the cause of the working classes. The deputation at the Mansion-house was introduced to the Lord Mayor by Mr. Goschen, the President of the Poor-Law Board. The Lord Mayor evinced much interest in the views of the deputation, and promised to co-operate in giving them effect, for which purpose a committee is now in course of formation in the City.

Bleaching of Wood-pulp for Paper.—M. Orioli, a French chemist, says, in the *Revue hebdomadaire de Chimie*, that the chloride of lime, if the dose is the least in excess, has a tendency to give a yellow tinge to the pulp; that all energetic acids, without exception, tend to give a reddish colour to the paper when exposed for a long time to the effects of the sun or of moisture, and that the least trace of iron is sufficient in a very short time to blacken the pulp. He says he has succeeded in avoiding all these inconveniences by the use of the following mixture:—For a hundred-weight of wood-pulp, he employs 400 grammes (four-fifths of a pound) of oxalic acid, which has the double advantage of bleaching the colouring matter already oxidised, and of neutralising the alkaline principles which favour such oxidation; he adds to the oxalic acid one pound, or a little more, of sulphate of alumina, entirely deprived of iron. The principal agent in this mode of bleaching is the oxalic acid, the power of which over vegetable colouring matters is well-known; the alum has no bleaching power of its own, but it forms with the colouring matter of the wood an almost colourless lake, which has the effect of increasing the brilliancy of the pulp.

Silk Manufacture at Zurich.—In 1855 the number of silk looms at work in the canton of Zurich was 25,290, employing 32,862 weavers. During the most prosperous years of the silk trade, from 1858 to 1860, the number was 28,000, employing 37,000 weavers. Since then there has been a great falling off in this manufacture, and in 1867, though more active than the preceding years, the total number of silk looms was only 18,276, employing 26,883 weavers; and, although this trade is gradually improving, it will be many years before it regains its former prosperity. The total value of silk stuffs manufactured during 1855 was 8,291,406 francs, and in 1867 it amounted to 7,279,810 francs.

Colonies.

Cultivation of Cotton in New South Wales.—In Queensland two thousand acres of land are now planted with sugar-cane, and the culture of cotton has been there much more successful than in New South Wales; it has not, however, been proved that the climate or soil of New South Wales is unsuited for the production of cotton, but hitherto the attempts to establish cotton-growing in

that colony have been almost exclusively made by a large company, whereas in Queensland numerous small farmers have, in spite of repeated disappointments, successfully cultivated cotton, relying chiefly on the members of their own families for the requisite labour.

Sugar Manufacture in New South Wales.—The erection of numerous mills for the manufacture of sugar, on the northern rivers of this colony, will give an immense impetus to the cultivation of the cane. Considerable areas of land are being cropped with the varieties best suited for cultivation, and in twelve months hence a large and profitable return may reasonably be expected. Attention is also being paid to the cultivation of arrowroot and rice, branches of agriculture that may prove equally remunerative.

Victorian Railways.—There continues to be a considerable improvement in the revenue of the Government railways. The total revenue from 1st of January, 1868, to 15th October was £437,207, or a weekly average of £10,712 against £9,976 during corresponding period of last year. The weekly average returns of the Melbourne and Hobson's Bay Company's lines since the beginning of last year has been £2,328, against £2,145 in 1867.

Notes.

Scholastic Registration Association.—The annual general meeting of this association will be held at the offices, 42, Queen-square, Bloomsbury, on Wednesday, the 6th of January, 1869, at 7 o'clock, p.m., to receive the reports of the secretary, of the treasurer, and of the auditors; to elect ten members of the committee, and two auditors; and to take into consideration various notices of motion. A conference of teachers, and other persons interested in middle-class education, for the purpose of discussing the recommendations made by the Schools Inquiry Commissioners in their recent report, will be held (by permission of the Council) at the house of the Society of Arts, on the following day, Thursday, the 7th January, at 12 o'clock. The chair will be taken by the Rev. W. Haig-Brown, LL.D., Head Master of the Charter House School, and President of the Council of the College of Preceptors. The object of this conference is to give teachers generally an opportunity of expressing and comparing their views upon the general principles of the scheme recommended by the commissioners, which, although mainly directed to the organisation of middle-class education, will, if carried into operation, materially affect the position and interests of teachers of every grade throughout the country. The following is the programme of subjects for discussion:—1. Qualifications of schoolmasters; 2. Grades of schools; 3. Privileges to be granted to registered private schools; what can be done to improve private schools, and make the profession attractive to men of ability; 4. Inspection and examination of schools by a central authority; the relative advantages of inspection and examination; 5. Constitution of the proposed council of examinations; 6. Education of girls.

Proposed Tunnel under the Mersey.—On Monday, the 21st December, an influential meeting was held at the Cotton Sales-room, Liverpool, Mr. Patterson, President of the Chamber of Commerce, in the chair, when Sir Charles Fox explained the project of making a railway tunnel under the Mersey, connecting Liverpool and Birkenhead and the Lancashire and Cheshire Railway termini. Sir Charles said that the engineering difficulties were comparatively slight as compared with those encountered in making the Thames Tunnel. The preliminary expenses for the "heading," which could be afterwards used for gas pipes, telegraph wires, &c., would not exceed £20,000, and the cost of the entire tunnel, with two lines and rolling stock, would not exceed £460,000. Sir Charles alluded to the metropolitan underground railways, and pointed out that at present twenty millions of people crossed the Mersey annually. Resolutions in favour of the scheme were unanimously agreed to.

Correspondence.

Artificial Refrigeration.—Sir,—I very much regret having failed to make myself intelligible to Mr. Flower when, in reading my paper on this subject, I expressed the opinion that Mr. King was entitled to the merit of having been the first to put to the test of practical trial the idea of applying ice-making machinery to direct refrigeration, and that it is to his enterprise that those interested in the subject of artificial refrigeration are indebted for the working out of this problem. I regret this more especially since I laid particular stress on that fact as being, in my judgment, one of the most important steps yet made in reference to the use of such ice-making machines as are yet known. I was at the time fully aware that Messrs. Flower had for the past three years employed in their brewery an ice-making machine, and that they had in 1867 taken out a patent for the use of brine or other dense solution, artificially reduced to a low temperature, for cooling brewers' wort and beer, and it was after full consideration of those facts that I expressed the opinion above referred to, which Mr. Flower now calls in question. I am not now aware of any circumstance which would require me to alter that opinion. By reference to my paper it will be seen that I pointed out the advantage to be gained in certain cases by direct refrigeration as compared with ice making, and I specially illustrated the nature and cause of this advantage in the case of the ether machine, which, so far as I am able to judge, is the only machine yet before the public that is suitable for artificial refrigeration. In fact, the advantage of direct refrigeration over ice making does not obtain in the case of the air machine, with which it is as easy to make ice as to cool water, except in so far as there may be a waste by communication of heat to the brine from the surrounding atmosphere, and by the transfer of the ice from the moulds in which it is formed. But the waste from either or both sources is, or need be, only very trifling. In the ether machine, however, the case is very different, for in working at the low temperature necessary for making ice the density of the ether vapour produced in the refrigerator is only about one-third to one-half what it is when the machine is used for cooling water to say 40° F. Consequently, in making ice, each stroke of the pump transfers from the refrigerator to the condenser only one-third or one-half as much ether as at the higher temperature, and for the same rate of working the machine the vaporization of ether—which is the immediate cause of the refrigeration—is only one-third or one-half as great as at the higher temperature. This is the explanation of the difference between the results obtained by Mr. King in ice making and in direct refrigeration, and a very important difference it is, inasmuch as the efficacy of the machine is thereby increased nearly threefold. I am not aware that this fact had ever been pointed out, or that this method of working was ever suggested before its adoption by Mr. King, and so far as I am acquainted with what Messrs. Flower have done in the use of ice making machines, I do not know that they have ascertained this fact, nor do I find anything to lead me to suppose that it was involved in any method they have adopted. Therefore, I still think that the credit of having first recognised or demonstrated this fact is due to Mr. King, quite irrespective of anything he may have seen at Stratford, and of anything contained in the specification of Messrs. Flower's patent. With regard to the assumed infringement of Messrs. Flower's patent, which your correspondent asserts Mr. King "must be" practising, I will only quote for his information the following passages:—First from the specification of a patent dated the 31st May, 1867, the complete specification of which was

filed on the 30th November, 1867:—"The liquid thus cooled may be used to freeze water, *to refrigerate brewers' wort, ales*, wines, and for other refrigerating purposes. Any other liquid of a non-congealable character may be passed through the tube, but a solution of chloride of calcium is preferable, owing to its cheapness and the low temperature to which it may be reduced without congealing; air may also be cooled by passing through the tubes." Secondly, from the specification of a patent dated 25th April, 1862, the complete specification of which was filed on the 24th October, 1862:—"A continued current of a saturated solution of common salt in water, spirit, air, or other convenient fluid, not liable to freeze at the lowest temperature used, which current *may be employed to cool any other substance* at a greater or less distance from the machine." And, lastly, from the specification of a patent dated 15th October, 1860. the complete specification of which was filed on the 15th April, 1861:—"Besides the formation of ice, the cold thus produced may be applied, as already stated, to the cooling of air, liquids, and other fluids, or even solids; to preserve food or aliments which are deteriorated by a high temperature; to facilitate the crystallization and precipitation of various salts and chemical products, &c., &c. . . . . *also to moderate the heat produced by fermentation, especially of wine, beer, and vinegar.*" I need now only state that Messrs. Flower's patent for the application of cooled brine or other dense solution to cooling brewers' wort and beer is dated the 8th of November, 1867, and that the complete specification was filed on the 7th February, 1868. —I am, &c., Benj. H. Paul.

Artificial Refrigeration.—Sir,—Mr. Flower, in his letter published in your *Journal* of the 25th instant, makes the very serious charge against me of deliberately infringing his patent. On reference to the specification of his patent, I find he says, "I use brine or water in which has been dissolved sugar, or saline, or other soluble matters;" and again, "The essence of my invention consists in cooling brewers' worts by the use of brine or other dense solution." I do nothing of the sort. In Dr. Paul's able paper my process was accurately described; there is, therefore, no need for me to repeat it here. If Mr. Flower had, before writing the letter, witnessed my application of Messrs. Siebe's ice-making machine, he would have satisfied himself that his invention is not infringed; and I do not hesitate to say, that by adopting my plan in preference to his own he would save at least fifty per cent. in cost of working.—I am, &c., T. King, Engineer.

Truman's Brewery, Spitalfields, N.E., Dec. 30th, 1868.

Electric Organ.—Sir,—Mr. Barber's inventions for the transmission of sound from the organ by electricity, induce me to call attention to acoustic means of transmission of musical sound, experiments on which have been long since suspended. I published some notes in the *Mechanics' Magazine* about 1836 or 1837.—I am, &c., Hyde Clarke.

32, St. George's-square, S.W., Dec. 30, 1868.

MEETINGS FOR THE ENSUING WEEK.

Mon.....Entomological, 7.
British Architects, 8.
Medical, 8.
Victoria Inst., 8.
Tues ...Royal Inst., 3. Prof. Odling, "On Carbon." (Juvenile Lectures.)
Syro-Egyptian, 7½. Rev. John Mills, "Warren's Excavations in Jerusalem."
Pathological, 8. Annual Meeting.
Anthropological, 8.
Wed ...Pharmaceutical, 8.
R. Society of Literature, 4½.
Obstetrical, 8. Annual Meeting.
Scholastic Registration Assoc., 7. Annual General Meeting.
Thur ...Royal, 8½.
Royal Society Club, 6.
Royal Inst., 3. Prof. Odling, "On Carbon." (Juvenile Lectures.)
Society of Fine Arts, 8. Mr. T. H. Wright, "On the Music of the Harp," with Illustrations.
Fri .....Astronomical, 8.
Sat .....R. Botanic, 3¾.
Royal Inst., 3. Prof. Odling, "On Carbon." (Juvenile Lectures.)

Patents.

From Commissioners of Patents' Journal, December 25.

Grants of Provisional Protection.

Bedsteads and leg rests for railway carriages—3810—C. A. B. Pocock.
Boilers—3438—W. R. Griffiths.
Boilers—3832—S. C. Lister.
Bottle stoppers—3780—Z. Poirier.
Bridges, &c., framings and joints applicable to—3788—H. L. D. Marsden.
Copper, &c., precipitating from solutions by iron—3822—W. A. Verel and J. Cameron.
Fabrics, manufacturing looped—3820—W. Cotton & E. Attenborough.
Felt-manufacturing apparatus—3808—W. Bywater.
Fibrous materials, spinning, &c.—3794—S. W. Smith.
Files, renewing worn-out—3836—J. Thorniley and G. B. Wing.
Flour, treating—3846—J. C. Walker.
Helmets, hats, &c—3802—J. H. Brown.
Iron and steel—3842—G. H. Benson and W. G. Valentin.
Letter boxes, apparatus applicable to—3782—C. E. Brooman.
Letter boxes, &c.—3662—P. Ellis.
Locks—3796—C. E. Brooman.
Mattresses and camp beds—3814—J. Frazer and W. Naar.
Mattresses, spring—3776—A. Woods.
Metals, inlaying—3828—A. M. Clark.
Miners' lamps 3826—L. Desens.
Motive-power—3792—H. E. Newton.
Ores, &c., treating—3786—A. Prince.
Paper sheets, &c., separating, &c.—3318—W. Collins, jun.
Pigments, black or brown 2578—P. R. and W. Hodge.
Pistons—3848—J. Quick, jun., and J. Sampson.
Rocks, boring—3824—J. B. Everard.
Sewage, treating—3457—C. Jones.
Signalling apparatus—3816—T. Wilson.
Smoke, &c, consuming—3784—F. Erskine.
Steam cultivators—3830—T. Aveling.
Tailors' measures—3778—C. Ellison and E. Parkinson.
Tea-kettles—3798—J. Thomas.
Tubes or cylinders—3844—T. Inglis and T. English.
Valves—3806—A. Baumann.
Ventilating apparatus—3812—M. Lockhart.
Wool, &c., preparing—3834—S. C. Lister.

Inventions with Complete Specifications Filed.

Chimes, machinery of—3860—D. Imhof.
Cotton, &c., machinery for spinning—3861—T. Spencer.

From Commissioners of Patents' Journal, December 29.

Patents Sealed.

2093. J. Blomfield.
2094. M. Bebro, O. Hopwood, and W. Elam.
2099. R. Ward.
2100. T. Ward and W. S. Black.
2105. C. F. Crailsheim.
2109. H. H. Henson.
2111. J. D. Pinfold.
2113. E. J. Scott.
2121. A. F. Robertson.
2124. C. Roussel.
2129. J. B. Brown.
2134. A. Fryer.
2135. A. Albini.
2144. A. Fryer.
2158. G. Morton.
2170. W. Tasker, jun.
2175. T. J. Mayall.
2183. A. M. Clark.
2197. R. Mackie.
2206. A. Munro & W. B. Adamson.
2217. J. Cope and J. Bradbrook.
2219. W. Shaw.
2220. W. B. Farwell.
2314. P. Pearson.
2492. F. Le Roy.
2542. W. Shaen.
3165. W. R. Lake.
3365. W. R. Lake.

Patents on which the Stamp Duty of £50 has been paid.

3321. S. Chatwood.
5. T. Prideaux.
16. A. and W. Young.
3323. E. Clifton.
3334. G. and D. Hurn.
3350. N. W. Wheeler.
3351. N. W. Wheeler.
3353. J. Bates and E. and E. W. Brookes.
3358. R. A. Brooman.
84. R. A. Brooman.
85. R. A. Brooman.
115. N. W. Wheeler.
3338. J. Fisher.
3342. J. Rea.
3345. J. Young, jun.
3369. A. Barclay.
3336. E., J. C., and J. Lones, J. and T. Brettell, and C. Vernon.

Patents on which the Stamp Duty of £100 has been Paid.

3217. J. Rosindell.
56. H. Bessemer.
3258. J. B. Payne.
3214. J. H. Johnson.
3235. R. Needham.
3249. E. Lord.

Journal of the Society of Arts.

FRIDAY, JANUARY 8, 1869.

Announcements by the Council.

Ordinary Meetings.

Wednesday Evenings at eight o'clock :—

Jan. 20.—"On Photography and the Magic Lantern, applied to the Teaching of History. By Samuel Highley, Esq., F.G.S. Practically illustrated.

Jan. 27.—"On the Progress of the British Colonies." By John Robinson, Esq., of Natal.

Cantor Lectures.

The Second Course of Cantor Lectures for the present Session will be "On Painting," by S. A. Hart, Esq., R.A., late Professor of Painting at the Royal Academy, and will consist of Four Lectures, to be delivered as follows :—

Lecture I.—Monday, February 1st.

On the History of Portrait Painting.

Lecture II.—Monday, February 8th.

On the Practice of Portrait Painting.

Lecture III.—Monday, February 15th.

On the Suggestions offered by surrounding circumstances to the Artist.

Lecture IV.—Monday, February 22nd.

On Landscape Painting.

Each lecture will begin at eight o'clock. These Lectures are open to Members, each of whom has the privilege of introducing two friends to each Lecture. Tickets for this purpose will be forwarded in due course.

FINAL EXAMINATIONS, 1869.

Notice to Institutions and Local Boards.

In order to avoid holding these Examinations on the same evenings as those of the Department of Science and Art, it has been decided to hold them, in 1869, on the evenings of

TUESDAY,	**the 20th**	**APRIL,**
WEDNESDAY,	**the 21st**	,,
THURSDAY,	**the 22nd**	,,
FRIDAY,	**the 23rd**	,,

From 7 p.m. to 10 p.m., instead of on the 27th, 28th, 29th, and 30th April, as announced in the Programme of Examinations for 1869.

In consequence of this alteration the Previous Examinations must be held earlier, and the Forms No. 2 and No. 4, referred to in par. 6 of the Programme, must of course be sent in a week earlier than the dates there fixed for receiving them.

It is very important that this alteration should be made as public as possible. For this purpose a number of small slips, to be inserted between pages 8 and 9 of every Programme sent out, have been forwarded to each Institution and Local Board. They should also be specially sent to any person to whom Programmes may have already been forwarded.

Large bills, to be suspended on the walls of the Institution reading-room, or in some other public place, will also be provided.

Subscriptions.

The Christmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Cantor Lectures.

"On the Aniline or Coal Tar Colours."

By W. H. Perkin, Esq., F.R.S.

Lecture II.—Delivered Monday, December 14th.

Mauve, Magenta, and some of their Derivatives.

You will remember that in my last lecture we went over all the various steps between coal and colour. We saw how coal tar was produced from coal; how coal tar, naphtha, and benzol were separated from coal tar; how nitrobenzol and aniline were made from benzol, and concluded with an account of the preparation of aniline purple, or mauve from aniline. We will now proceed to the study of some of the most remarkable properties of aniline purple.

This colouring matter is sometimes supplied to consumers in a pure and beautifully crystalline condition. This product is found to be a salt of a compound, chemically termed an organic base. This base has been called "mauveine;" it is composed exclusively of carbon, hydrogen, and nitrogen, in the following proportions:—

$$C_{27}H_{24}N_4$$

Mauveine, although the base of aniline purple, when in solution is not of a purple but of a dull violet shade, and in the solid state is a nearly black crystalline powder. The moment, however, mauveine is brought in contact with an acid so as to form a salt, its solution changes to a purple colour. This takes place even with that feeble acid carbonic. I have here a dilute solution of mauveine; you will observe the dull violet colour it possesses, but if my assistant only breathes through it a few moments the carbonic acid of his breath will combine with it, and it will acquire the ordinary colour of aniline purple.

Mauveine is a most powerful chemical body, and will easily decompose ammoniacal salts. This may be readily seen if some mauveine be heated with chloride of ammonium and a little water, when an abundance of ammonia gas will be evolved, which can be distinguished not only by its odour, but by the white fumes it produces with hydrochloric acid.

The salts of mauveine are beautifully crystalline, and possess a splendid green metallic lustre. The crystallised commercial product consists of the acetate. Mauveine possesses one of the peculiar properties of

indigo. Indigo, when treated with reducing agents, such as a mixture of sulphate of iron and lime, is rendered nearly colourless and soluble, but this colourless indigo, when subjected to the oxidising influence of the atmosphere, rapidly becomes blue again. I here refer to the indigo vat so much used by dyers. Mauveine, when treated in a similar manner, is also nearly decolourised, changing to a pale brownish yellow fluid, but the moment this is exposed to the air it assumes its original colour far more quickly than indigo. This remarkable fact may be strikingly illustrated by boiling an alcoholic solution of salt of mauveine with a few strips of zinc in a sealed tube from which the air has been previously removed. The dark purple solution will gradually lose its colour, and change to a very pale-yellowish brown shade.

I have a tube containing some aniline purple decolourised in this manner, and now if I open it, the air rushes in and the solution instantly assumes the ordinary purple colour.

Ordinary indigo is quite insoluble in water, and, therefore, its property of becoming soluble, as well as colourless, when treated with reducing agents, is of great practical value, as the dyer, by immersing his goods in this solution of indigo, and then exposing them to the oxidising influence of the air, gets the colouring matter firmly fixed in the fibre of his materials. But as the mauve is always soluble in water, this property has not been found of any practical value.

Aniline purple, when introduced as a dye, being the first colour of its kind, had to encounter many prejudices, and, on account of its peculiar nature, required the adoption of new or modified processes for its application. These difficulties, however, once overcome, its progress was very rapid. At first it was principally employed by the silk dyer and printer, its application to silk being comparatively easy, but it was not used by the calico-printer till a few years afterwards.

I distinctly remember, the first time I induced a calico-printer to make trials of this colour, that the only report I obtained was that it was too dear, and it was not until nearly two years afterwards, when French printers put aniline purple into their patterns, that it began to interest British printers.

It will be seen that to introduce a new coal-tar colour after the mauve was a comparatively simple matter. The difficulty in the manufacture of all the raw materials had been overcome, as well as the obstacles in the way of the practical applications of an aniline colour to the arts.

We will now turn our attention to a colouring matter which has often been confounded with aniline purple. I have designated it as "Runge's blue," as it was first observed by Runge. I have mentioned that Runge, when he first obtained aniline, termed it "kyanol," or blue oil, on account of the blue-coloured solution it gave with chloride of lime.

After discovering the mauve, I naturally made experiments with this coloured product of Runge's, to see if it contained aniline purple, but my experiments answered the inquiry in the negative. A few years afterwards, however, I was puzzled by finding that French manufacturers were beginning to produce aniline purple by the agency of chloride of lime and a salt of aniline; being much occupied at that time, I was unable to look carefully into the matter; and it was not until investigating these apparently opposite results a short time since that I was able to understand them. I will perform Runge's experiments, and for that purpose will take a solution of hydrochlorate of aniline, and add to it a very dilute solution of chloride of lime (taking care not to add too much). The solution is now changing, and getting slightly opaque; by daylight it has an appearance like indigo, but if I render it clear by the addition of alcohol, and place it before the magnesium lamp, it is seen to be of a brilliant colour, and nearly pure blue, quite unlike aniline purple.

I have lately succeeded in obtaining this blue product in the solid condition, by treating a solution of hydrochlorate of aniline with a dilute solution of chloride of lime, and precipitating the resulting colouring matter with common salt; it is thus obtained in an impure condition, and may be collected upon a filter; by treatment with cold ether or benzol, a large quantity of brown impurities are separated, the colouring matter being left in the solid condition. This substance dissolves in alcohol, forming a nearly pure blue solution, and is capable of dyeing silk a blue or blue-violet colour.

An alcoholic solution of Runge's blue behaves with caustic potash quite differently to aniline purple, forming a brownish red-coloured solution instead of a violet. Therefore, there can no longer be any reason for confounding this body with aniline purple, it being entirely different, both in colour and chemical properties. But as this colouring matter is produced by oxidising hydrochlorate of aniline with chloride of lime, how is it that manufacturers have succeeded in preparing aniline purple with the same re-agents? This question I find is very easy to answer; the manufacturer has gone a step further and boiled his product. Now, if I take a piece of silk dyed with Runge's blue, and, instead of boiling it, which would wet it, and make it difficult to manipulate, do that which is equivalent—steam it—a very remarkable change takes place—Runge's blue being changed into the mauve. So, here we have cleared up the mystery, and find that by the action of chloride of lime on hydrochlorate of aniline, we first get Runge's blue, and then, by heating this blue, we change it into mauve. Runge's blue is a very unstable body, and of no practical value, its alcoholic solution changing into mauve in a day or two. This change takes place directly by boiling.

We must now pass on to another colouring matter, in name well-known to all of you, I mean magenta, also called roseine, fuchsine, aniline red, and various other names. The discovery of this body and its manufacture were strangely dependent upon the source which had been selected for the preparation of aniline for the mauve. Had the aniline contained in coal tar, or the aniline obtained from indigo, been employed for the preparation of the mauve, instead of that prepared from commercial benzol, magenta and its train of coloured derivatives would in all probability have remained unknown to this present day, from the simple fact that magenta cannot be produced from pure aniline, a second body being also required.

You will observe, by reference to the table of coal tar products, that next to benzol there is a substance named toluol, a substance having a boiling point not very much above that of benzol. On this account toluol is always contained in commercial benzol, and possesses most of its properties. With nitric acid it forms nitrotoluol, very similar to nitrobenzol; with iron and acetic acid it is converted into a base, toluidine, very similar to aniline, except that it is solid instead of liquid. when pure. Therefore, aniline prepared from commercial benzol always contains a little toluidine, and this is the second body requisite for the formation of magenta.

An apparatus for the fractional distillation of coal tar naphtha has been devised, so that its constituents may be almost completely separated from each other, and thus pure benzol or pure toluol may be obtained.* Having obtained these hydrocarbons, pure aniline and pure toluidine may be prepared and then mixed in the most suitable proportions for manufacturing magenta. This process is not very generally employed, however, but the quality of the mixture of aniline and toluidine is determined by distillation, noting the quantities which come over at different temperatures. The necessity of toluidine as well as aniline for the production of magenta was discovered by Dr. Hofmann, who found that it could not be produced by

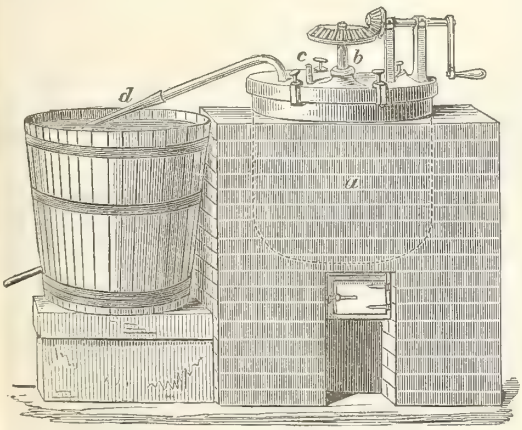
* See "Clarke's Specification," A.D. 1863, June 5th, No. 1,405.

perfectly pure aniline, nor perfectly pure toluidine, but that a mixture of these two bases yielded it in quantity. Magenta was apparently first observed by Natanson, in 1856, when examining the action of chloride of ethylene on aniline, and afterwards by Dr. Hofmann, in 1858, when studying the action of tetrachloride of carbon on aniline, but industrially the discovery of magenta was made by M. Virguin, of Lyons, in 1859, three years after the mauve. M. Virguin's process consisted in treating commercial aniline with a fuming liquid, called tetrachloride of tin, and was first carried out by Messrs. Renard Brothers, of Lyons. Since 1859 patents have been taken out for the production of this colouring matter with aniline, and almost all chemicals known, whether capable or incapable of forming magenta. I may mention one process which was extensively employed, and is still used to some extent in Germany, and that is the method of making magenta with commercial aniline and nitrate of mercury. With care this process works very well, and the colouring matter produced is of good quality. When first introduced, magenta prepared by this method was not purified, but sent into the market in a crude form, so that before using it the dyer had to extract it with water. In the preparation of magenta by this process, all the mercury of the nitrate of mercury employed is recovered in the metallic state, but although this process may possess some advantages, yet the use of mercury salts is most undesirable, on account of their fearfully deleterious influence upon the workmen.

The process, which has almost superseded all others, is that for the use of arsenic acid, as proposed by Medlock, and patented by him in January, 1860. This patent is notorious for the amount of litigation it has caused, showing that a patentee should not only be a discoverer but a lawyer, and even more, and able to discover precisely how much to claim and disclaim in his patent, and also to arrange his specification so that the intellects of the whole world may not be able to discover a single flaw in his description; and it is a common misfortune to inventors who wish to thoroughly protect themselves, to find that they have claimed too much.

The manufacture of magenta, as now carried on, is a very simple process; it is conducted in an apparatus somewhat similar to that represented by fig. 5.

Fig. 5.



This apparatus consists of a large iron pot, *a*, about 4ft. diameter, set in a furnace of brick-work; it is provided with a stirrer, *b*, worked by hand. All the gearing for this stirrer is fixed to the lid, so that stirrer, lid, and all may be lifted away by means of a crane, or other suitable apparatus. There is also a bent tube fixed into the lid, and connected to a condensing worm, *d*, by means of a joint, which can be made or broken at pleasure. In preparing magenta, a quantity of aniline, containing about 25 per cent. of toluidine, and a nearly-saturated solution of arsenic acid, is introduced into this apparatus, and well mixed by working the stirrer; the proportions of the materials are in about the ratio of 1 of aniline to 1·5 of a 75 per cent. solution of arsenic acid. When these are well mixed the fire is lighted. After the product has been heated for some time water begins to distil over, then aniline and water, and lastly nearly pure aniline.

This operation requires some hours for completion, and this is determined by inserting an iron rod, from time to time, and drawing out a portion of the product for examination, as well as by the amount of aniline which distils over. When the heating has been completed, a steam-pipe is introduced into the apparatus, and steam blown through the fused mass; by this means an additional quantity of aniline is separated. The lid is then liberated and lifted, with the stirrer, from the apparatus, and the product left to cool before it is removed. A more elaborate and larger apparatus is sometimes used, which possesses considerable advantages over the smaller one. The iron pot is larger, and is provided with an outlet at the side, which is closed during the operation, and the shaft of the stirrer is hollow (as in the aniline apparatus described last lecture, fig. 4), and worked by steam. When the operation of heating is concluded, steam is blown down the shaft, and after the addition of water the product is boiled and run out of the outlet in the side of the pot; by this arrangement it is unnecessary to disconnect the lid of the apparatus, and the product does not require to be removed by mechanical means, as with the apparatus previously described.

The crude product obtained by heating aniline and arsenic acid, is next transferred to vats, boiled with water and filtered. Common salt is then added, which precipitates the crude magenta; this is collected and dissolved in boiling water, again filtered, and the solution, on cooling, deposits the colouring matter in the crystalline condition. This, when recrystallised, constitutes commercial magenta.

Commercial magenta consists of brilliant crystals, sometimes half-an-inch in length, having a beautiful golden green metallic appearance; these dissolve in warm water almost entirely, forming an intense purplish red solution. Dr. Hofmann has carefully studied the chemical nature of magenta, and has found it to consist of the salt of an organic base, which he has called rosaniline. This base may be obtained from the commercial product, by dissolving it in water and boiling it with an alkali, or alkaline earth, such as ammonia, potash, or lime; it is thus rendered nearly colourless, and after filtration rosaniline separates from the clear solution, on cooling, in colourless crystals. It is composed of carbon, hydrogen, and nitrogen when anhydrous, but generally contains an equivalent of water also. The anhydrous base has the formula—

$$C_{20}H_{19}N_3$$

This colourless base immediately becomes dark red upon combining with an acid, as I can show you by heating some with acetic acid, when the colour is immediately developed. The magenta produced by heating commercial aniline with nitrate of mercury is the nitrate of rosaniline; that produced with arsenic acid is the arseniate, but in the process of purification this latter salt becomes converted into hydrochlorate, which is the salt most generally found in the market. Other salts are also commercially manufactured, such as the oxalate and acetate, especially when a very pure product is required; these salts are generally prepared from pure rosaniline, by combining it with the required acid, and crystallising from water.

The acetate of rosaniline crystallises in magnificent octahedra, possessing the ordinary golden green metallic lustre to a very high degree; it is also the most soluble salt of rosaniline known. The affinity of rosaniline salts for animal fibres is very great; it does not, however, resist the action of light nearly to the same extent as the mauve. All the derivatives of rosaniline also possess a very great affinity for animal fibres, in most cases quite equal to that of magenta itself.

When speaking of aniline purple, I showed you that by reducing agents it became colourless, or nearly so, but that the original colour was developed when it was exposed to the oxygen of the air. Salts of rosaniline or magenta are also decolourised by reducing agents, but, unlike aniline purple, the colour is not restored by exposure to the air. Dr. Hofmann has found that in this case a new organic base is produced which he has called leucaniline. This substance differs only from rosaniline in containing an additional quantity of hydrogen. It may be reconverted into rosaniline by oxidising agents such as bichromate of potassium, &c.

There is another very peculiar reaction of rosaniline. This base, when brought in contact with hydrocyanic acid, instead of forming a coloured hydrocyanate of rosaniline, yields a perfectly colourless body, which is not a salt but a base. This remarkable fact was discovered by Dr. Hugo Müller, and he has called this new body hydrocyanrosiline. We shall have occasion to refer again to this substance and leucaniline.

In the formation of magenta, a second product is obtained, commercially called phosphine. This substance was first introduced by Mr. E. Nicholson. Dr. Hofmann has investigated it, and found it also to contain an organic base, which he has called chrysaniline.

Phosphine or chrysaniline is not capable of being produced at will, and the quantity formed in the manufacture of magenta is variable. In shade it is of rather a yellow orange. This colouring matter differs from rosaniline, the base of magenta, in exactly the opposite direction to leucaniline, containing two atoms less of hydrogen. Leucaniline, rosaniline, and chrysaniline, are thus related:—

Leucaniline	$C_{20}H_{21}N_3$
Rosaniline	$C_{20}H_{19}N_3$
Chrysaniline	$C_{20}H_{17}N_3$

The principal use of phosphine is for the formation of a scarlet with magenta. It is not converted into magenta, nor decolourized with reducing agents or hydrocyanic acid, and therefore does not seem to be of the same class of colouring matters as rosaniline.

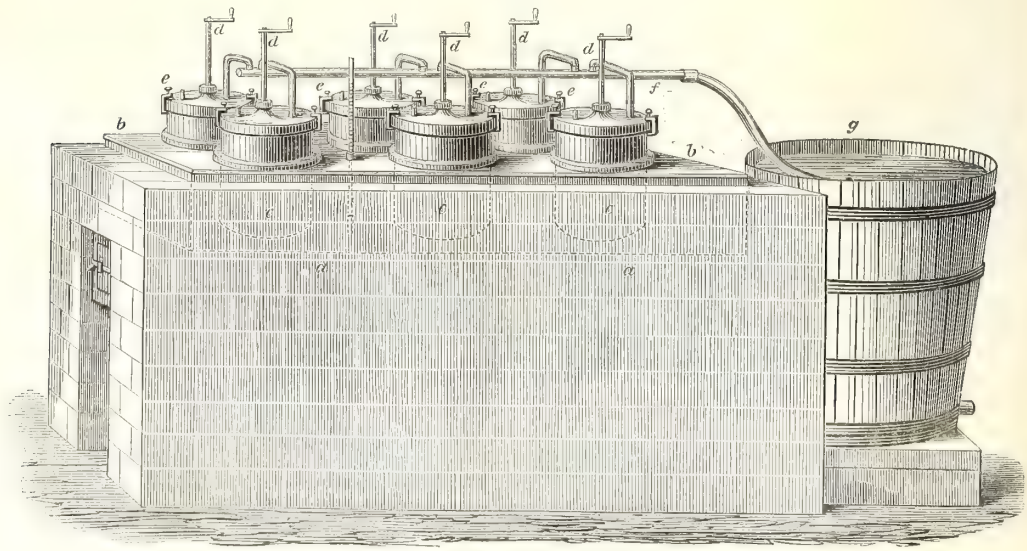
From the residues obtained in the manufacture of magenta three new colours have been obtained by Messrs. Girard and Delaire, but, I am sorry to say, my time will not allow me to enter into the particulars of these products. I believe they have not been commercially introduced as yet.

Magenta is now more used as a source of other colours than as a dye. This has caused its manufacture to be conducted on a very extensive scale, and it is now looked upon by the manufacturer as a raw material much in the same way as aniline was regarded in the early days of aniline purple.

We will next consider some of the derivatives of magenta, and the first we will study is aniline blue or bleu de Lyon. If aniline be treated with a salt of rosaniline or magenta, a remarkable change takes place; at first the colour gradually becomes purple, but afterwards gets quite blue, ammonia being evolved at the same time. This peculiar reaction was observed by MM. Girard and Delaire, who found that this change of colour was due to the formation of a new body, which they termed the bleu de Lyon; intermediate products were likewise obtained, to which we shall refer presently. MM. Girard and Delaire patented their process in January, 1861. This new aniline blue is one of the most important of the artificial colouring matters, and its manufacture has been very much improved upon since its discovery. There are several circumstances which materially influence the beauty of its tint, such as the quality of the aniline and the particular salt of rosaniline employed in its manufacture. It is found by experience that the aniline should be as pure and free from toluidine as possible, and that the salt of rosaniline should contain a feeble acid, such as the acetate, valerate, oleate, or benzoate; but why the latter is necessary chemists are unable to understand at present. Practically, the various salts of rosaniline required for the manufacture of the blue are not prepared separately, but are produced in the operation by double decomposition, which is simply a process of exchange; thus, if acetate of rosaniline is required, a mixture of hydrochlorate of rosaniline and acetate of sodium is employed; these re-act on each other, and change into acetate of rosaniline and chloride of sodium.

On the large scale, the process of making aniline blue is carried out in various ways, but many employ the apparatus shown in fig. 6. This apparatus con-

Fig. 6.



sists of an oil bath, *a*, set in a brick furnace; it has a cover, *b*, perforated with large holes; into these holes are placed small enamelled cast-iron pots, *c*, provided with a flange, on which they rest. These pots will hold from three to five gallons, and are fitted with lids held down with clamps; each lid is provided with a small stuffing-box, through which the rod of a stirrer, *d*, passes. In the lid are also two other perforations; one of these is fitted with a wooden plug, *e*, for the purpose of testing the progress of the operation; the other is connected with a bent, movable tube, *f*, united to a long central main, to collect any aniline vapour which passes over. This main is connected at one end with a worm, *g*, to condense the vapours. The oil bath by which these pots are heated is provided with a thermometer, so that the temperature may be properly regulated. In preparing the blue a mixture of magenta, acetate of sodium and aniline is introduced into the pots, the aniline being employed in excess. When charged the oil bath is heated up to 190°C., and kept near that temperature. At first the red colour of the mixture changes slowly, but afterwards with rapidity. The progress of the operation is ascertained by removing the wooden plug, and withdrawing a small quantity of the product upon the end of an iron or glass rod, and it is considered complete when a good blue colour has been obtained; to ascertain this point with precision, considerable experience is necessary. The excess of aniline distils during this operation, and is condensed by the worm, and collected in a suitable receiver, so that it may be used again.

From the crude blue product thus obtained, which is a fluid of the consistency of treacle, all the different qualities of blues found in the market are prepared. The cheaper qualities are obtained by simply treating the crude product several times with hydrochloric acid. This removes all the free aniline, and most of the red and purple impurities. Another similar but more effective process is employed for the preparation of the better qualities, and consists in mixing the crude product with methylated spirits of wine, and pouring it into water acidulated with hydrochloric acid, and then thoroughly washing the colouring matter which it precipitates with water. But for the purest kinds of blue there are several processes employed; these are based upon the difficult solubility of some of its compounds in alcohol. In preparing these very pure qualities of blue, instead of starting with the crude product, one of the purified blues is taken.

Aniline blue, or "bleu de Lyon," is supplied to consumers as a coarse powder having a coppery lustre, or in alcoholic solutions; it is nearly insoluble in water, and has to be dissolved in alcohol before it is added to the dye bath.

The nature of this blue has been determined by Dr. Hofmann. It is found to contain, like magenta, a colourless base, becoming blue only upon combining with acids. Dr. Hofmann has shown this base to contain—

$$C_{38}H_{31}N_3$$

and has called it "triphenylrosaniline." Like rosaniline, it becomes colourless when treated with nascent hydrogen, forming a new base, giving colourless salts, as leucaniline. The composition is—

$$C_{38}H_{33}N_3$$

The insolubility of aniline blue in water has been found a great drawback to its use, because when employed for dyeing it is thrown out of solution in the dye bath, and then mechanically adheres to the goods, so that it afterwards rubs off.

Mr. Nicholson has, however, discovered a process for rendering this blue perfectly soluble in water. His process closely corresponds to that employed to render indigo permanently soluble. This, it will be remembered, is effected by subjecting indigo to the action of concentrated sulphuric acid, whereby a sulpho acid is produced.

Mr. Nicholson has found that aniline blue, when treated by a similar process, also forms a sulpho acid, perfectly soluble in water, and forming with alkalies nearly colourless solutions. These, however, when decomposed by acids, change back to the original blue.

This soluble blue is now much used for silk dyeing, but by dyers it is not thought to be so fast as the normal compound. By some modification of the process just described, Mr. Nicholson has obtained another soluble blue, commercially known as "Nicholson's blue." This is now very extensively employed in Great Britain for wool dyeing, but its application does not appear to be well understood in France and Germany, so that its use there is not so great as in our own country.

If a salt of rosaniline and aniline be heated together, and the process stopped before aniline blue is produced, the resulting product when treated with dilute acid gives a colouring matter, which has been called "violet imperial." This was at first supposed to consist of a mixture of blue and magenta, but recent research has shown it to consist of intermediate products. Very large quantities of this colouring matter have been used, but its consumption is now rapidly falling off, owing to the introduction of new violets, about to be described. A few months after the discovery of aniline blue, another colouring matter, called the "bleu de Paris," was obtained by M. M. Persoz De Luynes and Salvetat. These chemists found that when aniline was heated with tetrachloride of tin for thirty hours to 180°C. in a sealed tube, neither a red nor a violet, but a very pure blue was produced. This colouring matter is generally described as being identical, or probably identical, with the bleu de Lyon. These blues are, however, widely different in their chemical nature, as the bleu de Paris is easily soluble in water, and crystallizes freely in needles of a blue colour, with a coppery reflection. It consists of the hydrochlorate of an organic base, which is precipitated from its solution by alkalies as a purplish blue powder; it dyes silk readily, and retains its blue colour by artificial light. It is remarkable that the discoverers of the bleu de Paris do not seem to have observed its difference from the bleu de Lyon.

I have prepared some of this product with a view to its examination, but hitherto have been prevented from determining its composition. I hope to do so soon.

The bleu de Paris is, unfortunately, difficult to prepare in large quantities, and has never been introduced commercially.

The recognition of the nature of the bleu de Lyon, by Dr. Hofmann, led him to study the action of a class of substances upon rosaniline, known to chemists as the iodides of the organic radicals; this investigation resulted in the discovery of the brilliant colours known as the Hofmann violets, and of which so many shades can be obtained, from a very red purple to a nearly pure blue.

The substances generally used for the preparation of the Hofmann violets from rosaniline are the iodides of methyl and ethyl; the iodide of methyl differs from that of ethyl in a practical point of view, in being rather quicker in its action; it is also more volatile. Both these substances contain a remarkable element called iodine. This body is found in sea-water and sea-weed; its aspect is very similar to that of a metal; one of its characteristic properties is that when heated it volatilizes and produces a beautiful purple coloured vapour, and here we find how dangerous a little knowledge is when relied upon. When the iodide of ethyl, which, as I have told you, contains iodine, was introduced for the preparation of the Hofmann violets, it was stated in some of our periodicals or daily papers, I do not remember which, that chemists had at last succeeded in fixing the colour of iodine, whereas, the iodine has nothing whatever to do with the colours produced with the iodides of ethyl and methyl, but is simply an instrument in bringing about the change which takes place in their formation; moreover, these colours can be equally produced without

using iodine at all. It is unfortunate that the popular reports upon scientific matters are generally so utterly untrustworthy. One of the most remarkable reactions of iodine is the blue violet colour it gives with a solution of starch; this is used as a test for its presence when in the free condition, and is remarkably delicate; it is of no use as a colour, as it is instantly decomposed when heated. To prepare iodide of ethyl, ordinary alcohol is treated with iodine and phosphorus; the operation has to be conducted with care, as iodine reacts upon phosphorus with great energy; usually the alcohol and phosphorus are placed in a retort, and the iodine added very carefully, and in small quantities at the time. The mixture is then distilled, and the distillate mixed with water, which causes the iodide of ethyl to separate as a colourless heavy oil. Iodide of ethyl is very volatile, boiling at 70°C.; it has an ethereal odour, and when pure is colourless and transparent; it contains no less than 81 per cent. of iodine. Iodide of methyl is prepared in exactly the same manner as that of ethyl, substituting wood naphtha, or methylic alcohol, for ordinary alcohol; it contains a still larger quantity of iodine than the iodide of ethyl, viz., 89 per cent.

For the preparation of these substances on the large scale special apparatus has been devised, and sometimes amorphous or red phosphorus is substituted for the ordinary kind; but I shall not have time to enter more fully into this subject. To produce the violets, Dr. Hofmann heats pure rosaniline with iodide of ethyl, or methyl and methylated spirits of wine, in a cast-iron digester, closed air-tight, with a lid fastened down with screws. A process very similar to this is sometimes employed, and consists in using a salt of rosaniline, caustic alkali, iodide of ethyl, and alcohol. But in Germany the ordinary hydrochlorate of rosaniline is employed with alcohol, or wood spirit and iodide of ethyl, and is found to work very successfully. By employing the rosaniline itself a lower temperature is required for the formation of violet, than when using its salts; in fact, I have found that a mixture of iodide of ethyl and rosaniline re-act even at the ordinary temperature if left in contact for a few days, and produce a red shade of violet.

On the large scale Hofmann's violet is generally prepared in deep cast-iron vessels, surrounded with a steam jacket, and provided with a lid having a perforation, closed with a screw plug. This lid can be firmly fastened down with screws, the joint being made with a vulcanised indiarubber washer. This apparatus is charged with a mixture of hydrochlorate of rosaniline dissolved in alcohol or wood spirit, and iodide of ethyl or methyl, in proportion according to the shade required. After the apparatus is closed the steam is allowed to enter the steam jacket, and the heating continued for five or six hours; the plug is then removed from the lid of the apparatus, and the alcohol or unused iodide of ethyl distilled off. The resulting product is dissolved in water, filtered, and precipitated with chloride of sodium, but sometimes it is first treated with caustic alkali, to remove all the iodine, so that it may be recovered. Thus obtained, the colouring matter is of a golden lustre if of a blue shade, and of a greenish if of a red shade.

Like all the other colours we have considered, the Hofmann violets are nearly white organic bases, their composition differing according to the shade of colour, thus:—

A red shade is composed of .. $C_{22}H_{23}N_3$
A red violet shade, of ..... $C_{24}H_{27}N_3$
A very blue shade ..... $C_{26}H_{31}N_3$

The colours of the Hofmann violets are remarkable for their brilliancy, but, unfortunately, they do not resist the action of light so well as might be desired; it is remarkable, however, that the regard for fastness seems to have given way to the desire for brilliancy.

In the early days of coal-tar colours fastness was so much talked about, that when magenta was first introduced it was thought by some that it would not be largely used—how different has it proved to be. Although not very fast upon cotton, the Hofmann violets are sufficiently so for woollen and silk goods, as colours always resist the light better when applied to animal fibres.

In the formation of Hofmann violets we see that rosaniline, when treated with iodide of ethyl, becomes blue, the red being converted into violet; but with mauveine, the base of the mauve, exactly the reverse takes place, the mauveine being converted into a much redder shade with iodide of ethyl. The colouring matter produced from mauveine and iodide of ethyl is commercially known as "dahlia;" the colour is intermediate in shade between aniline purple and magenta. This colouring matter possesses the same character for fastness as the mauve, and also gives the same reactions with acids; unfortunately it is rather expensive, and has therefore not been very extensively used.

Lastly, there has been a process proposed for the production of colouring-matters similar to the Hofmann violets, by first converting the aniline into ethyl-aniline, a base previously discovered by Dr. Hofmann. It is found that by substituting this base for aniline, in some of the processes which have been employed for the manufacture of magenta, the ethyl-aniline yields purple or violet colouring-matters.

This process has been patented by M.M. Poirier and Chappat, but the reaction appears to have been first observed by M. E. Kopp. From the great similarity of these colouring matters to the Hofmann violets, I need not enter into any lengthened description of their properties.

Sea-water contains, besides iodine, another remarkable element called bromine; it is a liquid giving off very irritating orange-coloured vapours. This remarkable body yields, with many hydro-carbons, a great variety of compounds. With ordinary turpentine, it acts with great violence; but if the action be moderated by the presence of a large quantity of water, a thick viscid oil is obtained. This body was examined by Mr. C. Greville Williams, who found it to possess the formula—

$$C_{10}H_{15}Br._3$$

I have found that this substance, when heated with a solution of magenta in methylated spirits, produces a purple colouring matter of great beauty, commonly known as the Britannia violet; it is very extensively employed for dyeing and printing, and can be produced of any shade, from purple to a blue violet.

The Britannia violet possesses the golden green lustre so common to all the aniline colours. It is easily fusible, amorphous, and very soluble in water.

In my last lecture I showed you the great intensity of the mauve dye. I will now make a few experiments, to illustrate the great intensity of some of the colouring matters we have been considering this evening.

I have here some screens of white paper, on which I have dusted a very small quantity of the solid colouring matters,—so small a quantity that I dare say you can scarcely discover its presence. If I now project spirits of wine upon these screens, so as to dissolve the colours, you will see their remarkable intensity.

Let us now consider for a moment the great rapidity with which the discovery of new coal-tar colours followed that of the mauve or aniline purple.

Aniline purple was discovered in 1856; three years afterwards, in 1859, the magenta was introduced. In 1861 we had the aniline blue; in 1863 the Hofmann violet; and in 1865 the Britannia violet. Thus we see that all these colours have not only been discovered, but introduced commercially, in a period of less than ten years.

We have now reviewed the principal coal-tar colours, but there still remain some important ones for our consideration next lecture; and although some of these are not at present largely used, yet it is to them, perhaps, that we may look for the future development of this branch of industry.

THE PRESERVATION OF MEAT.

The following letter has been addressed to the editor of the *Daily News* :—

Sir,—I am directed by the Lords of the Committee of Privy Council for Trade to transmit to you the enclosed copy of a decree, issued by the Argentine Government, which has been received through her Majesty's Minister at Buenos Ayres, offering a prize of £1,600 to the inventor or improver of the best method of preserving meat. I am, &c.,

Robert G. W. Herbert.

Office of Committee of Privy Council for Trade,
Dec. 31, 1868.

"*Decree.—Buenos Ayres, Nov.* 2, 1868.

"In pursuance of the authority given to the executive power, by the law of the National Congress of the 7th September, to apply the sum of 8,000 hard dollars to a prize, to be given to the inventor or introducer of the system of preserving fresh meat, best adapted, in the judgment of the executive power, to its working on a great scale, the President of the Republic decrees that a term of six months is fixed, reckoned from this date, in order that those who shall consider themselves in a position to try for this prize may present their proposals, within that time, to the Ministry, to be examined in the way the Government may think fit.

"(Signed)

"Sarmiento Dalmatius Velez Sarsfield."

THE MEYRICK COLLECTION OF ARMS AND ARMOUR.

(*Continued from page* 105.)

The two suits of armour mentioned at the conclusion of the notice printed last week in the *Journal* may be regarded as the culminating point of the collection. From the first bay to this point, the arms and armour, bay by bay, increase in number, in variety, in artistic quality, and in improvements. Commencing, however, with the reign of James I., it will be observed that the number of arms and of specimens of armour sensibly decreases, although the ingenuity displayed in the make of the arms, particularly the fire-arms, &c., naturally progresses. With the reign of William III. the collection of European arms, &c., terminates. The series, however, of suits of armour ends at the suit of pike-man's armour; and the last mounted figure of the historical collection is a dragoon of Charles the Second's time.

To return to the notice of individual specimens. The bay devoted to James I. and Charles I. is principally occupied by a mounted figure, in a richly engraved and gilt suit of armour, in which the "tappul," or point, has entirely disappeared, and the "cuirass," similar to that in use at the present time with the Household Troops, has taken the place of the pointed breast-plate. The design enriching this suit is chiefly composed of scrolls, in the midst of which are emblazoned the arms of the Italian families Manfredi and Monaco. The work is dated 1620, and the suit was one for state occasions. Upon a wooden support to the left-hand side, at the back of the mounted figure, is the last piece of armour in the collection having a "tappul," or point, towards the centre of the breast-plate at the waist. The thigh-guards—very similar to the "tassets" of earlier periods, are, as well as the other portions of the suit, enriched with gilt work. This specimen is unique, and of great value. Below it is a shield through which is fixed a rapier of the finest steel, and of such pliability that the point can be brought round to the hilt, without damaging the rapier. In the shield, itself are two curious apertures or slits; one of these, the upper one, allowed the soldier using the shield to look through, while at the same time he wounded his adversary with the point of his sword through the lower slit. On the wall, the collection of fire-arms presents a very complete appearance. Amongst the pistols should be noticed a great rarity, in a double-barrelled wheel-lock pistol, as well as an axe with a pistol attached. The peculiarity of this latter object is the distance intervening between the trigger and the lock. The hilt of a sword, in delicate chiselled work, is worth careful examining. At the top of this board of arms is a folding bow, jointed in the centre, and at the side is an inlaid dag. The inlay work pourtrays, with much minuteness and accuracy, a number of figures in costumes of the period, thus affording much that is of interest to the antiquary. Next to these arms are some miscellaneous bits of engraved and gilt armour, of which the two "cuisses" are the most conspicuous, both for interest and workmanship. The gauntlet, an historically interesting piece, is said to have belonged to Henry, Prince of Wales, his cypher, H.P., being engraved at the wrist. It is not improbable that this gauntlet is one which belongs to the unique suit of armour—the property of Her Majesty the Queen—at Windsor Castle. An object which will necessarily arouse the attention of visitors who give more than a hasty and general inspection to the collection, is a gun with a set of eight revolving chambers, nearly identical to a Colt's revolver, placed next to the above-mentioned armour. It is certainly a more ingeniously contrived weapon than the hunting prodd near it, the stock of which is a barrel, and the prodd thus becomes available to be employed both as a wheel-lock and a prodd. Below a set of claymores and target, which, if the chronological arrangement of the whole collection had not been carried out under Mr. Planche's direction, one might have supposed more fitly belonged to a later period than Charles I., perhaps James II., is a very interesting steel mask, formerly used by executioners. It is of black beaten or repoussé steel, and, although not obtrusively hideous, is still somewhat repulsive, particularly when looked at in conjunction with the instruments of capital punishment and torture placed near the window, opposite Charles I. bay. Before noticing these, however, mention must be made of the cuirass placed over a leathern jacket, the arms and skirt of which are delicately embroidered with very thin silver lace, of the helmets which abound plentifully in this bay, and, lastly, of the pikes, called 18 feet pikes. The instruments of torture are represented by two executioners' swords, with engravings on the blades of various modes of punishment in process of infliction upon criminals; between the swords are smaller but, to English minds, more obnoxious vehicles for carrying out the criminal punishments of James and Charles the First's reigns—such as thumb-screws and an iron whip. The tiger's claw, a secret weapon, consisting of three iron claws fixed to two rings through which the operator's fingers passed, and the hand thus concealing the claws, is an Oriental implement. Placed at the termination of the sixth bay is a suit of German "splints," belonging to a German "ritter."

The Commonwealth period occupies the staircase leading to the upper galleries of naval architecture, &c. The objects are few in number, and, excepting a good lobster-tailed helmet, the triple-barred head-protectors, and a wall-musket, a revolver with the chambers revolving at right angles to the lock, and a gilt wooden powder flask, there is not much to call for especial notice. The pikes and halbards about this period were of an ornamental description. The stand of pikes, &c., at the foot of the staircase terminates with a fine black suit of armour belonging to a pikeman. It will be here observed that the tappul has entirely been abolished. This suit is the last complete one in the collection, and after it come trophies of guns, &c. At the side of the first of these is a most remarkable "partisan," the shape of which corresponds curiously with the unornamented "partisans" of Edward the Third's time. The ornamentation of this weapon, gorgeous, repoussé, and pierced-work gilt, is of the best kind. Two richly-carved Austrian guns form appropriate companions to the "par-

tisan." The double-barrelled gun is a specimen of inventive genius, the second barrel being on a hinge below the principal one. At the back of the mounted dragoon in a triple-barred helmet and thick buff leather coat, the skirts covering the thighs down to the knees, is a board on which is a very handsome "gorget," a specimen of the latest species of armour worn, excepting the cuirass, of which, both in the reigns of James II. and William III., there are some dark blue steel ones.

It was in the reign of Charles II. that the bayonet appears to have been first used. In fact many of the arms which, a few years previous would have been battle-axes, have an inclination to a bayonet form of weapon. This is especially shown in the two Dutch battle-axes in James the Second's bay, Of the bayonet proper, the first example is exhibited on the board of arms, &c., in Charles the Second's bay. In the place of the present contrivance, spring catch, &c., for fixing it to the barrel of the gun, is a simple tapering wooden end, and this was forced into the muzzle of the musket, thus rendering the musket temporarily useless for shooting purposes. Then, in the time of James II., there are variations in the form of the bayonet; there is a "short flaming bayonet" and a short bayonet, engraved with an inscription. Those interested in military arms, may, perhaps, remember the short bayonet exhibited by Mr. Scott Tucker, in the Paris Exhibition, 1867. It is a curious coincidence that the various changes and phases through which the bayonet passed, during the first few years of its invention, should be nearly similar to the changes and improvements which, at the present time, are constantly going on. Mr. Scott Tucker's bayonet, already referred to, is nearly half the length of the ordinary triangular one, and is almost the same length as the bayonet of James II. It is not improbable that the same idea may have prompted the respective inventors to produce, in the leading principles, almost identical arms. The last remarkable rapier in the collection is the one exhibited on a board in the time of James II. The blade is engraved with events from the life of Joseph. A pair of high-heeled Dutch boots, and some hunting implements, bring the collection of European arms and armour to a conclusion.

In the adjoining room is exhibited many pieces of Oriental armour and weapons, all chiefly of comparatively recent date. There is a complete suit of Japanese mail armour, ornamented with embossed brass plaques, which is curious. Disposed amongst the numerous cases, and on the walls, are many swords, shields of rhinoceros hide, damascened and perforated; Persian and Turkish helmets, portions of Indian suits of armour, wonderfully inlaid with mother-o'-pearl and ivory; examples of firelocks, cuttars or kreeses, and a fine double-handed sword of state. Beyond these is a series of weapons used by the natives of the South Sea Islands; and with these latter the "Arms and Armour Collection" is brought to a termination.

Besides this splendid and unrivalled collection, the more especial objects of which this notice has, it is hoped, been the means of bringing before the members of the Society of Arts, there is a most excellent exhibition of ivories, and a few other objects of great value and interest. In the collection of ivories may be found two small miniatures in ivory boxes, the lids of which are delicately carved; miniatures respectively of Henry VIII. and Anne of Cleves, painted by Holbein. The miniature of Anne of Cleves is the original one which was sent to Henry VIII. before his engagement to her. In a case beyond are shown some Limoges enamels, other "objets de vertu," and some good bronze works; in particular a fine knocker, formerly belonging to the door of the principal entrance at Goderich Court. The work, attributed to Giovanni di Bologna, represents the slaughter of the Philistines by Samson.

It is difficult not to enlarge upon the merits of the many objects in this case, such as a beautiful piece of chiselled work for the hilt of a sword, a carved box, which belonged to Mary Queen of Scots, and a jester's wooden belt; but the objects are very numerous, and the present article being one on arms and armour, it is inexpedient to attempt to deal with the latter section of the entire Meyrick collection. The mention already made perhaps will suffice to draw attention to the fact that, in addition to the incomparable display of armoury, the collector, Sir Samuel Meyrick, proved his appreciation of other art works.

That the entire collection, as it stands, is most fitting to become the property of the nation none can gainsay; and it is most earnestly to be hoped that, before the termination of its loan to the South Kensington Museum, the Government, recognising the importance of preserving it intact, will unhesitatingly come to a decision, and secure it for the historical and artistic enlightenment of the people of Great Britain.

Amalgamated with the armour collection from the Tower of London, the two combined collections, placed in a suitably-planned and well-adapted exhibiting gallery to be erected in some more accessible locality of the metropolis than Tower-hill, would form a centre of attraction for all classes and nationalities, and would, undoubtedly, be a collection of its kind unsurpassed, worthy to take the highest rank amongst the foremost ones in Europe.

Fine Arts.

Museum of Casts, Paris.—A considerable collection of groups, statues, bas-reliefs, &c., moulded from the best examples of sculpture in the museums of Rome, Florence, Naples, and London is now being arranged at the Imperial School of the Fine Arts, in Paris. A fine inner court, known as the Cour de Marbre, from its pavement, has had a glass roof thrown over, to form a museum. Visitors to Paris will remember this court as leading to the semi-circular amphitheatre, in the walls of which is Delaroche's famous painting of the celebrated artists of all ages and countries, supposed to be assembled to award prizes to modern competitors.

Paris Academy of Arts.—The commission appointed to select names of artists for the election of a foreign member of the Academy, in the room of the late composer, Rossini, presented the three following:—Sir Edwin Landseer, R.A.; M. Dracke, Prussian sculptor; M. Dupré, also sculptor, of Florence. On the reception of the list, the Academy, according to custom, added other names—those of M. L. Gallait, Belgian painter; Signor Pietra Rosa, architect and archæologist, of Rome; and M. Geefs, the well-known Belgian sculptor.

French Provincial Fine Art Exhibitions.—The results of the Havre Exhibition of Pictures, in connection with the Maritime Exhibition, are not very brilliant as regards sales. The total amount is only equal to £1,624; of this the town itself contributed £300, the Society of the Friends of Art £404, and private purchasers £920. We have a very different account from the town of Ghent, where the purchases at the exhibition have reached the important amount of £5,600. The cases are not, however, quite analogous: the exhibition at Ghent is purely an art exhibition, and a well established one, while the Havre show was merely annexed to the maritime exhibition, and, moreover, the building was not commenced till after the opening of the maritime galleries; still, with all allowance made, the difference is strikingly against the rich and flourishing port of Havre, especially considering the collection of pictures was a very good one.

Manufactures.

The Tobacco Manufacture in Italy.—The tobacco plant is cultivated, by exception made to the royal monopoly on tobacco, in the provinces of Ancona, Bene-

vento, Terra di Lavoro, Principato Citeriore, Terra d'Otranto, Umbria, Vicenza, and Sardinia. In 1867, 3,806 hectares of tobacco were cultivated, containing 46,129,565 plants. The following was the production of tobacco in Italy from 1864 to 1867 :—

	Hectares.	No. of plants.	Production.	
			Quantities.	Value.
			Quintals.	frs.
1864.....	1,222	16,246,000	13,796	784,000
1865.....	1,733	22,682,000	16,470	909,000
1866.....	2,361	32,683,000	21,618	1,197,000
1867.....	3,806	46,129,565	30,054	1,736,000

The average production, in 1867, per hectare was 789 kils. of tobacco, and 65 kils. per 1,000. The greater part of the tobacco used in Italy is imported from abroad, and, in 1866, 93,856 quintals were imported from America. The number of manufacturers of tobacco was 14, 9 of which were first-class and 5 of second-class. The first-class manufacturers are at Naples, Turin, Milan, Venice, Florence, Bologna, Lucca, Chiaravalle, Modena; the second-class are those of Parma, Sestri Ponente, Cagliari, Massa Carrara, and Lecce. The motive power of these manufactories, comprising 10 steam-engines, 31 water-wheels, and 7 turbines, amounts to upwards of 250 nominal horse power. The number of persons employed in these works, in 1867, was 15,055, of which 214 were employed in the administration, 470 superintendents, and 14,371 workmen. The wages amounted to 5,790,312 francs. The average wages earned by the cigar makers varies from 2·30 to 2·50 per day for men, and the women engaged in this branch earn from 1·45 to 1·90 per day. The wages for those employed in preparing snuff and cut tobacco vary from 2·20 to 4 francs per day for the men, and from 1·35 to 2·05 francs per day. The production of tobacco of these manufactories in 1867 was as follows :—

	Quintals.
Cigars	51,592
Cut tobacco	65,409
Snuff	33,976
Total....	150,977

The greatest quantity of tobacco was manufactured at Naples, 27,714 quintals; the next in importance was at Turin, 25,275 quintals; Milan, 21,197 quintals. The following shows the quantity and value of the tobacco manufactured in Italy, not including the Venetian provinces, from 1863 to 1867 :—

	Quantities. Quintals.		Value. Francs.
1863	112,463	..	69,507,000
1864	122,684	..	75,421,000
1865	110,655	..	76,680,000
1866	120,739	..	84,035,000
1867	119,565	..	79,977,000

For 1867 the quantity of tobacco sold in the Venetian provinces was 16,865 quintals, of which there were 6,458 quintals of snuff, 4,800 quintals of cut tobacco, and 5,573 cigars. The produce of this sale amounted to 12,471 francs. The various quantities of tobacco sold in 1867 were as follows:—

	Quantity. Quintals.		Amount received. Francs.
Snuff	26,305	..	13,802,000
Tobacco in cord..	12	..	6,000
Ditto cut.....	60,914	..	29,085,000
Cigars	32,334	..	37,084,000
Total	119,515		79,977,000

The imports of tobacco, in 1866, were 5,994 quintals, amounting in value to 2,400,000 francs; and 31 quintals of Havana cigars, of the value of 170,000 francs, making a total value of imports of 2,570,000 francs.

English Machinery in Siam.—English machinery is being largely employed by the natives of Siam. The Siamese dockyards are busy building and repairing steamers; iron bridges have been erected over some of the creeks; gas-works constructed in the palaces of the King and Prime Minister; two steam dredges put together and set to work; and another steam rice mill added to the four large mills already existing. A large sugar mill and distillery; a saw mill; British ship-yard and dry-dock, have been in operation since the beginning of 1867; and as the supplies for all these come almost entirely from England, there must be a very considerable export of British machinery going on to the East.

Commerce.

Commerce of Italy.—The following table represents the exports and imports of Italy in 1866, as compared with those of 1865* :—

	Commercial Value of Imports.		Commercial Value of Exports.	
	1865.	1866.	1865.	1866.
Wines, spirits, oils, etc.	38,624,754	37,884,112	115,111,524	131,773,236
Colonial produce, sugar, etc.....	128,349,528	124,125,797	38,283,432	43,284,393
Fruit, seeds, herbs, and plants.....	5,667,924	3,379,771	67,465,154	58,177,898
Tallow and other fatty substances ...	15,991,361	15,570,738	11,597,959	16,488,014
Fish	13,232,563	13,934,681	849,482	1,277,449
Cattle	12,532,771	18,420,528	8,616,100	17,161,720
Skins and hides	29,587,237	37,391,465	4,505,036	9,711,551
Hemp and flax (raw or manufactured...	21,696,821	20,720,849	26,325,268	33,292,828
Cotton (ditto)	106,572,843	127,445,615	9,227,184	13,821,408
Wool, hair (ditto) ..	84,313,009	85,210,004	3,160,438	13,480,918
Silk (ditto)	168,477,975	137,025,540	148,900,414	183,902,880
Corn, cereals, flour, and pastes..... ...	152,192,432	98,135,198	43,785,131	37,346,341
Timber & woodwork	20,362,923	40,897,284	8,945,685	8,449,777
Paper and books	5,508,239	4,711,242	6,881,084	4,963,508
Hardware & cutlery of all sorts	44,113,100	36,105,445	16,464,317	25,273,676
Metals & metal work	60,480,174	54,352,908	3,613,798	12,889,753
Gold, silver, precious stones, & jewellery	3,939,136	5,716,165	2,965,394	6,980,150
Stone, marble, etc ..	22,366,757	26,068,317	40,762,081	46,865,326
Porcelain, earthenware, glass, etc....	15,505,612	9,428,743	709,382	2,005,531
Tobacco	15,658,513	20,773,208	156,733	802,789
Total frs.....	965,173,672	917,297,605	558,285,576	627,942,146
Total £	38,606,947	36,691,904	22,331,423	25,117,966

Port of Brindisi.—The dredging in the port of Brindisi is being pushed forward in a most satisfactory manner. The amount of stuff raised by the dredging machines during the month of October was upwards of 40,000 centimetres.

Japanese Tea has hardly fulfilled the anticipations formed of it in the earlier years, and the trade in it has taken little development. The demand, such as it is, is almost entirely for American consumption. In 1867, 67,400 cwts. was shipped, principally to America. In 1865, the export was 74,000 cwts. Occasionally small shipments are made to England, but the market there is uncertain, and the quality is evidently unsuited to the demands here.

Siam Cotton.—In 1867, 15,710 cwt. of cotton, of the value of £56,874, was exported from Bangkok, about half of which was in the seed.

Re-arrangement of Apothecaries' Weights in Germany.—North Germany has adopted the French *gramme* as the basis of medical weights, and this obliges certain German States to alter their pharmacopœias. This is especially the case as regards the Grand Duchy

* See vol. xvi. of *Journal*, page 233, for those of previous years.

of Mecklenburg-Schwerin; but it being evidently inconvenient that each State should make changes without concert with its neighbours, the representative of the Grand Duchy has proposed to the Federal Council to convoke a commission of medical men and apothecaries to establish a pharmacopœia common to all the States of the German Northern Confederation.

Colonies.

Wine Vats in Victoria.—A new branch of business has been opened to the coopers of the colony in the manufacture of vats for use in the cellars of the wine makers. Some very large elliptical vats, with concave sides for this purpose, have lately been turned out.

Mining in Victoria.—Mining operations are in a satisfactory condition, continued progress in the mineral resources of the country being reported from all quarters. The gold mining industry, indeed, is rapidly resuming a very important place in the pursuits of the colony, and the principal gold-fields are now looked upon by the merchants, shopkeepers, and the labouring classes as affording almost unlimited operations. The discovery of the Mary River gold-fields may be said to be the beginning of a new era in the mining history of this colony. Good news from many other diggings is frequently received, but in consequence of the more brilliant attractions on the fields just mentioned, the news in question does not receive that attention which it deserves. While many of the digging population are amassing fortunes, the vast majority may be said to be doing well and earning good wages.

Obituary.

Abraham Cooper, honorary retired R.A., died on Thursday, the 24th December, at Greenwich, in the 82nd year of his age. He was born in September, 1787, in Red Lion-street, Holborn, of parents in a humble condition of life. He was elected an Associate of the Academy in 1817, and attained the full honours of that society in 1820, the same year which witnessed the election of Sir Thomas Lawrence to the presidential chair. In early life he passed much of his time among horses, and to this circumstance must be ascribed the direction in which his artistic talents developed themselves in youth. His first picture, properly so called, was the portrait of a favourite old horse belonging to the late Sir Henry Meux, Bart. By the advice and encouragement of Sir Henry, he was led to resolve to devote himself to art in earnest, and in him he found his earliest and most liberal patron. The only studio frequented by him was the stable or the grass-field, and the only books he consulted were some old numbers of the *Sporting Magazine*, illustrated with portraits of horses drawn by Marshall, a well-known animal painter of that time. His first exhibited picture, "Tam o'Shanter," sent to the British Institution in 1814, was bought by the then Duke of Marlborough. Mr. Cooper has been a constant exhibitor both at the Royal Academy and at the British Institution. He was the chief "battle painter" of the English school, and among his principal pictures may be mentioned "Blucher at the Battle of Ligny," "Cromwell at Marston Moor," "Lord Arundel Capturing a Turkish Standard," "Lord Arthur Capel defending Colchester during the Civil War," "The Battle of Shrewsbury," "Sir William Russell at the Battle of Zutphen," "The death of Harold," "Richard I. and Saladin at Ascalon," "The Battle of Assaye," and "The Battle of Waterloo." Several of these pictures have been engraved. The most widely known of all, perhaps, is his "Hawking in the Olden Time," which has been engraved, and, side by side with his "Greeks and Arab Horses," graces the collection of the Marquis of Westminster. Mr. Cooper also exhibited at various times "Arab Scheiks examining Captives," "Baggage Waggons attacked," "Highland Courtship," "Harvest in the Highlands," "The Dead Trooper," "The Return from Deer-stalking," "The Battle of Lewes." So lately as the Academy of 1867, he exhibited three paintings—"Arabs," "The Painter and his Models," and "Dressing a Fly, a scene in Glen Urquhart, with Urquhart Castle in the distance;" and in 1868, he exhibited one picture, "A Scene from Don Quixote."

Publications Issued.

Exposition Maritime Internationale du Havre, 1868. Rapports du Jury International et Catalogue Official des Exposants Récompensés. London: (*J. M. Johnson and Sons*, Castle-street, Holborn.)—This is a handsome volume of 650 pages, containing all the official details of the Havre Exhibition. An extract from the speech of the Minister of Agriculture and Commerce, on the occasion of declaring the Jury Awards, given in the introduction, well sets forth the purposes for which this Exhibition was originated:—"The principal object of the promoters of the Exhibition was the development of the industries identified with ship-building and maritime commerce. The vicinity of the docks of Havre afforded an opportunity for establishing a competitive examination of vessels afloat, that had been wanting in former Exhibitions. The International Jury were thus able to examine, not merely by models on a small scale, but upon the ships themselves, the improvements which had been made of late years in the build and fitting of sailing and steam vessels. It was a happy idea to give the place of honour to the ship, that *chef-d'œuvre* of science and of industry, that marvellous machine, so rapid in its speed, so docile under the hand that guides it, so powerful and yet so fragile at the same time, that it seems a being created with living organs and an intelligent force, to aid man to traverse the sea, and to combat the elements. A Maritime Exhibition held at the port of Havre naturally drew together a concourse of foreign nations. Great Britain, Belgium, Holland, Germany, and the United States, among others, felt themselves called upon to be represented. A cordial hospitality was offered to all who responded to the appeal thus made, and they were received, not as rivals, dreaded or wished absent, but as friends associated in the same labour, exposed to the same dangers, devoted to the same work—the progress of general commerce. England, above all, occupied an important position in the Exhibition. She contributed her models of ships, her appliances for fisheries, and the improved products of her industry; she now looks forward with you towards renewed progress as the result of these useful comparisons It is unnecessary to dilate upon all the advantages that have resulted from this close connection, which, during the last twenty years, has become, between France and England, more and more intimate. To allude only to its commercial results—the aggregate imports and exports annually exchanged between the two nations 20 years ago only reached in value £8,000,000; since the Empire, the increase has been so rapid that, in 1866, the amount exceeded £72,000,000. In former times the sea was made the battle-field, on which each struggled to dominate. At one time nations disputed with arms for the monopoly of distant colonies; at another, for the privileged possession of a commerce in itself restricted, and for ever menaced. Now, the sea is merely a highway; colonial ports are open to all flags and to all kinds of merchandise. The ports see removed those fortifications which formerly so jealously guarded them; they are transformed, and then enlarged into formidable cities, where the products of all parts of the world are brought together, and exchanged. In fact, maritime

commerce has become one of the most powerful means of connecting nations by identifying their interests." The volume opens with the official report of M. P. Nicolle, the Director of the Exhibition. This is followed by lists of the *personnel* or staff; the various committees, foreign delegates, and jurors; and it may here be mentioned that a novel feature in this Exhibition was the election of jurors by the exhibitors themselves, which seems to have worked well, and given satisfaction. The jury reports and the lists of awards made, with the motives which induced them, are given, and the whole is published in two languages, French and English. Notices of the aquarium, of the horticultural and poultry shows, the congress held on maritime affairs, health at sea, and the various musical and other *fêtes*, wind up the book, which is alike creditable, in its arrangements and completion, to the direction and the publishers.

THE ARCHITECT: A JOURNAL OF ARTS, ENGINEERING, AND BUILDING.—(*Gilbert Wood*). This is a new technical journal in connection with the subjects its title denotes. The first number appeared on Saturday, the 2nd instant, and it will be continued weekly each succeeding Saturday.

Notes.

EXCAVATIONS AT ROME.—The excavations which are being carried on in Rome are fruitful of interesting results. The last announcement is that the Emporium has been found intact, being merely enclosed by barbarous constructions, which are being cleared away. Another report is that a large number of blocks of rare marbles have been found, including seven blocks of violet paonazetto, which is not now to be obtained at any cost; the remainder consists of Porta Somta, Africano, Milesio and Parian, the blocks being as remarkable for their size as for their extraordinary beauty.

UNIVERSAL EXHIBITION AT VIENNA.—The Austrian Government has decided on organising a grand international exhibition at Vienna. The site to be devoted to the purpose is a large park, which will afford accommodation for a building with surrounding grounds on a very extensive scale. Full particulars will be available shortly.

NEW LINE OF STEAMERS BETWEEN BRINDISI AND ALEXANDRIA.—Messrs. Florio and Company, of Palermo, the proprietors of the Italian mail steamers between Naples and the principal Italian ports, are about to establish a line of steamers between Brindisi and Alexandria. The first voyage will probably be made shortly.

ANNUAL SHOW OF CATTLE IN PARIS.—The first cattle show at the new general market of La Villette is announced to take place in March next. The animals are to be received and weighed on the 20th and 21st, when the classification and cataloguing will be performed; on the 22nd the jury will settle the awards, and in the afternoon visitors will be admitted by payment of five francs; on the 23rd the admission will be one franc; and on the following day the show will be thrown open gratuitously to the public. The prizes will be distributed by the Minister of Agriculture and Commerce.

THE MONT CENIS TUNNEL.—During the first fortnight of the past month (December), the progress made at the Mont Cenis tunnel was 41·15 metres, of which 20·80 metres were driven at the Italian side, at Bardonnèche, and 20·35 on the French, at Modane. The position of these works up to the 15th December was as follows:—

Length driven at Bardonnèche	5,340·20
Length driven at Modane.....	3,776·95
Total length driven	9,117·15
Length remaining to be driven	3,102·85
Total length of tunnel	12,220·00

THE SUEZ CANAL.—During the month ending 15th November, the excavations for the Suez Canal amounted to 2,102,000 cubic metres. This is the fourth month in which the excavation has exceeded two millions of cubic metres. Six steam dredging machines on the canal, between Port Saïd and Rasa El-Ech, excavated 313,628 cubic metres, or, on the average, 52,271 cubic metres each. The quantity, however, excavated by one of these dredgers amounted to 88,889 cubic metres, or near 3,000 cubic metres per day. The position of these works up to the 15th November was as follows:—

	Cubic metres.
Amount excavated up to 15th October, 1868	51,347,718
Ditto from 15th October to 15th November	2,102,000
Total amount excavated up to 15th November	53,449,718
Remaining to be excavated	20,662,412
Total excavation in line of canal	74,112,130

INTERNATIONAL STAMPS FOR PAYMENT OF SMALL SUMS.—It is said that the French Government is about to propose to all the states that have adopted the French monetary system the use of stamps for the payment of small sums. Some mode of liquidating amounts too small for a banker's draft has long been wanted, though this is supplied as regards several countries (Prussia, Italy, and Belgium) by international post-office orders. It is not, therefore, these countries that most require such an arrangement as that proposed, but England, Austria, Russia, and the United States, which have neither monetary nor money-order arrangements with France. At present the only way of paying a small amount in one of these states is to keep a supply of postage stamps of the country, which is not always convenient, or even easy of accomplishment.

THE COMMUNAL SCHOOLS AT MILAN.—The total number of pupils at the communal schools at Milan is 12,550, being a considerable increase on the number of last year. This number is divided as follows:—

Elementary schools for boys	5,418
,, ,, ,, girls	3,755
Evening schools	2,192
Fête day schools	1,185
Total.....	12,550

Correspondence.

ARTIFICIAL REFRIGERATION.—SIR,—Having read the replies from Dr. Paul and Mr. King, I can only repeat that an ice-making machine was applied to "direct refrigeration" in Messrs. Flower's brewery two years before Mr. King so applied it in Messrs. Truman's. Dr. Paul does not seem to be aware that although Kirk's machine at Stratford can be used for making ice, it has also been applied to the direct refrigeration of beers and worts. The saving in waste, which Dr. Paul dwells on in his letter, and which he considers Messrs. Flower are not acquainted with, was ascertained by them two years ago, and since that time the machine, although occasionally used for ice making, is almost constantly employed in refrigeration, at a temperature of from 35° to 40°. For this purpose the brine, instead of passing through the cells of the ice-box, is merely turned through the ordinary brewers' refrigerator. This is certainly the simplest and most direct refrigeration possible, and the saving in cost over ice-making is considerable, as a pressure of 60 or 70 lbs. is sufficient, instead of 100 lbs. which is required to bring the temperature of the machine low enough to make ice. I have not taken out a patent with a view to profit, but simply to record the first practical and successful

application of artificial refrigeration to brewing. I am quite aware that vast improvements may be expected, and to that end I shall ever be ready to give to others, as I have already done to Messrs. Siebe and King, any information or assistance in my power. I only write to you lest my silence should be construed into an acquiescence with an inaccurate statement in Dr. Paul's paper. Having done so, I shall not trouble you further. I am, &c., Charles E. Flower.

Stratford on-Avon, January 2nd, 1869.

MEETINGS FOR THE ENSUING WEEK.

Mon.....R. Geographical, 8½. Mr. Douglas W. Freshfield, "Journey in the Caucasus, and Ascent of Kasbek and Elbruz."
Medical, 8.
London Inst., 6.

Tues ...Medical and Chirurgical, 8½.
Civil Engineers, 8. Discussion upon Mr. S. P. Bidder's (jun.) paper, "On Mechanical Appliances for Getting Coal."
Photographic, 8.
Ethnological, 8. Mr. H. H. Howorth, "On the Westerly Drifting of the Nomades, from the Fifth to the Nineteenth Century."
Royal Inst., 3. Mr. Westmacott, "On Fine Art."

Wed ...Geological, 8. 1. Prof. Huxley, "On the *Hyperodapedon* of Elgin, Devon, and Central India." 2. Mr. W. Whitaker, "On the Locality of a New Specimen of *Hyperodapedon* on the South Coast of Devon." 3. Mr. W. H. Baily, "Notes on Graptolites and allied Fossils." Communicated by the President. 4. Mr. W. H. Baily, "On Plant-remains found associated with the Basalt in the North of Ireland." Communicated by the President.
Graphic, 8.
Microscopical, 8. Dr. H. C. Bastian, "On Mounting and Tinting Animal Tissues."
R. Literary Fund, 3.
Archæological Assoc., 8.

Thur ...Royal, 8½.
Antiquaries, 8½.
Zoological, 8½.
Royal Society Club, 6.
Mathematical, 8.
London Inst., 6.
Royal Inst., 3. Mr. Rupert Jones, "Protozoa."
Society of Fine Arts, 8. Annual General Meeting.

Fri .....Philological, 8½.
R. United Service Inst., 3. Capt. J. R. C. Colomb, "The Distribution of our War Forces." Part I.
Royal Inst., 8. Prof. Tyndall, "Chemical Rays and Molecules."

Sat .....Royal Inst., 3. Prof. Odling, "Hydrogen and its Analogues."

Patents.

From Commissioners of Patents' Journal, January 1.

Grants of Provisional Protection.

Alum, &c., manufacturing—3870—P. Spence.
Anchors, carrying in board after being weighed—3856—E. S. Griffiths.
Bandages—3890—T. B. Hubbell.
Bobbins—3813—M. Brown-Westhead and R. Smith.
Carriages—3862—G. D. Robinson.
Casks, cans, &c., metallic—2611—D. Evans.
Cartridge pouches—3807—R. S. Garden.
Coal, &c., getting—3884—J. S. Walker.
Colouring matters—3527—A. Leykauf.
Copperas, manufacturing—2959—P. Spence.
Corsets—3809—J. W. Chilcot.
Cotton, &c., cleaning, &c.—3803—C. Mather.
Diving dresses, &c.—3175—A. Denayrouze.
Electricity, machines for exciting frictional—3878—W. F. Stanley.
Engine counters—3799—J. Hay.
Fabrics, composition for the surfaces of—3833—G. Ritchie.
Fire-arms, breech-loading—3859—S. Remington.
Flax, &c., machinery for breaking, &c.—3787—G. A. C. Bremme.
Gas—3843—G. H. Benson and W. G. Valentin.
Hats—3805—H. Williamson.
Heating apparatus—3865—J. Petrie, jun., and W. T. Cheetham.
Hydro-pneumatic pumps—3894—P. G. Jarre.
Jute, &c., treating—3864—E. Pavy and J. Clark.
Ladies' skirts—3872—W. S. Thomson.
Leather, currying and dressing—3900—H. T. Vanner and E. Prest.
Lock spindles, &c.—3791—W. Meakin.
Locomotion, mechanism applicable to—3888—W. Pidding.
Lubricators—3783—G. Preston and J. Prestige.
Lubricators—3847—R. Hallimond.
Mangles—3821—W. N. Nicholson.
Materials, machinery for turning—3781—S. Cowperthwaite.
Millstones, dressing—3789—J. Hine.
Nuts, forging—3853—J. W. Brierley.
Omnibuses, &c.—3663—P. Ellis.
Omnibuses, &c., tell-tales for—3827—R. Wappenstein and R. Ray.
Parasols, &c.—3898—G. Ritchie.
Photographs, &c.—3849—J. Pouncy.
Pins, &c., tinning—3858—J. Edridge and J. Merrett.
Ploughs—3882—W. Lewis.
Printing purposes, metallic cylinders for—3801—A. Watt.
Railway rolling stock, &c.—3825—T. C. Fidler.
Railway signals—3841—W. Manners.
Railway switches, &c., working—3793—J. J. Stevens.
Railways, preventing collisions on—3800—T. Lynch.
Rocks, &c., cutting and working—3876—W. R. Lake.
Sewers, &c., ventilation of—3868—J. Brierley.
Sewing machines—3854—W. F. Thomas.
Ships, assisting the flotation of—3851—E. T. Hughes.
Shutters and blinds—3845—F. H. Knevitt and H. H. Hazard.
Smiths' bellows—3779—T. Smith.
Sounding machines—3880—J. E. Massey.
Steam gauges—3857—T. B. Salter and J. Silvester.
Stone, &c., tools for dressing—3785—J. Hamilton and J. B. Crawford.
Sulphuric acid, manufacturing—3404—L. A. Israel.
Taps or valves—3896—J. Breeden.
Tea and coffee urns, &c.—3852—E. T. Hughes.
Tobacco-cutting machines—3795—J. Allmark and W. Blakey.
Tubes and rods, ornamenting—3817—J. T. Grice.
Umbrellas, &c.—3874—G. H. Asker.
Velocipedes—3886—E. A. Cowper.
Washers—3892—H. W. Hammond.
Watches, &c., apparatus for winding, &c.—3838—F. Robert-Theurer.
Water-closets—3777—H. Law.
Weaving apparatus—3855—J. Hodgson, H. Bottomley & E. Cockroft.
Windows, lighting painted, &c.—3839—A. Perry.

Inventions with Complete Specifications Filed.

Boots and shoes, machines for pegging—3950—W. R. Lake.
Steam valves, &c.—3941—G. T. Bousfield.

Patents Sealed.

2108. L. Francis.
2110. W. Dean and R. Andrew.
2115. D. Hall.
2127. G. Bennett & J. Woodcock.
2132. J. A. Muller.
2133. J. Head.
2137. E. H. Newby.
2139. T. G. Messenger.
2143. P. Jensen.
2146. E. H. Waldenström.
2177. J. Harris and V. Pendred.
2182. T. Worth.
2230. R. Couty and J. Richard.
2247. W. I. Ellis.
2283. A. Homfray.
2370. A. Morrall.
3122. W. Moodie.
3198. H. A. Bonneville.
3489. H. A. Bonneville.

From Commissioners of Patents' Journal, January 5.

Patents Sealed.

2147. J. H. Whitehead.
2150. G. R. Wilson.
2151. T. J. Mayall.
2152. E. Coppée.
2154. J. Lawson and E. G. Fitton.
2155. T. R. Crampton.
2156. B. P. Walker.
2159. T. J. Mayall.
2160. T. J. Mayall.
2164. J. Holt and G. S. Coponet.
2165. J. Prest, W. Mather, and W. Doherty.
2167. A. J. Le Blanc.
2168. E. Coppée.
2171. E. Rouget.
2176. W. Creasy.
2181. W. R. Oswald.
2184. J. H. Johnson.
2193. W. Russell.
2198. J. D. Brunton.
2207. A. Munro and W. B. Adamson.
2218. T. Wood.
2261. D. Webster.
2302. L. Dulac.
2409. H. Moule.
2446. E. Evans.
2683. C. F. Varley.

Patents on which the Stamp Duty of £50 has been paid.

3376. R. Smith.
194. W. K. Hall.
12. P. S. Bruff.
34. F. Wright.
30. T. E. Vickers.
42. E. Walker.
81. W. E. Newton.

Patent on which the Stamp Duty of £100 has been Paid.

55. J. Stenhouse.

Registered Designs.

4986—Dec. 3—Improved ring roller brush—C. Hargrove and G. H. Wain, Birmingham.
4987—Dec. 9—Handkerchief box—H. M. Matier and Co., Belfast.
4988—Dec. 10—A gas-heating and cooking apparatus—L. J. Mills, 21, De Beauvoir-crescent, N.
4989—Dec. 10—Roasting jack—E. B. Bennett and Son, Birmingham.
4990—Dec. 11—The Cestus corset—Chilcate and Co., Landport, Hants.
4991—Dec. 15—The railway key whistle—T. Yates, 37, Coleshill street, Birmingham.
4992—Dec. 28—Handkerchief box—Richardson, Son, and Owden, Belfast.
4993—Jan. 5—A plug washer and grating for sinks—W. S. and J. D. Adams, 41, Marshall-street, Golden-square, W.

Journal of the Society of Arts.

FRIDAY, JANUARY 15, 1869.

Announcements by the Council.

Swiney Bequest.

A meeting of the judges appointed under the will of the late Dr. Swiney is hereby summoned to be held on Wednesday, the 20th of January inst. (being the anniversary of his death), when the bequest under the said will, in favour of the "author of the best published Treatise on Jurisprudence," will be adjudged. The meeting will take place at the House of the Society of Arts, at four o'clock, p.m.

(By order) P. Le Neve Foster,
Secretary.

13th January, 1869.

Ordinary Meetings.

Wednesday Evenings at eight o'clock :—

Jan. 20.—"On Photography and the Magic Lantern, applied to the Teaching of History. By Samuel Highley, Esq., F.G.S. Practically illustrated.

Cantor Lectures.

The Second Course of Cantor Lectures for the present Session will be "On Painting," by S. A. Hart, Esq., R.A., late Professor of Painting at the Royal Academy, and will consist of Four Lectures, to be delivered as follows :—

Lecture I.—Monday, February 1st.

On the History of Portrait Painting.

Lecture II.—Monday, February 8th.

On the Practice of Portrait Painting.

Lecture III.—Monday, February 15th.

On the Suggestions offered by surrounding circumstances to the Artist.

Lecture IV.—Monday, February 22nd.

On Landscape Painting.

Each lecture will begin at eight o'clock. These Lectures are open to Members, each of whom has the privilege of introducing two friends to each Lecture. Tickets for this purpose will be forwarded with next week's *Journal.*

Institutions.

The following Institutions have been received into Union since the last announcement :—

Greenwich (East), Science Classes, St. Mary's National School.
Ramsgate, Church Institute and Literary Society.
Spring Vale (Hammersmith, W.), Institute and Evening Classes.

FINAL EXAMINATIONS, 1869.

Notice to Institutions and Local Boards.

In order to avoid holding these Examinations on the same evenings as those of the Department of Science and Art, it has been decided to hold them, in 1869, on the evenings of

TUESDAY,	the 20th	**APRIL,**
WEDNESDAY,	the 21st	,,
THURSDAY,	the 22nd	,,
FRIDAY,	the 23rd	,,

From 7 p.m. to 10 p.m., instead of on the 27th, 28th, 29th, and 30th April, as announced in the Programme of Examinations for 1869.

In consequence of this alteration the Previous Examinations must be held earlier, and the Forms No. 2 and No. 4, referred to in par. 6 of the Programme, must of course be sent in a week earlier than the dates there fixed for receiving them.

It is very important that this alteration should be made as public as possible. For this purpose a number of small slips, to be inserted between pages 8 and 9 of every Programme sent out, have been forwarded to each Institution and Local Board. They should also be specially sent to any person to whom Programmes may have already been forwarded.

Large bills, to be suspended on the walls of the Institution reading-room, or in some other public place, will also be sent on application.

Proceedings of the Society.

Cantor Lectures.

"On the Aniline or Coal Tar Colours."

By W. H. Perkin, Esq., F.R.S.

Lecture III.—Delivered Monday, December 21st.

Various Aniline, Phenol, and Naphthalin Colours—Application of the Coal Tar Colours to the Arts.

Last lecture we considered, among other subjects, magenta and some of its coloured derivatives, as the blues and violets. This evening we commence with some of the green colouring matters which have also been produced from magenta. The first green colouring matter we shall consider is the "aldehyd green," which owes its name to a substance called "aldehyd" being employed in its preparation. I must, therefore, first tell you what aldehyd is.

Aldehyd is a product of the oxidation of alcohol; it is a volatile liquid possessing a very peculiar odour, and was discovered by a chemist named Döbereiner, but analysed by Liebig. It is obtained by treating alcohol with a mixture of bichromate of potassium and sulphuric acid, and was generally prepared in glass retorts, but, now that it is required for colour making, the glass apparatus is replaced by copper or leaden vessels.

Towards the end of 1861, M. Lauth described a reaction by which rosaniline could be made to produce a blue colouring matter; but this product was found to be useless as a dye, on account of its instability. It was produced by the action of aldehyd upon a solution of rosaniline and sulphuric acid. This useless colour was afterwards experimented upon by a dyer named Chirpin,

who, after a number of fruitless attempts at fixing it, told his difficulties to a photographic friend, who evidently thought if it was possible to fix a photograph it was possible to fix anything else. He, therefore, advised his confidant to try hyposulphite of sodium. On making this experiment, however, the dyer did not succeed in fixing his blue, but found it converted into a splendid green dye, now known as aldehyd green.

To prepare this colouring matter, a cold solution of magenta, consisting of one part of colouring matter dissolved in a mixture of three parts of sulphuric acid, and one part of water, is employed; about one and a-half parts of aldehyd are added by degrees to this solution, and when the whole is mixed it is heated on a water bath, until a drop of the product diffused in water produces a fine blue colouration. It is then poured into a large quantity of boiling water, containing three or four times as much hyposulphite of sodium as the magenta employed. After boiling a short time the product is filtered off from a greyish insoluble residue which forms. The filtrate contains the green. This process being a very simple one, a great number of dyers now prepare the colouring matter as they require it. It may, however, be precipitated by means of tannin or acetate of sodium, collected on filters and drained to a paste, and, if necessary, dried. In both these forms it is found in the market.

The aldehyd green is principally employed in silk dyeing. It is a splendid colour, and very brilliant both by day and artificial light. The chemistry of this green is at present hidden in obscurity, as it is very difficult to obtain in a chemically pure condition. But like the colouring matter previously described, it is undoubtedly the salt of an organic base apparently containing sulphur.

This base is colourless, or nearly so, and becomes changed to the normal colour of aldehyd green upon absorption of carbonic acid.

It will also decompose ammonia salts, combining with the acid and becoming green. I have here a solution containing the colourless base of this green, an ammonia salt and a little free ammonia. If I pour it upon a piece of white blotting-paper it does not stain it, but if I heat it the ammonia salt is decomposed, and we get the green developed with its ordinary intensity.

There is another green of an entirely different nature to the aldehyd green; it is called the iodine green. This colouring matter is always produced, but in variable quantities, in the preparation of the Hofmann violets, from magenta and iodide of ethyl or methyl. Of late much attention has been directed to this colouring matter, and by making a few alterations in the process for preparing the Hofmann, from forty to fifty per cent. of product can now be obtained from the magenta used. The iodine green is much used for cotton and silk dyeing; its colour is bluer than that of aldehyd green, and it is, therefore, more useful, as it yields, with the addition of yellow, a greater variety of green shades.

Iodine green contains an organic base which is not precipitated by alkaline carbonates. With picric acid it forms a difficultly-soluble picrate, and is generally prepared on the Continent as a paste consisting of this colour precipitated with picric acid and drained on a filter. In England it is, however, sold in alcoholic solution. It is a good green by gaslight.

The next green I have to bring before you is a magenta derivative, commercially called "Perkin's green." In its properties it resembles more closely the iodine than the aldehyd green, but differs from this in its solubility, and in being precipitated by solutions of alkaline carbonates, as carbonate of sodium. It is an organic base which is nearly colourless, and is by no means a chemically powerful body. Like the iodine green, it is precipitated by picric acid, forming a picrate which crystallises from alcohol in small prisms with a golden reflection. This colouring matter is principally employed for calico printing, and is now extensively used. Thus you see we have three aniline greens, some useful for one, and some for another purpose, so that the silk and cotton dyer, and the calico-printer, as well as others can be supplied. For fastness these greens are, I think, quite as good as the violets; the aldehyd green, however, I believe, resists light the best.

In the formation of the mauve, or aniline purple, there is always a small quantity of a second colouring matter produced, of a rich crimson colour, similar to that of safflower. Several years ago I examined this substance, and found it to dye silk a remarkably clear colour, but owing to the press of other matters, and the very small quantities in which it could be obtained, I did not give it any further attention. By a new process, however, it can now be produced in somewhat larger quantities, and endeavours are being made to introduce it to the arts, as it produces beautiful tints of pink upon silk and cotton, and, moreover, can be used for printing cotton, silk, and wool processes, to which safflower cannot be applied as it will not bear steaming. This aniline pink or crimson is a beautiful chemical body, crystallising in small prisms, possessing a golden green lustre. It is soluble in alcohol, and also in water; it produces solutions remarkable for their fluorescence, so much so, that by certain lights they appear as if filled with a precipitate. In colour and fastness it is equal to safflower, and should it be found possible to manufacture it at a moderate price, I should imagine it would entirely supersede that colouring matter, especially as it is not affected by alkaline solutions.

There is a product in the English market supposed to be an aniline colour called "Field's orange," after its discoverer Mr. Frederick Field. Its properties are those of a nitro-acid, but as its preparation has not been described, of course I cannot tell you anything about it. With alkalies it forms a rich orange-coloured solution, but by the addition of an acid it is precipitated as a pale yellow powder.

Field's orange is a very useful colouring matter, having a great affinity for animal fibres, and is extensively used for wool-dyeing, as it resists the action of light very well.

We now come to a colouring matter of a very indefinite nature. I refer to aniline black. This substance appears to be closely allied to the insoluble part of the black precipitate formed in the manufacture of the mauve. This precipitate, however, always contains oxide of chromium, which cannot exist in the aniline black generally employed, as no chromium compound is used in its preparation, but as copper compounds are used, it may be that aniline black represents the black precipitate with the oxide of chromium replaced by the oxide of copper, or it may even be that in either case the metallic oxide is not an essential part of this black substance.

Aniline black is perfectly insoluble, and has, therefore, to be formed upon the fibre when employed for calico printing. As we shall have to refer to its application to dyeing and printing, I will not make any further remarks upon it just now.

From mauve and magenta, chocolate maroons and browns are prepared, but, as they are of secondary importance as yet, I will only just mention one or two of the methods of preparing them.

One of the processes for preparing chocolate from magenta is by the action of nitrous acid, but care has to be taken to watch the progress of the operation, and to stop it when the required shade has been obtained. Another process consists in heating magenta with hydrochlorate of aniline to a temperature a little above 200° C. The product, when purified, produces a maroon colour. Browns are generally obtained from the residue of magenta making.

All the colouring matters we have considered up to the present time are derivatives of aniline and toluidine, and constitute nearly all the colours of the rainbow.

By the action of nascent hydrogen upon dinitrobenzol, Mr. A. H. Church and myself obtained, in 1857, a

crimson colouring matter, which was named nitrosophenyline. I have lately made a few new experiments upon this remarkable body, and find that it has an affinity for pure cotton, dyeing it of a clear cerise colour, considerably less blue in tint than safflower. With very dilute acids, this colouring matter forms a blue solution; with less dilute acid, a crimson colour; and with concentrated sulphuric acid, a green colour. It is difficult to judge of the probable utility of this colouring matter, as it is so difficult to obtain in quantity by the present process. I may mention that my new experiments with this substance have caused me to doubt the purity of the product examined by Mr. Church and myself; and this is not remarkable when we consider how few methods of purifying artificial colouring matters were known at the date of our experiments, as well as the small amount of substance at our disposal.

We now turn to a product very different from aniline, though related to it in some respects very closely. On the table you will see a coal-tar product called "phenol" or "carbolic acid." It was discovered, a long time since, by Runge, and afterwards studied by a great number of chemists. It is only, however, during the last few years that it has been introduced into commerce in a pure condition, thanks to Dr. Crace Calvert, so well known to the Society of Arts.

Phenol or carbolic acid is a splendid crystalline body, possessing many most interesting properties; but I must confine myself to a short account of its coloured derivatives only.

Carbolic acid, when treated with nitric acid, yields a yellow acid, known as picric acid. This substance can be produced from many other bodies besides carbolic acid, and when first employed for dyeing purposes was generally prepared from the resin of the *Xanthorrhea hastilis*, but now, owing to the cheapness and purity of carbolic acid, I believe it is exclusively used in its manufacture. Picric acid requires care in its preparation, if phenol and strong nitric acid be employed, as the action is very violent. Pure picric acid is of a very pale yellow colour; it is employed principally for silk dyeing, the colour it produces on silk being much darker than that of the acid itself. Picric acid has a very bitter taste, and by some it is said to be a great improvement upon hops, in the manufacture of bitter beer, especially as it has been proposed as a tonic in place of quinine. Picric acid forms beautiful yellow salts, the most interesting being that of potassium. This salt is extremely insoluble in water, and very explosive; it has been proposed as a substitute for gunpowder for charging shells. Picric acid, under the influence of cyanide of potassium, is perfectly decomposed, and changed into a new compound called isopurpuric acid, a substance isomeric with murexide. The potassium salt of this compound is very explosive, and, to avoid danger, it is generally supplied in a moist condition, and mixed with glycerine. It produces a kind of maroon colour upon wool, but I do not think it has been extensively used up to the present.

Runge, when experimenting with the products of the distillation of coal, obtained two compounds, called by him rosolic and brunolic acids, which he regarded as products existing in coal-tar; I think it most probable, however, that these bodies were produced in his process of purification, and did not exist ready formed in coal-tar.

Rosolic acid was afterwards examined by Dr. Hugo Müller, who obtained it from crude carbolate of calcium, which had been exposed to the oxidising action of the air. This process, however, does not yield rosolic acid in quantity, but in 1861, Kolbe and Schmitt described a method of producing this substance, by heating a mixture of oxalic, carbolic, and sulphuric acids. It is stated, however, that this process was discovered by M. Jules Persoz, in 1859. It is by this method that rosolic acid is now manufactured.

Commercial rosolic acid, commonly called aurine, is a beautiful brittle resinous substance, having a slight green metallic lustre; when pure it may be crystallised, and if pulverised forms a scarlet orange powder. Its solutions are of an orange colour, but change with alkalies to a most magnificent crimson. It has not been found capable of very many applications in dyeing and printing, although it produces very good orange shades, and with magenta it makes a very good scarlet.

The great difficulty in applying rosolic acid to the arts is owing to the easy solubility of its salts in water. It appears to be closely allied to rosaniline, as it has lately been found possible to obtain it from this colouring matter.

When heated with ammonia, in a closed vessel, to 120° or 140° C., rosolic acid permantly changes into a new colouring matter of a crimson shade, called "peonine" or "coralline." It forms beautiful tints upon silk, similar to safflower, provided it is kept slightly alkaline, but if treated with the least quantity of acid the freshness of its colour is destroyed. When heated with aniline this colouring matter undergoes a similar change to magenta, being converted into a blue called azuline. This colouring matter, as well as coralline, was discovered by M. Jules Persoz, and patented by M. M. Guinon Marnas and Bonnet in 1862. Azuline, when in the solid state, presents a coppery coloured surface, it is soluble in alcohol, but difficultly so in water. It is not manufactured now, having been replaced by the more brilliant blues obtained from rosaniline, and described in our last lecture.

We must now turn our attention to another series of coal-tar colours, derived from a beautiful product called naphthaline. You will see it on the table of coal tar products, it is a hydrocarbon containing

$$C_{10} H_8$$

and may be obtained in any quantity. It is remarkable for the readiness with which it sublimes, and, like benzol and toluol, it yields with nitric acid a nitro-compound called "nitronaphthaline," a beautifully crystalline body, and this, with iron and acetic acid, yields an organic base called "naphthylamine." This base is solid, and beautifully crystalline, but possesses a very disagreeable odour.

Mr. Church and myself obtained from a salt of "naphthylamine" and a mixture of nitrite of potassium and potash, a beautiful substance crystallising in orange needles with a green lustre. It is called by a rather long name "azodinaphthyldiamine."

This substance is a feeble organic base, and dissolves in alcohol, forming an orange-coloured solution, which changes to a splendid violet colour upon the addition of hydrochloric acid. It has, however, been found useless as a dye, because the purple colour only exists in the presence of free acid, and the orange-colour of the base itself is liable to turn brown when exposed to the light. It would appear probable, however, that azodinapthyldiamine may become useful as the starting-point for new colouring matters, as I have lately succeeded in producing from it a very promising crimson substance, possessing a considerable affinity for animal fibres.

A very beautiful yellow colouring matter has been obtained by Dr. Martius from napthylamine, somewhat similar to picric acid, but of a much more intense colour. It is prepared by treating hydrochlorate of naphthylamine with nitrite of potassium; by this means a substance known as diazonaphthol is obtained; this is then heated with nitric acid, and is transformed into the new yellow, chemically known as dinitronaphthol. This substance is commercially called Manchester yellow. It possesses the properties of an acid. The commercial compound consists of a beautifully-crystalline calcium salt, soluble in water, and dyeing silk or wool a magnificent golden yellow colour.

Owing to an increasing demand for benzoic acid, experiments have lately been made, with a view of obtaining it from naphthaline instead of gum benzoin, &c. For this purpose experiments were made with an acid derived

from naphthaline, called phthalic acid, which, when carefully heated with lime, is found capable of yielding benzoate of calcium, from which benzoic acid can be prepared. But as in these processes secondary compounds are formed, which interest us this evening, I will briefly describe the process employed for obtaining these various substances.

First of all, naphthaline is heated with a mixture of chlorate of potassium and hydrochloric acid; in this way a mixture of chloronaphthaline and bichloronaphthaline is obtained. These products are then heated with nitric acid, and yield a mixture of phthalic acid, and a substance called the chloride of chloroxynaphthyl. The phthalic acid is converted into the calcium salt, and heated with slaked lime to a temperature of 350° or 370° C., to convert it into a benzoate.

It is, however, the chloride of chloroxynaphthyl which interests us now. This substance, when heated with an alkali, yields the salts of an acid called chloroxynaphthalic acid, which may be obtained in a free state by means of hydrochloric acid. When pure, chloroxynaphthalic acid is a pale yellow crystalline powder, forming beautiful compounds with baryta, zinc, and copper. It dyes wool a scarlet colour. The great interest of this substance consists in its supposed relationship to alizarine, the colouring matter of madder, the only difference in composition of chloroxynaphthalic acid and alizarine being in the former containing an equivalent of chlorine in place of hydrogen, thus:—

$C_{10}H_6O_3$ ..... Alizarine.
$C_{10}(H_5Cl.)O_3$ ..... Chloroxynaphthalic acid.

Many endeavours have been made to remove this chlorine, and to put hydrogen in its place, with the hopes of producing alizarine; but, up to the present time, no definite results have been obtained.

I am inclined to think that, although this relationship of composition exists between these bodies, yet that their chemical nature is quite dissimilar. We generally find that chlorinated bodies have similar properties to those from which they are derived or represent. Chloroxynaphthalic acid, however, does not appear to possess properties similar to alizarine. This acid dyes wool readily without a mordant; alizarine only slightly stains it. When boiled with cloth prepared with alumina or iron mordants, it scarcely produces any change, while alizarine yields intense colours.

This process of preparing benzoic and chloroxynaphthalic acids is carried out on the large scale in France, by MM. P. and E. Depouilly, to whom I am indebted for the specimens of these products shown in this lecture. Some of the chloroxynaphthalates are beautifully-coloured salts, and are used as pigments.

Laurent in his researches obtained a body from naphthaline called carminaphtha. This product is now claiming the attention of manufacturers, and is said to produce very fine shades of colour upon fabrics.

Before making any further remarks upon the coal tar colours, I wish to draw your attention to some of their applications to the arts.

I have told you that most of the coal tar colours contain carbon, hydrogen, and nitrogen, and that they are generally organic bases. They differ essentially from most of the vegetable colouring matters, which contain, with but few exceptions, only carbon, hydrogen, and oxygen, and are weak acids. You will thus understand that many difficulties had to be encountered in their application for dyeing and printing, because they would not combine with the ordinary mordants used for the colouring matters of woods, as alumina and oxide of tin. These observations refer to the dyeing and printing of vegetable fibres, and not to silk or wool, as these materials absorb the coal tar colours without the intervention of a mordant.

In silk dyeing, the principal difficulty experienced in applying the coal-tar colours was owing to their great affinity for the fibre, thus preventing the dyer from obtaining an even colour, especially when dyeing light shades. After a time, however, it was found that this obstacle could be overcome by dyeing the silk in a weak soap lather, to which the colour had been added. This not only caused the dyeing to proceed with less rapidity, but also kept the face of the silk in good condition. Silk dyed by this process is left soft, but may afterwards be rendered hard or "scroop" by rinsing in a bath of slightly acidulated water.

This process was first used for dyeing silk with the mauve or aniline purple. It has, however, been since found suitable for nearly all the aniline colours, as magenta, Hofmann, and Britannia violets, &c. For dyeing silk with coal-tar colours of an acid nature, such as picric acid, dinitronaphthol, &c., the silk is simply worked in a cold aqueous solution of the colouring matter, sometimes slightly acidulated, as when using the sulpho-acids of aniline blue or soluble blue. The process of printing silk with aniline colours is comparatively simple. An aqueous or alcoholic solution of the colouring matter is thickened with gum senegal, printed on with blocks, and, when dry, exposed to the action of steam for about half-an-hour. The gum is then washed off, and the goods finished.

In my last lecture I referred to the formation of two colourless products from magenta, the one called leucaniline, and the other hydrocyanrosaniline.

Some few years since, it was found that if silk dyed with magenta has the reagents necessary for the formation of these colourless products printed upon it, what is called a discharge style can be produced. One of the substances used for effecting this change is powdered zinc mixed with gum. This process also applies to all the coloured derivatives of magenta, and yields better results than can be obtained by printing on the colouring matter and leaving the white parts, because the colours are always clearer when dyed than when printed. But this is not all. When printing two colours on silk, say a pattern with a green ground and purple spots, two blocks have to be used, the one for the ground and the other for the spots; and, when removing the first block, the silk often moves slightly, therefore when the spots are put in by the second block they do not exactly register, and thus an imperfect result is obtained. This difficulty, however, can be avoided by taking silk dyed with any of the derivatives of magenta, and printing it with the discharge previously mixed with the colour it is desired to introduce, of course employing a colouring matter which is not affected by the discharge, as aniline purple, aniline pink, &c. This discharge style has only been employed for silk at present.

We will now turn our attention to the methods of dyeing wool. These methods, as a rule, are very simple, the wool being merely worked in a hot aqueous solution of the desired colouring matter, no mordant being required. Acids are generally found to be injurious, a neutral bath being preferred, and the operation finished by bringing the temperature nearly up to that of boiling water.

With the blue known as Nicholson's blue, the process of dyeing is different to that just given, and consists of two distinct operations, the wool being first worked in an alkaline solution of the colour, which gives it a kind of grey or slate shade, and then in an acid bath, which developes the colour.

The printing of wool is similar to that of silk, the colouring matter being simply thickened with gum, printed on the goods, steamed, and then washed.

The dyeing of cotton with aniline purple at first presented many difficulties. This colouring matter was found to be capable of producing a very beautiful colour without a mordant, and it was proposed to employ it in this manner, but the colour thus obtained would not bear washing, being nearly all removed with hot water and soap. Mordants, such as alum, were then experimented with, but these gave no results. After some time Mr. R.

Pullar and myself found a method of applying this colouring matter to cotton, which is based upon the insolubility of the compounds it forms with tannin. In using this process the cotton is first soaked in a decoction of sumac or some other tannin agent, then in a solution of stannate of soda, and, lastly, in water, slightly acidulated with sulphuric acid. The cotton thus prepared contains an insoluble compound of tin and tannin, and which possesses a great affinity for aniline purple. The stannate of soda may be replaced by alum, or a solution of tin salt. This method of preparing cotton has been found suitable for nearly all the aniline colours discovered since the mauve, and is now almost universally employed in Great Britain for cotton dyeing. Other processes have been proposed for cotton dyeing, but are not so generally employed as the one just described.

We now pass on to the application of coal-tar colours to the art of calico printing. The mauve, when first introduced, was applied to printing in a very simple manner; the colouring matter was merely mixed with gum and albumen, printed on the goods and steamed; by this process the albumen became insoluble, and fixed the colour. Caseine and gluten were sometimes used as substitutes for albumen. Being dissatisfied with this mechanical mode of applying aniline purple, in conjunction with Mr. Grey, I made a number of experiments with a view of obtaining some more chemical method of fixing this colouring matter, and at last succeeded. The process proposed consisted in printing the pattern with a salt of lead, then converting this into the oxide or a basic salt, by passing the goods through an alkaline solution. Thus prepared, they were worked in a boiling solution of aniline purple in soap. In this way a very pure colour was obtained on the mordanted parts, the soap keeping the whites pure. This process, however, was of very limited application, as it could only be applied for single-colour patterns. After this, several processes were patented for the use of tannin for fixing the mauve; these were based upon the method of dyeing cotton previously mentioned, and some very fast results were obtained, but as these methods are now out of use, I will not describe them further.

The process now nearly universally employed in the north was discovered by M. Alexander Schultz and myself; in consists in printing the colouring matter with a mordant composed of a solution of arsenite of alumina in acetate of alumina. On steaming the cloth printed with this mixture for about half-an-hour, the colour is firmly fixed in the fibre. After steaming, the goods are generally soaped, and then finished. One of the great advantages of this process is that it can be worked in patterns with a great variety of colours, and is also suitable to nearly all the aniline colours, as well as the mauve, yielding shades of great brilliancy.

During the last few years, much attention has been given to the application of aniline black to calico printing. This substance is not prepared in the separate condition, but formed on the fabric; it is produced by printing a mixture of a salt of aniline, chlorate of potassium, and sulphide of copper, thickened with starch, upon the goods, and in this manner a dull grey impression is obtained; but, after three or four days ageing, this changes to a dark olive, and is then rendered perfectly black by passing the goods through a dilute solution of carbonate of soda. This colour is very fast, but is inclined to acquire a slightly green shade by long exposure to the air. Unfortunately, it cannot be printed on with other colours, because when steamed the cotton is destroyed by the acid character of the mixture employed for its formation. It can, however, be printed on at the same time as madder mordants, and these can be afterwards dyed with a lead mordant, so that when passed through bichromate of potassium, a pattern with black and yellow or orange can be obtained.

The aniline colours have produced quite a revolution in the arts of dyeing and printing, and have made these processes far simpler than they were, and there is such a variety of shades of colour now sent into the market, that the dyer or printer has little else to consider than the intensity of the colour required; and, in fact, if a dyer has a large order to execute of a particular shade of colour not in the market, he will not trouble about matching it himself, but sends to the colour manufacturer to supply him with a product capable of yielding the required shade.

Besides dyeing and calico-printing, several other branches of industry have benefited by the coal-tar colours, such as the arts of lithography, type-printing, paper-staining, and colouring, &c. Before they could, however, be used for these various purposes, it was necessary that they should be made into lakes or pigments, by union with alumina or other suitable base; but as most of the aniline colours are of a basic nature, it was found impossible to combine them directly with a metallic oxide like alumina; advantage was, therefore, taken of their affinity for starch granules, and some very brilliant products were obtained by dyeing powdered starch with the cold aqueous solution of these colouring matters. These starch powders, however, are wanting in covering power or body, so that other processes had to be sought for, and now these lakes are made upon an alumina base, by the intervention of tannin or benzoic acid.

Many attempts have been made to prepare a pigment from rosolic acid or aurine, and this, to some extent, has been accomplished by precipitating a solution of the colouring matter with alumina; by this process, a bright orange-scarlet coloured product can be obtained; it is, however, only suitable for paper-staining. I have, therefore, lately been further experimenting in this direction, and have succeeded in forming a very brilliant scarlet pigment, which can be used for printing inks and a variety of other purposes.

Upon the table there are some specimens of magenta, Britannia violet, aniline blue, green and orange lakes, and also some very beautiful and intense-coloured preparations of coal-tar colours, now generally called carmines. These lakes, when ground with printers' varnish, produce printing inks of very great brilliancy, and are extensively used for this purpose, and Mr. Hanhart, whose name is so intimately connected with the art of lithography, has most kindly furnished me with the various illustrations of the application of these products to lithographic printing for this lecture.

These lakes in a wet condition are being largely used for paper-staining, and also for paper colouring, as well as for a variety of other less important purposes.

The peculiar bronze surface produced by evaporating a solution of an aniline colour, has been taken advantage of by the manufacturer; and all the bronze bonnets, hats, flowers, and feathers, so much worn in the autumn of last year, derived their lustre from aniline colours. When first employed for this purpose, no fixing agent was used with them, and as they are mostly soluble in water, a shower of rain was often found to cause beautiful purple drops to fall from these bronzed bonnets and hats, and produce a kind of mottled pattern upon the white collars, and sometimes even upon the face of the wearer.

Aniline colours are used for writing inks, colouring soap, &c., but as these applications are only of small importance in a commercial point of view, I will not spend time in speaking about them.

I have in these lectures brought before you in a rapid —I fear too rapid—manner, an account of most of the coal-tar colours; but, before concluding, I should like to show you the close relationship which exists between some of them, especially between those derived from rosaniline or magenta.

I have endeavoured to show you that the derivatives of magenta closely agree in properties, all of them containing colourless organic bases, the colour being developed upon their combining with acids. But I

now wish to show you more than this, by briefly explaining their chemical structure. To describe this thoroughly it would be necessary for me to enter fully into the chemical theory of substitution; but as this would occupy a great deal of time, I must content myself with just mentioning a few facts connected with that subject.

Rosaniline and its derivatives contain carbon, hydrogen, and nitrogen, as I have told you on a previous occasion. Chemical substances containing hydrogen often hold it in what is turned a replaceable condition, that is, in such a condition that it may easily be removed, and another substance of equal value (either simple or compound) introduced in its place. A compound substance, capable of replacing hydrogen, is called a "radical," and I want to speak about two of these radicals, one called ethyl, and contained in iodide of ethyl, the other called phenyl, and contained in aniline.

Ethyl contains $C_2\,H_5$
Phenyl ,, $C_6\,H_5$

I will first mention a familiar instance of the replacement of hydrogen by a radical. Water is composed of two equivalents of hydrogen and one of oxygen, thus—

$$\left.\begin{matrix}H\\H\end{matrix}\right\}O$$

Now, it is quite easy to remove an equivalent of this hydrogen and replace it by ethyl.

$$\left.\begin{matrix}H\\(C_2\,H_5)\end{matrix}\right\}O$$

This is water with hydrogen replaced by ethyl, a replacement compound by some very much preferred to water itself; it is alcohol.

Rosaniline contains three equivalents of hydrogen, replaceable by radicals. This is the formula of the hydrochlorate of rosaniline, the three separate H's being replaceable:—

$$\left.\begin{matrix}(C_{20}H_{16})\\H\\H\\H\end{matrix}\right\}N_3,H\,Cl.$$

Now, what takes place upon boiling this salt with aniline? The phenyl of the aniline simply takes the place of the replaceable hydrogen, producing what is called triphenylrosaniline. The result of this replacement is that the rosaniline salt has been changed from red into blue—the bleu de Lyon—which is represented thus:—

$$\left.\begin{matrix}(C_{20}H_{16})\\(C_6\,H_5)\\(C_6\,H_5)\\(C_6\,H_5)\end{matrix}\right\}N_3,H\,Cl.$$

Dr. Hofmann, on observing this relationship, was induced to try whether he could replace the hydrogen in rosaniline by other radicals than phenyl. He tried to introduce ethyl by digesting rosaniline with iodide of ethyl, and succeeded in introducing three molecules of the radical ethyl in the place of the three replaceable hydrogens. I will endeavour to show you how this takes place, by the following equation:—

$$\underbrace{\begin{matrix}(C_2H_5)\,I\\(C_2H_5)\,I\\(C_2H_5)\,I\end{matrix}}_{\text{Three molecules of iodide of ethyl.}}\;+\;\underbrace{\left.\begin{matrix}(C_{20}H_{16})\\H\\H\\H\end{matrix}\right\}N_3,H\,Cl.}_{\text{Hydrochlorate of rosaniline.}}\;=$$

$$\underbrace{\begin{matrix}HI\\HI\\HI\end{matrix}}_{\text{Three of iodide of hydrogen or hydriodic acid.}}\;+\;\underbrace{\left.\begin{matrix}(C_{20}H_{16})\\(C_2H_5)\\(C_2H_5)\\(C_2H_5)\end{matrix}\right\}N_3,H\,Cl.}_{\text{Hydrochlorate of triethylrosaniline.}}$$

Here we see the iodine has simply exchanged its ethyl for the replaceable hydrogen of rosaniline, and the result is a blue shade of the Hofmann violet.

Now it is not necessary to replace the three hydrogens; two may be replaced, and we get a less blue violet. Represented thus:—

$$\underbrace{\left.\begin{matrix}(C_{20}H_{16})\\(C_2H_5)\\(C_2H_5)\\H\end{matrix}\right\}N_3,H\,Cl.}_{\text{Hydrochlorate of diethylrosaniline.}}$$

Or one may be replaced, and we get a red violet. Represented thus:—

$$\underbrace{\left.\begin{matrix}(C_{20}H_{16})\\(C_2H_5)\\H\\H\end{matrix}\right\}N_3,H\,Cl.}_{\text{Hydrochlorate of ethylrosaniline.}}$$

When speaking of the violet imperial, I mentioned that it consisted of products intermediate between rosaniline and the bleu de Lyon. These intermediate substances consist of rosaniline with one or two equivalents of hydrogen replaced by phenyl.

Up to the present moment it has only been found possible to replace one equivalent of hydrogen in mauveine, or the mauve dye, and, as I previously mentioned, it is curious that the result of this replacement is perfectly opposite to that which takes place in the case of rosaniline, the replacement of hydrogen by ethyl in rosaniline causing it to become bluer in shade, and the replacement of hydrogen by ethyl in mauveine causing it to become redder in shade. The following is the formula of the hydrochlorate of ethyl-mauveine or dahlia:—

$$\left.\begin{matrix}C_{27}H_{23}\\(C_2\,H_5)\end{matrix}\right\}N_4H\,Cl.$$

But although I have tried to explain the relationship of these colouring matters as simply as I can, yet, this part of my lecture assumes much of the character of a lecture on theoretical chemistry. Here we are talking about substitution products of bodies, a branch of the highest theoretical chemistry and it must strike us as remarkable, when we find that these considerations have been pressed upon us, by the discussion of bodies which may now be said to be common dye-stuffs. We have also been talking quite in a familiar manner about nitrobenzol, aniline, iodide of ethyl, aldehyd, &c., substances which were, only a few years since, the *recherché* compounds of the laboratory. In fact, the coal-tar colour industry is entirely the fruit of theoretical chemistry. Let us consider the enormous rapidity with which this industry has developed. It only dates from 1856, and now we have large factories for the production of coal-tar colours, not only in Great Britain, but in Germany, France, Switzerland, America, and other countries. I had hoped to have been able to give you a statistical account of this industry, but have not had sufficient time for this purpose. Dr. Hofmann, however, in his report on the coal-tar colours, shown at the Paris Exhibition of 1867, remarks that, "in 1862, the value of these manufactures had risen from nothing to 10,000,000 of francs, or more than £400,000 sterling. At the present day this sum is trebled, which would make it about one million and a-quarter pounds sterling, although the products are much cheaper than they were before." And, now, when you hear of these results, do not forget that they are the truly practical fruits of theoretical chemistry, not studied for the purpose of producing commercial products, but simply for its own sake.

Proceedings of Institutions.

Lancaster Mechanics' Institute.—The forty-third annual report (being for 1868) says that there still hangs over the Institute a heavy debt, which must necessarily cripple its usefulness until liquidated. On the other hand, the committee have to acknowledge with thankfulness some handsome legacies. The library has been considerably enlarged, and 109 volumes added. It now contains upwards of 6,800 volumes. The highest number of members connected with the Institute during the year was 387; the number at present is 269, the falling off being principally amongst the quarterly members. Mr. Dalzell is at present engaged in arranging the fine collection of coins, medals, &c., presented by the representatives of the late Mr. Corbyn Barrow. The receipts of the penny bank for the year ending October 24, 1868, were £560 16s. 9d., and the payments £545 18s. 6d. The income amounted to £374 7s. 8d., and the balance in the treasurer's hands is £57 4s. 4½d. In the science classes the subjects taught have been—Animal Physiology, Elementary Mathematics, Inorganic Chemistry and Analysis, and Geology. During the past session 156 lectures have been delivered, which have been attended by 44 students. The number of students attending the classes is as follows:—Animal Physiology, 32; Inorganic Chemistry, 36; Elementary Mathematics, 10; Geology, 8. In the school of art, the total number of students on the books at present is 328, divided as follows:—Female pupil teachers, 11; gentlemen, 9; school children, 29; ladies, 42; artizans, 68; pupils at several schools, 134. The system of local prizes has proved very successful in giving direction and force to the studies of the pupils. These prizes are, for the most part, confined to the artizan classes. The principal object of competition this year has been to direct the attention of the students to the practical application of drawing, painting, and modelling to manufactures. Prizes have been offered for efforts made in this direction, and also for efforts of a more ambitious character, viz., to gain a more cultivated perception of beauty in form by the study of antique models. Mechanical drawing has also been encouraged.

SOCIETY OF ARTS.

In the paper read by Mr. Davenport on the 25th of November last, it was intended to give more fully the history of the period from the Society's incorporation to 1852, at which time the publication of the *Journal* was commenced, but owing to want of time it became necessary to refer to it but briefly. This portion, in continuation of the paper, is given as follows:—

Second Period.

It is an unfortunate fact, and one much to be regretted, that the Society, both in the first and second periods of its existence, was for several years unable to bear the cost of publishing in a concise form a record of its transactions. The natural result is that anyone now desirous of reading up the history of the past, finds himself without any other beginning to his history than such as is generally supplied in the form of a list of names and dates. Our second period is unfortunately without any written record of a concise and intelligible nature, and it will therefore be my object, in what I am about to say, to place a narrative of facts, so far as I know them, in as few words as possible. I shall not attempt to take out from the sixteen volumes of the Society's *Journal*, published since 1852, any lengthy quotations from the various papers which have been read on the industries of this and other countries, papers which include communications on the progress of discoveries in relation to the electric telegraph, the railway system, cotton culture, supply, and manufacture; carpet manufacture, lace, iron, silk and wool, sewage and its uses, the health of towns and industrial pathology, British agriculture and agricultural dwellings, the steam plough and traction engines, our colonies and their products, the structure of ships and our light-house system, water supply and gas lighting as well as many other subject, including unused and unappreciated raw products. I shall rather attempt to indicate the course of action on the part of the Council since the incorporation of the Society by Royal Charter (10th June, 1847), which has resulted in the position which the Society has attained to of late years.

I have already stated that Mr. Arthur Aikin resigned the secretaryship of this Society in 1839. In doing so, he said that "advancing years and a failing memory unfitted him for longer holding an office, the duties of which he felt could only be executed properly by the combination of promptness in applying knowledge already acquired, and activity in keeping up with the continual advance of practical science." Mr. Aikin was a man of progress, and to his foresight and industry is due the change which took place in the character of the Society's meetings. He felt that a broader basis of action must be opened up, if the Society was to keep pace with the times. He therefore proposed and made collections illustrative of industries; and the following notice, in reference to his efforts, appears in vol. xlvii. of the *Transactions*:—"But the Committee feel that they shall scarcely have discharged their duty without some notice of the evening illustrations, which so agreeably occupied the time of the Society during part of the last session. The plan, which originated with the secretary, was to devote each evening to the description of some art or manufacture, in which historical notices should be combined with practical details, illustrated with drawings and specimens, so as to form a summary, at the same time entertaining and instructive, of the most important and curious of those arts which, by calling forth the skill and enterprise of the human race, have eminently contributed to the advance of civilisation and knowledge. The first subjects illustrated were pottery and porcelain, glass, gypsum and the art of casting in plaster, stereotype, type-founding and paper." Thus the seed was sown which, in after years, was to take root, and, under more genial circumstances, give permanent interest to the records of the meetings of the Society; but the time for its full growth had not yet arrived. Nevertheless, Mr. Aikin continued his exertions year after year, and on the 12th May, 1835, a subscription having been made by the members, an acknowledgment of his long and eminent services was presented to him, "in testimony of their high respect for his character, and of their gratitude for the zeal and ability with which he has advanced the objects and promoted the interests of the Society."

It was not, however, till 1841-2 that the Society's doors were opened somewhat wider, so as to admit of communications upon patented inventions being discussed.

Council Proposed.

On December 15th, 1841, at which period the whole business of the Society was managed by the members at their ordinary meetings, a committee was appointed to revise the working of the Society, and recommended that a Council to manage the affairs of the Society should be instituted; that the restrictions which had hitherto fettered the Society, in relation to matters which had been brought before other societies, and which had been protected by letters patent, should be removed. The committee, in its report, says:—"It is needless to give expression to the conviction that the Society cannot continue to exist on the plan of proceeding which is at present pursued. The object of the Society is the promotion of the useful arts, rather than the personal gratification of members. . . The proceedings of the weekly meetings are principally confined to the discussion of rule and order, accounts, and other matters not tending to the promotion of the interests of the Society." To remedy these inherent defects in the management of the

Society, it was further recommended that six committees be established, of five members each, and that the decisions of the committees be maintained as to rewards recommended; that two gentlemen of each committee be elected as chairmen, and constitute the Council, which in turn was to elect its president and vice-president.

The Society did not, however, at this time adopt the recommendation in full, but in lieu of a Council appointed a Committee of Miscellaneous Matters, which emanated from committees elected by the Society, and which committees were open to all the members, the Society reserving to itself the confirmation of the reports of committees.

Exhibition of British Industry, etc., Proposed.

During Mr. Whishaw's secretaryship the rules excluding patents from rewards were abolished, and the first attempt at establishing an exhibition was suggested, and in 1844–45 a circular was issued, headed "Proposed Exhibition of the Products of British Industry," in which it was set forth that "The exhibitions of national industry which attract so much attention on the Continent, have suggested to some members of the Society of Arts and to some distinguished manufacturers the propriety of establishing something of the kind in this country." Special subscriptions in aid of the proposition were received, and the originator of the plan, though then unknown, was Mr. Fothergill Cooke, the inventor of the electric telegraph. Exhibitions, as then proposed, were to be of two kinds — industrial and art. The former were to have been limited to British manufacturers, and in the latter case, the artists contributing pictures to the proposed exhibition were, by ballot, to act as the judges of their own works, and were to receive pecuniary rewards, towards which, however, each artist was to contribute £1 1s., to form, with other moneys, a common prize fund. It is scarcely necessary to add, that neither proposition, as originally put forward, was ever carried out.

Council Established.

In December, 1845, Mr. John Scott Russell accepted the office of secretary, Mr. Whishaw continuing as joint honorary secretary with him in relation to the exhibition proposed. At this date the rules of the Society were again revised, and the recommendation that the management of the Society's business be vested in a Council was adopted, but the old *régime* of rule and order was still perpetuated in a modified form till the incorporation of the Society by Royal Charter, in 1847. To the energy, perseverance, and constant activity of Mr. Thomas Webster, Q.C., the Society is much indebted for the modifications in its laws and system of management. In this he was aided very materially by Mr. (now Sir William) Bodkin.

I have been thus particular in relation to the changes in the rules of the Society, and in the secretarial and other offices, as, in my opinion, the successful raising of the present Society is partly due to the constant changes which then took place. Each newly-elected officer exerted himself to introduce and create an interest on the part of some of his friends, which ultimately resulted in bringing together a body of gentlemen of active intelligence, with minds untrammelled by old associations, and whose want of knowledge of what others had done for the Society in years past, protected them from the imputation of personal feelings.

The Council, appointed under the Society's Regulations of 1845, immediately issued an address to the Society, proposing an enlarged action in aid of which, and the exhibitions above referred to, special subscriptions were received.

A Council having been instituted, a charter of incorporation was soon after obtained. The Council did not, however, delay action till a charter had been obtained, for in the address read to the members on the 17th December, 1845, they state:—

"At this meeting, which forms the commencement of the ordinary scientific business of the 92nd Session of our Society, it has appeared to the Council now charged with the management of your affairs a proper occasion to lay before the members a succinct view of our position and prospects. . . . . Placed in the metropolis of England, long distinguished as the Society charged with the responsibility of seeing that the Arts, Manufactures, and Commerce of this country are encouraged to extend themselves in the right direction, and prosecuted in the most efficient manner, a heavier responsibility is laid upon us in proportion as those arts, those sciences, and those manufactures are making progress around us; therefore it behoves us to advance in the exact proportion in which the rest of our countrymen are advancing in the same direction. Having at our head a Royal personage distinguished not more by his attainments in science and art than by the sincerity and heartiness of his co-operation for their advancement . . . we feel that in our position as a Society, in our history, in the patronage we possess, and in the influence we might wield for the accomplishment of any great and good object, some grievous fault must attach to us, either collectively or as individuals, if we be not found coming forward and prominently exerting ourselves as the zealous, practical, and effective promoters of all that is most beautiful in Art, most useful in Science, or most valuable in the Manufactures and Commerce of the country."

After reviewing what the Society had done in times past, and the means which had been employed in doing it, the Council proceeded to point out that one field for the Society's future action which appeared most capable of successful culture was that which combined art with manufacturing industry, and they the more readily set to work upon that, as it afforded a threefold advantage, viz., that of directing the attention of men of science to the discovery of new agents to be employed in art industries, at the same time that it encouraged the production of more beautiful objects, both of form and colour, and by their production advanced the education of the masses of the people in their appreciation of a higher art.

Special Prizes for Articles of Manufacture.

A special fund was obtained by subscription, and prizes were offered, in 1846, to manufacturers and designers for the production of articles of every-day use; and the response to these prizes was the successful starting-point of exhibitions in this country.

Among the articles received in competition for the prizes offered were jugs, mugs, and plates, and a tea-service manufactured by Messrs. Minton and Co. This tea-service was a step leading to the first International Exhibition, and to the high state of usefulness and prosperity the Society has been able to attain to. When the articles were received in competition it was unknown who were the producers of them, and the awards were made by a committee of artists and others, of which the late Sir William Ross, R.A., was chairman. After mature deliberation, the committee awarded the prize offered for a tea-service to a set designed by "Felix Summerly," and manufactured by Messrs. Minton and Co.; and awards were also made to other competitors. The Society was not long in discovering who "Felix Summerly" was, as His Royal Highness Prince Albert, president, presented the prize offered, viz., the Society's silver medal to Mr. Henry Cole, on the 12th June, 1846.

Exhibitions.

British Manufactures. — Fresh prizes were offered and awarded during the session of the Society 1846-7, and the articles now sent in, in competition, together with those rewarded in 1846, and others lent for the purpose, formed the subject-matter of the first exhibition of select specimens of British manufactures, exhibited at the Society's House in March 1847. Of the growth of these exhibitions it is needless to say much

more than that a second was held in 1848, and a third in 1849, by which date the public had become so interested in the action set up, and manufacturers were so much more willing to contribute specimens, that it was difficult to arrange the contributions, and the crowds that visited these exhibitions could not at times gain admission to the Society's rooms. The result of this was that in 1848 it was resolved to group manufactures, and to show sections of industry year by year.

Ancient and Mediæval Art.—In the Session 1846-7, it had been declared to be the intention of the Society to hold "an enlarged and *national* exhibition," and the impossibility of the Society now being able to carry out this intention became so apparent that, in 1850, an exhibition of works of ancient and mediæval art was substituted, as best calculated to afford instruction to artists, manufacturers, and workmen who proposed to become exhibitors at the Great Exhibition of 1851, which had then been determined on.

To the details of the realisation of the Great Exhibition I will refer hereafter, as it will be more convenient that I should state here that, while British manufactures were being thus developed and brought before the public, British art and art-industries, together with the mechanical inventions of the times, were not overlooked.

Lithography.—In December, 1847, an exhibition illustrative of the progress of lithography in England was opened. It included illustrations of engravings on stone, drawing on stone with ink and chalk, printing in neutral tints, and also in gold and colours. There were also drawings with the point, printed in black ink; Hullmandel's graduated tints and prints in colours, from several stones; drawings with the stump; lithographic transfers from engraved plates; and specimens printed by steam machinery. There were also added to the collection a series of specimens of printing from transfers from old prints, newspapers and pen drawings by the anastatic process—a process recently introduced into this country.

Bookbinding. — Other exhibitions of a technical nature were also held, such as ornamental art as applied to ancient and modern bookbinding. At a later date, in 1852, the first exhibited collection illustrative of the art of photography was arranged, and in the same year specimens of the art of colour printing illustrative of the then state of litho-chromatic and typo-chromatic arts were shown. Nature printing was also illustrated.

National Gallery of British Art. — While these industrial art processes were being brought before the public, the Society endeavoured to promote the establishment of a National Gallery of British Art. The object sought to be attained will be best understood by my quoting from a paper prepared and read by Mr. Henry Cole, January 27th, 1847:—"The wish to establish a National Gallery of British Art has found utterance oftentimes and in many ways, but, hitherto, no practical steps have been taken to realise it. A national collection of pictures, which shall worthily exemplify the state and progress of the British School of Art, still remains a public want. . . . We have no public collection of our own painters' works. France and Belgium have been honouring their people by placing before them the works of their painters—but England has hitherto done nothing. . . . . As the Society took the foremost position when British Art made its first step in the establishment of an academy, so it is a fitting sequence that the Society should now proffer its aid and become the first agent to gather together, as in a treasury the fruits of that academy in its years of maturity. With these views, I have suggested that the Society shall organise an annual exhibition of pictures entirely novel of its kind. . . . There would be great interest in bringing together the works of the best artists of our own school—in exhibiting year after year the works of such men as Eastlake, Leslie, Edwin Landseer, Maclise, Collins, Etty, Mulready, Turner, &c. . . . There are many advantages in exhibiting the works of an artist during his lifetime rather than after his death. . . The principal object then of this exhibition is to amass a fund for the purpose of forming a nucleus of a gallery of the best works of British artists—to be thus enabled to give to the artist whose works are exhibited a commission for a picture without dictation as to subject or size. . . . When the picture is painted it is proposed to present it to the National Gallery."

Mulready Exhibition. — With this object in view an exhibition of the works of William Mulready, R.A., was arranged and opened in June, 1848, by which a small sum was realised, but not sufficient to enable the Society to obtain for the nation a picture by Mr. Mulready, but as his fame rested probably as much upon the beauties of his studies in the life school as upon his other works, two examples of such studies were secured by the Society and presented to the National Gallery, to be held in trust for the nation, with power to the trustees to lend the same under certain conditions. As part of the plan, a subscription was also raised in aid of the fund, the subscribers to which were presented with a copy of one of the artist's works; in this case "The Sonnet," lithographed by John Linnel, after the chalk sketch for the picture by William Mulready, was the specimen presented.

Etty Exhibition.—The second exhibition of this series consisted of the works of William Etty, R.A., and was opened to the public on the 9th June, 1849. In the preface to the catalogue of this collection, the Council say—"They are unable to express, adequately, their full sense of the liberal courtesy with which the valuable pictures forming this collection have been entrusted to them for exhibition, and they feel that these acknowledgments are more especially due to the members of the Royal Scottish Academy, whose paintings fill so prominent a place in the exhibition." The subscribers on this occasion were each presented with a copy of Mr. Doo's splendid engraving of Etty's great picture of "Mercy interceding for the Vanquished," one of the series of pictures lent by the Royal Scottish Academy. The catalogue was prefaced with a life of the artist, written by himself. The excessive cost of bringing this collection together, and its failing to produce a balance at its close, induced the Council to give up this series of exhibitions, as they found that it was not likely to produce the funds necessary for carrying out the object for which it was instituted, but, on the contrary, involved a probable heavy charge upon the funds of the Society.

Mr. Etty died on the 13th November, 1849. A few weeks after the exhibition closed, he left London on a visit to Oxford, but, contrary to his original intention, he retained possession of his chambers in the Adelphi, with a view, as he stated, to having a home in London where he might for the few remaining years of his life meet his brother artists during the season. At the end of one month he left Oxford to take up his residence at his house in Carrey-street, York, a house which he had, when a poor boy, looked up to as a house far beyond anything he could aspire to, and the possessor of which he had thought of as the great man of the city, but which house he had lately purchased. After a residence of only a few weeks in his native place he was taken ill, and owing to an internal disorder and a combination of diseases, he expired after a short illness. The sight of that old man, when he first found himself surrounded by the labours of his life, the tears he shed, and the speeches he uttered, will never be forgotten by those who were so happy as to be present with him. And though the collection of his works failed to attain the object for which they were brought together, still the labour of those who made the collection was amply repaid by the high appreciation it elicited from the public, of the works of a man who had been so little understood and so much spoken against.

Though the hope of establishing a Gallery of British Art by means of exhibitions failed of realization, the Council, from time to time, have brought together collections of works by other artists; thus, in 1855, the works of John Chalon, R.A., and those of his brother, Alfred Edward Chalon, were collectively exhibited; and in 1860, an exhibition of the principal works of the then recently deceased Sir William Ross, R.A., was made.

Exhibitions of Patented Inventions.—While the Council were thus anxious to get Art represented in a permanent gallery belonging to the nation, and to aid industrial art by placing new processes before the public, and making known the degree of development which those of longer standing had attained to, it did not disregard the claims of science or the right of invention to be duly represented. Accordingly, in December, 1848, an exhibition of models of modern machinery and improved recent inventions was opened. This collection was the forerunner of a series of exhibitions illustrative of the patents taken out during the twelve months preceding the date of the exhibitions. These exhibitions were continued yearly till 1859, when arrangements were in progress for holding the second great International Exhibition, then proposed to be held in 1861. In the preface to the catalogue of the exhibition opened in November, 1850, attention was drawn to the fact that—"On the eve of a probable radical change in the laws relating to the protection of inventions, and as confirmatory of the justice of the principles on which the Council have appointed the committee who are now working towards that important end, it is interesting to observe among the articles in the catalogue several which, though registered under the Designs Act, are obviously improvements, not substantially in 'form or configuration,' but in 'action, mode, or contrivance,' and, as such, plain evasions." Among the articles so registered was a gas meter, a tubular filter, a new action for upright pianos, a turnip cutter, an Esculapian still, &c., for all of which protection was sought avowedly for "shape and configuration." I must now refer somewhat in detail to the Exhibition of 1851, and some of its results.

Great Exhibition, 1851.

In June, 1849, the secretary, Mr. J. Scott Russell, stated in presence of His Royal Highness Prince Albert, president, when present at the distribution of the Society's rewards, that, owing to the yearly increasing success of its exhibitions, the Council had no doubt as to their being able to carry out the plan originally proposed for holding a Great National Exhibition of the products of British industry in 1851. This announcement led to immediate and frequent communications between His Royal Highness the President, and the secretary, on behalf of the Society, and it was during this correspondence, and while the Council were investigating the steps necessary to be taken for carrying out the first aggregate exhibition of native manufactures, that the plan was expanded into a proposition for holding the first Great International Exhibition of 1851. It is impossible to detail all the steps which the Society took at this date to secure support in carrying on its work. The promise of a site for the erection of a temporary building for the purpose of holding an exhibition of British industry had been obtained from Lord Carlisle, First Commissioner of Works, and the quadrangle of Somerset-house or Trafalgar-square had been named. The proposition, however, soon vastly expanded, and it became necessary to secure the support and aid of the Government, and on the 31st July, 1849, His Royal Highness Prince Albert addressed a letter to the Home Secretary, in order to bring the subject officially to the notice of Her Majesty's Government. The letter was as follows:—

"Osborne, July 31, 1849.

"Sir,—The Society of Arts having during several years formed exhibitions of works of national industry which have been very successful, believe that they have thereby acquired sufficient experience, and have sufficiently prepared the public mind, to venture upon the execution of a plan they have long cherished, to invite a quinquennial exhibition in London of the industry of all nations.

"They think that the only thing wanting to ensure the success of such an undertaking would be the sanction of the Crown given in a conspicuous manner, and they are of opinion that no more efficacious mode could be adopted than the issue of a Royal Commission to inquire into and report upon the practicability of the scheme, and the best mode of executing it.

"I have, therefore, been asked, as President of the Society, to bring this matter officially before you, and to beg that Her Majesty's Government will give this subject their best consideration.

"The exhibition was proposed to be invited for 1851, and the magnitude of the necessary preliminary arrangements renders it highly desirable that the decision which the Government may have come to should be ascertained within the space of a few months.

"I have, &c.,

"(Signed) Albert.

"The Right Hon. Sir George Grey, Bart., G.C.B."

During the period necessary for Government inquiry, however, the Society did not remain idle. Looking to the cost necessarily to be incurred in carrying out this proposition, it was evident that it was quite beyond the means at the Society's disposal, and they therefore sought and found in Messrs. Munday, gentlemen who were willing to provide the necessary funds. The outlay for the building upon the scale then thought of, and for the preliminary expenses, was £70,000. And on the 23rd August, 1849, a contract was made, and on the 7th November following was signed, between the Society of Arts and the Messrs. Mundays, under which the latter in consideration of providing the necessary funds, were to receive in the first instance repayment in full of all moneys advanced, with 5 per cent. interest, and any residue at the close of the exhibition, was to be divided into three equal parts, one part to be paid to the Society of Arts as a fund for future exhibitions; the remaining two-thirds as remuneration to the contractors for the risk incurred in promoting the undertaking. Power was reserved to determine this contract before the 1st February, 1850, should the result of His Royal Highness's letter to the Government render such a course necessary or desirable. Meanwhile several members were appointed who acted under commission from His Royal Highness, as president of the Society, and who proceeded to the manufacturing districts in order to collect the opinions of the leading manufacturers, and obtain their support to the proposition. Public meetings were held, and local committees of assistance formed. Upon presentation of the reports from the commissioners to Her Majesty's Government, the Queen was pleased to issue a commission, which was published in the *London Gazette* of 3rd January, 1850, and for carrying on the work the commission states:—"Our further will and pleasure is that for the purpose of aiding you in the execution of these premises, we hereby appoint our trusty and well-beloved John Scott Russell, and Stafford Henry Northcote, to be joint secretaries to this our commission. And for carrying into effect what you shall direct to be done in respect of the Exhibition, we hereby appoint the said Henry Cole, Charles Wentworth Dilke the younger, George Drew, Francis Fuller, and Robert Stephenson, to be the Executive Committee in the premises, and Matthew Digby Wyatt, to be secretary of the said Executive Committee."

These gentlemen had been originally named by the Society in the contract-deeds with the Messrs. Munday as managers of the Exhibition.

At a special general meeting of the Society, held 8th February, 1850, the secretary made a statement as to the proceedings of the Council and Executive Committee

relative to the Great Exhibition of 1851, and resolutions were passed:—"That, in the opinion of the Society, the intention of H.R.H. the President to hold an Exhibition of the Works of Industry of All Nations in 1851 is worthy of his exalted position and character, and entitled to the hearty co-operation of all members of the Society, and that the Society hereby pledges itself to promote the object of H.R.H. the President to the best of its power." It was also resolved "That a subscription for promoting the Great Exhibition of the Works of Industry of all Nations be opened at the House of the Society of Arts." The subscriptions of members at the Society's House and in various localities amounted to £7,288. (See Report of Council, 22nd July, 1850.)

At the first meeting of the Commissioners, held on 11th January, 1850, it was resolved to terminate the contract with Messrs. Munday, and in July, 1850, the Commissioners were incorporated by letters patent, under the title of the "Commissioners for the Exhibition of 1851."

The Society's connection with the Exhibition may be said to have ceased on the determination of the contract with Messrs. Munday, whose claim for remuneration was settled under arbitration, the Society, in transferring its interest in the undertaking to the Royal Commission, not having reserved any legal claim to a share of the surplus profits should any arise. When, at the close of the Exhibition, a surplus of about £180,000 had been declared to have been realised, a supplementary charter, of the 22nd December, 1851, was granted to the Commissioners, which gave "them the power to dispose of the surplus in the furtherance of any plans that may be devised by them, to invest it in such manner as they may think fit, and generally to do whatever they may consider necessary for carrying out such plans, or maintaining and directing any establishment or institution to be founded in pursuance of them. It also empowers them to receive contributions in aid of the surplus, and to apply them in the furtherance of such plans; it gives them power to purchase and hold land and hereditaments in any part of her Majesty's dominions, and to apply or dispose of them in all respects as they may think fit."

In order to ascertain the views prevalent in the great centres of industry, as well as among other bodies, which had both provided funds to promote the Exhibition, as well as goods for exhibition, the Commissioners placed themselves in communication with such bodies with reference to the surplus funds at their disposal. As a result, applications were received from twenty-seven Literary and Mechanics' Institutions and Schools of Design, suggesting the application of the fund in promoting such Institutions; from the local committees and inhabitants of fourteen towns suggesting its use in the promotion of a central college of arts, manufactures, and commerce, in connection with provincial schools; and from forty-six other persons, or places, suggestions and applications were received, such as the establishment of a school of art for artist workmen—rewards for inventors—the conversion of the Exhibition building into a winter garden—a division of the surplus amongst the various towns in proportion to the amount subscribed, &c., &c. The Society of Arts, as the original promoters of the exhibition, asked for a grant of £10,000 in aid of a building fund to enable it to find more adequate accommodation for its wants, the absence of which accommodation prevented it from entering upon a more enlarged sphere of usefulness. The great majority of the suggestions, however, pointed to the use of the funds in the promotion of an extended art and industrial education, and this it was felt could not be carried out effectually by distributing comparatively small sums of money, and leaving the application of them to irresponsible bodies; the fund acquired was, therefore, invested in the purchase of an estate at South Kensington, upon which an industrial museum was erected, capable of being made available for the improvement of the taste and technical knowledge of the artisan, and at the same time affording a centre in which types of art industry might be collected and made available for improving the artistic taste and skill of the students of the Schools of Design throughout the country.

In order, however, to fit the working classes fully to avail themselves of the benefits the examples collected were capable of affording, an improved primary and scientific education was needed, and to aid the workman to obtain it the Society founded its Union of Institutions, and instituted an inquiry on the subject of industrial instruction.

When the accounts connected with the Exhibition had been finally adjusted, it was found that the surplus amounted to £186,436 18s. 6d., to which was added by Parliament the sum of £157,500 in aid of the purchase and development of the Gore House Estate.

At the meeting of the Society on November 13th, 1850, Mr. (afterwards Sir) Joseph Paxton read a paper on "The Origin and Details of Construction of the Building for the Exhibition of 1851;" and on November 28th, 1850, a circular was issued to the members as follows:—

"The present Council, as their last official act, have the satisfaction of announcing that Messrs. Fox, Henderson, and Company have kindly acceded to their request to permit a meeting to be held in the building at Hyde Park, on Tuesday, December 31st, at twelve o'clock, when a paper will be read by Professor Cowper, on 'The scientific means which have been employed in the construction of the building.' Members of the Society will doubtless recognise in this liberal act of the contractors a recognition of the important aid which the Society afforded as promoting the origin of the exhibition."

An extraordinary special meeting, of the members of the Society of Arts only, accordingly took place, when Professor Cowper explained the scientific construction of the building, and the different processes, machinery, and tools, which had been employed in its erection.

In November, 1850, the Council stated "that the Exhibition of 1851 appeared to render it almost superfluous for the Society to pursue its ordinary course for the encouragement of Arts, Manufactures, and Commerce, and the most useful work the Society could undertake, and one they believe to be strictly auxiliary to the views of their Royal President, H.R.H. the Prince Albert, and of Her Majesty's Commissioners, would be to encourage the production of philosophical treatises on the various departments of the Exhibition, which should set forth the peculiar advantages to be derived from each to the Arts, Manufactures, and Commerce of the country." The Council accordingly offered the large medal and £25 for the best, and the small medal and £10 for the second best, treatise on the objects exhibited in the sections of Raw Materials and Produce, Machinery, Manufactures, and Fine Arts, and the best general treatise on the Exhibition. The treatises were to occupy as nearly as possible eighty pages, of the size of the "Bridgwater Treatises." The treatises, if approved and rewarded by the Society, were to become the property of the Society, but the Council undertook to award to the authors the net amount of any profits which might arise.

This plan was, however, superseded, as at the close of the exhibition the following letter was received from H.R.H. Prince Albert:—

"*Colonel Grey to the Secretary.*

"Windsor Castle, October 15, 1851.

"Sir,—I am commanded by His Royal Highness Prince Albert to request that you will have the goodness to submit the following suggestion for the consideration of the Council of the Society of Arts.

"Connected as the Society has been with the original idea for the formation of such an Exhibition as that which has just closed, and with the preliminary arrangements for carrying it into effect, His Royal Highness is

sure that they will have taken the warmest interest in its further progress and development, and that they will wish to continue, to a certain degree, their connexion with it, by aiding, as far as in them lies, in the attainment of those advantages to art and industry which it was the object of the Exhibition to endeavour to procure.

"Nothing would tend more, in His Royal Highness's opinion, to the accomplishment of that object than a series of lectures given under the direction of the Society of Arts, at their weekly evening meetings, on the probable bearing of the Exhibition on the various branches of science, art, and industry.

"The lecturer in each branch being selected for his special knowledge and proficiency in it, it should not be his object to show the results to be expected from the exhibition on art and industry *generally*, but its probable immediate effect on the particular subject of his lectures; and on this he should state his opinion freely and without reserve.

"Among the subjects of such lectures I may enumerate the fine arts, chemistry as applied to manufactures, special processes of manufacture, mechanics, railroads, agriculture, tools and implements, commercial relations, political economy, &c., &c., &c.

"Differences of opinion would probably be found to exist among the lecturers on these different subjects, as to the effect to be expected from the Exhibition; but as each lecturer would confine himself to a particular subject, and give the result of his own reflections on that subject only, this would be of little importance.

"Such lectures could not fail to direct attention most beneficially to these important studies; and His Royal Highness believes that the Society of Arts, in instituting them, would be adopting the surest method of turning the Exhibition to good account, and would still further identify themselves with a scheme which had for its object, not the gratification of a passing curiosity, but the continued improvement and advance of science, art, and industry.

"I have the honour to be, Sir,
"Your obedient servant,
"C. Grey.

"George Grove, Esq."

"*Resolutions passed at a Meeting of Council, held on "Monday, October 20th,* 1851.

"That the Council heartily affirm His Royal Highness's recognition of their having always taken the warmest interest in the progress and development of the Exhibition, and of their wish to continue their connexion with it.

"That they receive with gratitude His Royal Highness's letter, as a mark of his confidence that the Society may be made an instrument for perpetuating many of the beneficial results originated by that event.

"That the Council fully concur in the valuable suggestions made by His Royal Highness, and will proceed to take the necessary steps for carrying them into effect without delay."

Permission was sought to publish the letter suggesting the delivery of lectures, which was accorded, as follows:—

"*Colonel Grey to the Secretary.*

"Windsor Castle, October 22, 1851.

"My Dear Sir,—The Prince sees no objection to my letter being printed for circulation among the members of the Society of Arts.

"He desires me to add that, in carrying out his suggestion, everything will depend upon the proper selection of lecturers; and he trusts great care will be taken to secure, if possible, the assistance of the most able and eminent men in their several branches.

"I remain, yours faithfully,
"C. Grey.

"G. Grove, Esq."

Two courses of lectures were accordingly delivered.

(*To be continued.*)

INTERNATIONAL EXHIBITION OF DOMESTIC ECONOMY AT UTRECHT.

The Society for the Encouragement of Manufactures and Mechanical Industry in the Netherlands proposes to arrange an international exhibition of articles for daily household use, at Utrecht, in the months of August and September, 1869.

The principal object of this exhibition is to bring to the knowledge of the workman such articles of household use, furniture, dress, food, work, and instruction of different countries, as, at a low price, combine usefulness and solidity, so that he may be enabled, by judicious economy, to improve his condition. Articles of luxury as well as of elegance, strictly so called, are excluded. The exhibition will be classed as follows:—

Class 1.—Houses, &c.—(*a*) Plans of dwellings for married and single men. (*b*) Plans of lodging-houses, eating-houses, boarding-houses, baths, rooms for reading and recreation. (*c*) Details of construction. (*d*) Materials for such buildings.

Class 2.—Household Necessaries.—(*a*) Furniture. (*b*) Bed and table linen. (*c*) Glass ware, table crockery, earthenware. (*d*) Warming. (*e*) Lighting. (*f*) Cleaning. (*g*) Hosiery, basket-work, tin utensils, &c.

Class 3.—Clothing.—(*a*) Printed calicoes. (*b*) Linen and cotton goods. (*c*) Woollen cloth. (*d*) Mixed fabrics. (*e*) Ready-made linen. (*f*) Ready-made clothes. (*g*) Articles in gutta-percha. (*h*) Knitted and netted goods. (*i*) Hats, caps, bonnets, &c. (*k*) Boots, shoes, &c. (*l*) Other articles of dress.

Class 4.—Food.—(*a*) Corn chandlers' wares. (*b*) Preserved meats. (*c*) Drinks. (*d*) Ways of preparing them.

Class 5.—Workmen's and Gardeners' Tools.

Class 6.—Means of Moral, Intellectual, and Bodily Development.—(*a*) Books (school books excluded). (*b*) Music, musical instruments. (*c*) Indoor gymnastics. (*d*) Amusements, games, &c.

Class 7.—Reports, Statutes, Regulations of Different Associations for Promoting the Well-being of the Working Classes.

All the articles are to be sent in between the 15th and 30th July.

The committee of management reserves the right, not only to sell the articles exhibited at the price indicated, but also to order others of the same sort, at the same price, during the exhibition.

The proceeds of articles sold, after deducting charges, will be remitted to the exhibitors at the expense of the latter.

Goods from abroad which are sent back will be exempt from export duty.

The central committee, in concert with the local commissions, will try to obtain from the different companies a reduction of the charge for carriage, or exemption if possible.

Goods cannot be reclaimed so long as the exhibition remains open.

The articles exhibited will be submitted to a jury, which will distribute medals and honourable mentions. The jury will be appointed by the central committee, which will at the same time draw up regulations for their guidance.

Exhibitors will have, at all times, personal free admission, on presenting a ticket with which they will be furnished by the committee of management.

A preliminary meeting, with the view to further the project for the above exhibition, was held at the Mansion-house, on Thursday, the 7th instant. The Lord Mayor presided, and there were present, among others, Baron Mackay, from the Hague, President of the Central Committee for the Exhibition; Mr. Everwyn, the Netherlands Chargé d'Affaires, and Mr. May, Consul-General; Sir John Lubbock, Bart., Vice-President of the Society of Arts; Major-General Sir Vincent Eyre, K.C.S.I., C.B., member of the Council of the

Society of Arts; Mr. Biddulph, M.P.; the Hon. Auberon Herbert; Mr. Edwin Chadwick, C.B., member of the Council of the Society of Arts; Mr. C. E. Norton, from the United States; Mr. Le Neve Foster, Secretary of the Society of Arts; Mr. Critchett, Assistant-Secretary of the Society of Arts; Mr. James Hole, Secretary to the Association of Chambers of Commerce; Mr. Adair, M.P.; the Rev. William Rogers, Mr. Hodgson Pratt, and Mr. Ellis Davidson. Baron Mackay explained the objects and nature of the intended exhibition, and advocated its claims to support in this country.

After some discussion, it was resolved that a committee be appointed, under the presidency of the Lord Mayor, to further the objects of the exhibition, consisting of the above-named gentlemen, and the following, from whom letters expressing their approval of the undertaking had been received:—Mr. Grant Duff, M.P.; Mr. George Shaw Lefevre, M.P.; the Right Hon. Russell Gurney, M.P.; Mr. Samuel Morley, M.P.; Mr. Thomas Hughes, M.P.; Mr. Peek, M.P.; Mr. George Cubitt, M.P.; the Hon. William Broderick, M.P.; Mr. G. O. Trevelyan, M.P.; Mr. J. P. Gassiot, F.R.S., Vice-President of the Society of Arts; Mr. Twining, Vice-President of the Society of Arts; Mr. Hyde Clarke, member of the Council of the Society of Arts; Sir Daniel Cooper, Bart., member of the Council of the Society of Arts; Mr. S. Teulon, member of the Council of the Society of Arts; Mr. S. Redgrave, member of the Council of the Society of Arts; and Mr. S. Andrews, auditor of the Society of Arts.

Fine Arts.

Paris Academy of Beaux Arts.—The election of a foreign member of the academy, in the place of the late composer Rossini, has fallen on Signor J. Dupré, sculptor, of Florence. Signor Dupré exhibited in the Champ de Mars, in 1867—"Piety," a group in Marble; "The Infant Bacchus," a statuette; and "The Triumph of the Cross," bas-relief in plaster; and was awarded by the jury one of the grand prizes.

Memorial Statues in Corsica.—Ajaccio possesses an equestrian statue of Napoleon the First, a statue of Cardinal Fesch, and a splendid monument to the memory of Charles Abbatucci, the hero of Huningue; and the little town of Corte is about to erect a statue in honour of Joseph Buonaparte, King of Spain. This statue is to be executed by M. Vital Dubray, the sculptor of the Abbatucci monument already mentioned, and of several public works in Paris, Orleans, Montpellier, Rouen, and other towns, including a graceful statue of the Empress Josephine, erected during the time of the Exhibition of 1867 in the Boulevard bearing her name.

Art Education in Belgium.—The efforts made towards the art education of the working men in all countries multiply daily. The municipal council of Brussels, aided by a vote of the Belgian Chamber, has reorganised its industrial museum, and opened a school for the artistic education of workmen.

Fine Art Exhibitions at Liege and Brussels.—An exhibition of painting, sculpture, and engravings is announced to take place at Liege, to be opened on the 29th of March and close on the 31st of May in the present year, to be organised by the Association for the Encouragement of the Beaux Arts, under the direction of the Society of Emulation, and with the patronage of the communal authority. At the last exhibition of the association, in 1866, the quantity of works of art was so large that the galleries would not contain them all, and the acquisitions formed a very handsome list. Works are to be sent in to the Société Libre d'Emulation at Liege at least a fortnight before the opening of the exhibition. The society bears the cost of carriage to Liege, if the works be sent by slow train, but the return charges are to be paid by the exhibitors. No work can be exhibited without the consent of the artist. The Brussels exhibition opens soon after the closing of that of Liege, and M. Ch. Kepume, the treasurer of the Liege association, will forward works on receipt of advice to that effect, from the latter to the former place.

Manufactures.

Manufactures at Biella.—The town of Biella is one of the most industrial in Piedmont, and the immense water-power of the mountain torrents supplies motive-power to the numerous manufactories. This water-power is estimated at 3,200 litres per second (14,400 gallons), with a fall of 320 metres. The principal manufactures are those of wool, being in number 102, with 2,854 looms. The value of the woollen stuffs annually made at Biella amounts to twenty-one millions of francs, or 9,500 francs per loom. The number of persons engaged in this industry is estimated at 8,562. The cotton mills employ upwards of 2,500 persons, and produce to the value of about five and a half millions. 680 workmen are employed in the manufacture of hats, which are produced to the value of two millions of francs every year. The produce of the paper mills, iron works, &c., amount to about two millions, and employ 1,600 persons; that of the potteries and furniture to one million of francs, and employ 550 workmen.

Commerce.

Russian Commerce by way of Asia.—The commerce of Russia is at present not only rapidly improving, but it is undergoing great changes in various directions. An official document recently published states that the total commerce of the empire by the Asiatic frontier, amounted in 1867 to upwards of fifty millions of roubles, that is to say, six and a-half millions more than in 1866, and fifteen and a-half millions more than the average of the ten preceding years. The imports show an increase of nearly four millions, as compared with 1866, and of six and a-half over the decimal average, while the exports show a surplus of not quite three and ten millions respectively. The comparison of the years 1857 and 1867 shows the following striking results:—

	Imports.	*Exports.*
	Roubles.	Roubles.
1857	19,347,199	11,945,598
1867	28,434,836	24,639,548
Increase	9,087,637	12,693,950

The total commerce of Russia with Europe and Asia amounted in 1867 to 510,074,769 roubles, being 71,078,504 in excess of the preceding year, and 124,748,450 more than the average of the ten years preceding. The import duties amounted in 1867 to 2,867,401 roubles, of which 1,221,000 was derived from tea, 590,000 from cotton goods, and 281,000 from refined sugar.

The Improvement of the Sugar Cane.—The *Produce-Markets Review* says:—"A little practical Darwinism is sadly wanted among colonial sugar planters, for, far from striving to improve their canes by selection, they work their soil to death with the varieties of the plant cultivated in the time of their ancestors. The saccharine strength of the cane thus remains stationary, or even decreases, while the strength of the beet has been doubled, by careful cultivation and selection, since the beginning of the century, and its improvement still progresses, until we have little doubt that in the course of time the saccharine percentage of the beet will be as great as that now possessed by the cane—namely, 18 per cent. Considering that the field beet, or mangoldwurzel, from which the sugar varieties have sprung, contains

only 4 per cent., such progress is wonderful; but bearing in mind what artificial selection has effected for so humble a plant, may it not be hoped that the cane may be improved in almost as great a proportion. It is not only with regard to the actual percentage of sugar that the cane requires study: the suitability of particular varieties to particular countries has not received the attention it deserves, and we are unaware that any experiments have been made of late years in crossing different kinds, with a view to altering their habits. In tropical countries, also, it would be possible, we should think, to get varieties which would ripen at different times of the year, and thus spread the gathering of the crop over a greater length of time, to the great benefit of the grower, by diminishing the pressure to sell at particular moments, and, in a greater degree, by giving more regular occupation to his hands. There is an unworked field, where, no doubt, many valuable kinds may be discovered. In Queensland and other parts of Australia we believe that many kinds of indigenous sugar cane grow wild on the river banks, and we hope shortly to publish an account of the extraordinary variety and richness of the cane in New Caledonia. Planters may depend upon it that a plant which stretches over so vast a portion of the earth's surface as from Australia, South Africa, and Peru, to the North of China, the South of Spain, Louisiana, and Texas—the different varieties of which have received hardly any attention—is capable of vast development. We have before pointed out, with regard to Mauritius, that the repeated failures of the crop were probably due to the exhaustion of the variety of the cane used, or, more probably, of some elements in the soil necessary to its growth. The bad promise of the present crop has directed public attention in Mauritius to this point, and the Chamber of Agriculture, alive to the importance of the introduction of new seed cane plants, presented to the Governor a report, in which the necessity of renewing the cane in the colony was pointed out, and government assistance solicited. The Governor was asked to send Dr. Meller, director of the Botanical Gardens, to Hong Kong, Japan, the Philippines, New Caledonia, the New Hebrides, the Society Islands, and Queensland, to procure and despatch new canes, and to allow a certain portion of the Botanical Gardens to be set apart for their propagation. His Excellency looked most favourably on this proposal, and Dr. Meller was to leave shortly for the places mentioned, a vote of £400 having been taken for his first expenses. We should have thought that the sugar canes of our vast Indian empire should also have been examined, the more especially as the Indian government has, with a wise foresight, devoted a good deal of attention to such subjects, and the Botanical Gardens at Calcutta has long been one of the leading establishments of the kind in the world."

Colonies.

Steam Communication with Victoria.—A Sydney paper says:—"An energetic effort is now being made in Melbourne to secure the support of the British Government to a scheme for subsidising a line of ocean steamers direct from England to Victoria, viâ the Cape of Good Hope. The subsidy asked for is £5,000 per month, or £60,000 per annum. The project is connected exclusively with Victoria, and no other colony will be asked to contribute to the subsidy. The advantages anticipated from the direct route, consist not only in increased postal communication, but in a large expected increase of immigration. To reduce the length of the voyage would remove much of the disinclination to come to Australia. Every one knows how much the extension of steam navigation stimulated the intercourse between England and America. If we could shorten the voyage to Australia, immigration would no doubt be proportionately stimulated. It is proposed to build for the contemplated line, large vessels with full steam power, calculated to make the run from Falmouth or Plymouth to Port Philip in forty-two days; if the voyage could be accomplished regularly even in forty-five days, it would alternate well with the Suez line."

Emigration Statistics.—In 1867, the number of emigrants who left the Mersey was 115,681. In the year just concluded, the number was 129,337, or an increase of 13,656 on the year. Of the total number, 102,323 were for the United States, 15,409 for Canada, 1,601 for Victoria, and 340 for South America.

Exports to the Australian Colonies from the United Kingdom.—The total amount of exports during the ten months ending October, 1868, was £9,372,891, against £7,570,213 in the year 1867. The exports to

		1868.		1867.
West Australia were valued at		£91,452	against	£67,944
South Australia	,,	982,270	,,	731,497
Victoria	,,	4,317,287	,,	3,492,852
New South Wales	,,	2,233,953	,,	1,593,024
Queensland	,,	317,354	,,	225,229
Tasmania	,,	161,010	,,	186,910
New Zealand	,,	1,269,565	,,	1,272,757

Revenue of New South Wales.—The following is a statement of the revenue of this colony, for the years ending 30th September, 1867 and 1868 respectively.

1867	£1,999,656
1868	2,005,244

The following are some of the principal details:—

	1867.	1868.
Customs	£783,125	£754,064
Excise	243,486	225,608
Land	547,681	546,228
Railway	176,265	216,709
Post Office	79,659	81,423
Stamps	63,807	60,779
Telegraphs	30,359	30,041
Gold	25,517	23,237

Notes.

Budget of the City of Paris.—Since the publication of the general annual budget for Paris, noticed in the *Journal*, No. 840, the Prefect of the Seine has issued the special budget of the city itself, from which we extract the following items:—The current expenses of the city were given in the notice above named. The total receipts on all accounts for the year 1868, according to this provisional account, including all special income, amount to 225,448,064 francs (£9,017,922), while the estimated expenditure exceeds that amount by five and a-half millions of francs. The budget for 1869, or rather the general estimate for the year, stands as follows:—

		Francs.
Receipts and expenses, ordinary and extraordinary, for the city of Paris		192,663,424
,, ,, supplementary		15,500,000
,, ,, special		16,038,397
Total	(£8,968,073)	224,201,821

The expenditure for the current year will probably be much larger than that of 1868, for all the chief items increase yearly. The most important addition to the current year, noted in the document under hand, is that of the annual charge of the municipal debt, which is thus given:—

	Francs.
As shown in the account for 1867	19,130,872
Credited in the budget of 1868	21,044,364
Inscribed in the budget of 1869	46,170,824

Thus, the people of Paris will have to pay no less a sum

than £1,846,833 on account of the municipal debt alone. There is a change announced in the taxation of Paris. At present, persons not in business on their own account, and not rated at so much as ten pounds for rent, pay no house-tax; this exemption is now to be carried as far as a rating of sixteen pounds, which is stated to be equivalent to twenty pounds actual rent paid. In future, apartments rated not higher than twenty-four pounds will pay three per cent. house-tax; while the tax on dwellings of superior character is left as before, namely, five per cent. up to £40; seven per cent. on all under £60, and above that, nine per cent. per annum. The amount set down for public charity is under a million sterling, although 102 beds have been added to one hospital —a new hospital established for scrofulous children, and a new asylum for incurables. The sum set down for road-making, plantations, water, and sewers, is just a million sterling, or £22,856 more than in 1866. In the extraordinary expenditure are the following items:—£92,000 for the purchase of the privileges of the General Water Company and the Cab Company, and the tolls of certain bridges in the outskirts of Paris, and one or two other similar expenses. The following sums are set apart for important public works:—Roads and bridges, £127,212; architecture and the fine arts, £52,416; improvements of streets, £960,000; other public works, about £500,000. The amount set apart for architectural works and the fine arts is thus divided:—

	Francs.
Repairs of churches, &c.	300,000
„ municipal buildings and schools	200,000
Continuation of the repairs and embellishments of the Lycées	120,000
Completion of the new museum in the Hôtel Carnavalet	220,000
Fine arts and decoration	250,000
Minor items	220,393
Total	1,310,393

New churches, schools, or municipal buildings are provided for apart out of the special fund for great public works.

Technical Education in Italy.—The first examination of the students of the Technical Institution of Cuneo (which was established in 1865) was held this autumn. Out of 28 students who had completed their three years' course of study, and who presented themselves for examination, 26 passed, 20 having obtained a diploma in agricultural and land surveying, 4 in telegraphy, and 2 a licence as professors of mathematical and physical science. The Provincial Council of Cuneo has voted a sum of money to enable the two best students in agriculture to continue their studies abroad.

The Suez Canal.—In a communication to Paris, M. de Lesseps stated that a small schooner, "La Levrette," has recently passed through the Suez Canal, and that six vessels belonging to the Egyptian fleet are about to pass from one sea to the other. It now may be safely said that this canal is opened for vessels of small tonnage; and in six months' time ships of from 2,000 to 3,000 tons burden will be able to make use of the Suez Canal.

Newspapers in Switzerland.—The number of political newspapers published in Switzerland is at present 201. Of these 163 are in German, 31 in French, 4 in Italian, and 3 in Romany. Six are published seven times a week, 32 six times, 35 three times, 72 twice, and 54 once a-week.

Correspondence.

Artificial Refrigeration.—Sir,—Our attention has been drawn to the paper read by Dr. Paul on artificial refrigeration, and the subsequent correspondence on the same subject. We regret that in the discussion following the reading of Dr. Paul's paper there was nothing advanced of an original or interesting nature, and the old familiar suggestions of cooling chambers and freezing ponds (acted upon by us years ago) were again brought out. Still, it was not our intention to have intruded upon you, but from the remarks made by Mr. Flower, in his letter of the 2nd inst., implying that we have been indebted to him for information or assistance; we can only say, if this be so, it is not within our recollection, and, until now, had the question been put to us, we should have said that the contrary was the case. Some time ago, our manager, Mr. West, happened to be in the neighbourhood of Stratford-on-Avon, and called upon Mr. Flower, and was shown the air-engine, and the method adopted for reducing the temperature of wort by means of a cooled solution of brine. On leaving, a presentation was made to our representative of a copy of Mr. Flower's patent for applying cold brine, &c., by means of Siebe's or Kirk's refrigerator, to the purpose of cooling worts, &c. Mr. Flower states that his intention in taking out a patent for this was simply to record the first practical application of artificial refrigeration to brewing. Now, surely, the refrigerative apparatus being ready to hand, it is really a very small matter of detail how the cooling power so obtained be employed; but even this Dr. Paul has shown in his letter has not been lost sight of, and so far back as 1857, Harrison in his specifications (No. 2,362, page 13) remarks, "I am aware that the employment of saline solutions for carrying frigorific power has been frequently proposed, &c.," and again, that his invention "consists in the combination of a refrigerative process by the continued and self-regulated circulation of a stream of ether or other volatile liquid, with the continued circulation of a stream of uncongealable liquid, conveying and diffusing the frigorific effect over large surfaces and to cooling worts, &c." Moreover, ten years ago, and up the time of his decease (some three years since), the late Mr. Daniel Siebe advocated the employment of brine, as (so to speak) a carrier of cold for brewing purposes. In support of this, we are prepared to give references to brewers if so desired. Brine is the medium we employ in our apparatus for cooling or freezing water. This being so, what originality, we ask, is there in diverting the application to cooling worts? If it does one it will do the other. The setting up, therefore, of a "record," alluded to by Mr. Flower, we fear can only tend to act as a deterrent to persons unacquainted with what has been done before, and desirous of using brine as a cooling medium. With regard to Mr. King's application of our machinery for cooling worts, and which has been such a remarkable success, we can state it was entirely original —was his own idea—and we must admit carried out even contrary to our advice to use brine. Apologising for taking up so much of your valuable space.—We are, &c., Siebe, Brothers,

Mason-street, Lambeth, London, S., January 13th, 1869.

Artificial Refrigeration.—Sir,—In reference to Mr. Flower's letter, published in last week's *Journal*, I have been all along quite well aware that Kirk's machine had been applied by Mr. Flower to cooling brine, which was then passed through an ordinary brewers' refrigerator. I was also aware that this mode of working has a certain advantage over ice-making, especially with Kirk's ice machine, which requires a very great expenditure of power for making ice. That advantage, however, is trifling compared with the advantage gained by Mr. King's plan of direct refrigeration, without any brine at all, since, in this latter case, the useful effect is nearly three times as great as when ice is made. I am unacquainted with any announcement of this fact by Mr. Flower, or of any indication by him of its possible realisation, and, so far as I can judge from his letters, he does not seem, even now, to appreciate this fact. Besides this, it is an advantage which cannot be obtained by any means with the air machine, and relates exclusively to the ether machine. These are the facts upon

which I based the opinion expressed in my paper, and until Mr. Flower advances anything beyond assertion against them, I shall venture to retain that opinion, and say nothing more on the subject.—I am, &c., Benjamin H. Paul.

8, Gray's-inn-square, 13th January, 1869.

MEETINGS FOR THE ENSUING WEEK.

Mon.....Social Science Assoc., 8. Mr. John Scott, "On the Inns of Court, their Functions and Privileges."
R. United Service Inst., 8½. 1. Capt. E. A. Inglefield, "His new Hydraulic Steering Apparatus, as being fitted to H.M.S. *Achilles*." 2. Lieut. Arthur H. Gilmore, R.N., will exhibit his "New Expanding Plug for stopping Shot Holes, and New Sponge for Artillery Practice."
British Architects, 8.
Medical, 8.
Asiatic, 3.
London Inst., 6.
Society of Engineers, 7½. President' Inaugural Address.

Tues ...Civil Engineers, 8. Renewed discussion on "Mechanical Appliances for Getting Coal;" and, time permitting, Mr. Henry Hooper, "New Ferry and New Brighton Piers."
Royal Inst., 3. Mr. Westmacott, "On Fine Art."
Statistical, 8. Mr. R. Dudley Baxter, "The Taxation and Capital of the United Kingdom."
Pathological, 8.
Anthropological, 4. Annual General Meeting.

Wed ...Society of Arts, 8. Mr. Samuel Highley, "On Photography and the Magic Lantern applied to the Teaching of History."
Meteorological, 7.
R. Society of Literature, 8½.

Thur ...London Inst., 6.
Royal Inst., 3. Mr. Rupert Jones, "Protozoa."
Royal, 8½.
Antiquaries, 8½.
Linnæan, 8. Mr. Richard Spruce, "On the Palms of the River Amazon."
Zoological, 4.
Chemical, 8.
Numismatic, 7.
Royal Society Club, 6.
Society of Fine Arts, 8. Conversazione at the Gallery of the Female School of Art, Queen-square, Bloomsbury.

Fri .....Royal Inst., 8. Mr. A. Herschel, "Last Eclipse of the Sun."
Quekett Club, 8.

Sat .....R. Botanic, 3¾.
Royal Inst., 3. Prof. Odling, "Hydrogen and its Analogues."

Patents.

From Commissioners of Patents' Journal, January 8.

Grants of Provisional Protection.

Artificial fuel—3154—W. E. Gedge.
Baths employed in coating metals—3871—J. Jones.
Boilers—3908—S. Smart.
Bottles, packing—3421—E. and F. Dixon.
Bricks, &c., ornamental—3939—W. H. Ridgway and F. W. Walker.
Building materials—3279—F. Ransome.
Buildings, &c., heating—3818—J. E. Scriven.
Carpets, &c.—3881—H. G. Thompson.
Carpets, &c.—3923—H. G. Thompson.
Carriages, combined open and closed—3823—O. Hollingworth.
Casks, sheet-metal—3731—J. A. Farwig and C. Haynes.
Casks, &c., ferrules for—3922—G. Lowry.
Chemical compounds—3525—D. Burns.
Cloth, &c., plaiting or doubling—3960—G. Slater.
Cod-liver oil, &c., treating—3928—A. V. Newton.
Colouring matters, preparing—3850—C. Liebermann and C. Graebe.
Conservatories, &c.—3252—R. S. Burn and E. S. Eyland.
Cooking apparatus—3774—B. Hunt.
Cooking apparatus—3926—F. P. Warren.
Copper and brass, electric deposition of—3930—W. H. Walenn.
Corn, treating—3912—A. Sezille.
Cravat fasteners—3529—F. D. Sutherland.
Diving apparatus—3811—C. E. Brooman.
Drying stoves, &c.—3829—J. Worrall and J. Kershaw.
Filter vans and carts—3773—E. H. Bayley.
Fire-arms—3943—H. Hillebrandt.
Fire-arms, breech-loading—3946—C. Gordon.
Floating docks—3916—W. E. Gedge.
Forks for agricultural and horticultural purposes—3904—J. Palmer.
Gas—3909—F. N. Gisborne.
Gas—3954—A. Browne.
Gas burners—3929—A. M. Clark.
Glass furnaces—3931—T. Warren.
Hassocks, &c.—3918—E. M. Thornton.
Heat, indicating and regulating—3771—W. H. Bailey.
Horses, roughing—3717—W. Chiswell.
Hot-water apparatus—3917—B. W. Maughan.
Inkstands—3920—W. G. Reeve.
Iron—3883—I. Baggs.
Iron for plating vessels, &c.—2634—J. Jeavons and C. Martin.
Iron roads, &c., suspended—2709—E. Cortazzi.
Jewellery, &c., ornamenting—3641—R. A. Green.
Lamps, portable—3944—C. E. Brooman.
Locks—3676—L. J. Marechal.
Locks, &c.—3887—R. Whitaker.
Malt kilns, &c., constructing floors for—3936—R. Boby.
Metal pipes—3952—C. D. Abel.
Millstones, dressing—3688—H. Robinson.
Millstones, dressing—3935—H. Robinson and J. Smith.
Mines, ventilating—3910—J. Snape.
Motive-power—2734—J. Parker.
Motive-power—3940—A. C. Pilliner and J. C. Hill.
Motive-power engines—3869—M. S. Maynard and R. Grime.
Pianofortes, &c.—3948—J. P. Mills.
Pigments—2856—J. B. Spence and R. R. Kelly.
Press plates, heating—3819—J. Mill.
Printing surfaces, production of—3956—F. A. V. Michel.
Pulleys—3906—J. H. Johnson.
Punkahs or fans, apparatus for working—3937—H. C. M. Turnbull.
Railway signals—3410—C. E. and F. C. Winby.
Railway trains, communication in—3752—T. Sturgeon.
Railway trains, communication in—3899—W. R. Clark.
Reaping apparatus—2786—S. G. Archibald.
Rolling mills—3934—C. D. Abel.
Saddle cloths, &c.—3889—J. Wilkinson, jun.
Sash lines, &c—3921—G. Hookham.
Saucepans, &c., metallic lids for—3831—F. Ryland.
Sewage, treating—3914—J. G. Jennings.
Sewing machines, &c.—3958—F. N. Gisborne.
Steam engines—3456—A. J. Deblon.
Steam ploughs, &c.—2746—H. Cowing.
Taps—3895—W. E. Gedge.
Teeth, plates for holding artificial—3924—J. H. Johnson.
Telegraph cables, submarine—3938—H. Clifford.
Thread or twine wound upon bobbins, &c.—3866—M. Brown-Westhead and R. Smith.
Torpedoes, &c.—3907—F. N. Gisborne.
Umbrellas, &c.—3875—T. Warwick and A. Boyle.
Valves—3897—J. Clayton.
Velocipedes—3962—R. and T. Hughes.
Vessels, reefing and unreefing the mainsail, &c., of—3902—J. Jensen.
Watches—3942—W. Ehrhardt.
Wells, sinking—3764—J. F. Bentley.
Windows—3873—J. Dickson.
Wood, &c., cutting and shaping—3964—S. and W. Fox, J. Reffitt, and G. Grange.

Inventions with Complete Specifications Filed.

Gold, &c., coating articles with—23—H. A. Bonneville.
Lawn-mowers—37—A. W. C. Williams.
Malt, &c., apparatus for drying, &c.—3976—H. A. Bonneville.

Patents Sealed.

2172. M. Bebro.
2179. H. H. Doty.
2185. W. L. G. Wright.
2186. E. T. Hughes.
2190. J. D. Churchill.
2199. C. E. Brooman.
2201. E. Edwards.
2246. G. Moulton.
2342. A. V. Newton.
2355. A. V. Newton.
2379. A. V. Newton.
2486. W. E. Newton.
2589. A. Clark.
3138. W. R. Lake.
3345. R. W. Beckley.
3371. J. Taylor, jun.
3495. W. R. Lake.

From Commissioners of Patents' Journal, January 12.

Patents Sealed.

2204. G. B. Puricelli.
2209. G., G.W., & J. Betjemann.
2210. W. R. Lake.
2214. J. Bastow.
2221. C. J. Galloway and C. H. Holt.
2223. J. Thompson and J. G. Ingram.
2228. C. de Bergue and J. C. Haddan.
2233. J. Bonnall.
2235. W. Turner.
2251. J. Duguid, jun.
2252. W. J. C. Muir.
2253. C. J. Galloway and C. H. Holt.
2282. W. H. and A. M. Bates and H. Faulkner.
2292. A. M. Clark.
2328. G. Smith.
2341. J. Brigham & R. Bickerton.
2347. A. M. Clark.
2357. A. M. Clark.
2360. W. Lewis.
2476. W. E. Newton.
2477. G. Leach.
2562. B. Hunt.
3146. J. Robertson.
3151. W. R. Lake.
3192. W. E. Newton.
3336. J. H. Bertie.
3399. W. M. Brown.

Patents on which the Stamp Duty of £50 has been paid.

43. H. D. P. Cunningham.
104. A. H. Hart.
58. H. N. Penrice.
94. C. Bartholomew.
92. T. A. Blakely and J. Vavasseur.
122. C. G. Johnson.
137. E. M. Boxer.
100. F. J. King.
109. R. T. Sutton.
139. C. Moriarty.
294. L. Sterne.

Patents on which the Stamp Duty of £100 has been Paid.

60. J. Smith and S. Wellstood.
59. C. W. Siemens.
138. W. L. Winans.
46. J. Tatham.
77. W. H. Preece.
81. T. Ramsay.
82. H. Charlton.

Journal of the Society of Arts.

FRIDAY, JANUARY 22, 1869.

Announcements by the Council.

Ordinary Meetings.

Wednesday Evenings at eight o'clock :—

January 27.—"On Xylography, or Printing and Graining from the Natural Surfaces of Woods." By Wm. Dean, Esq., sen.

February 3.—"On the Useful Application of Waste Products and Undeveloped Substances." By P. L. Simmonds, Esq.

February 10.—

February 17.—"On the Efficiency and Economy of a National Army in Connection with the Industry and Education of the People." By Henry Cole, Esq., C.B. On this evening the Right Hon. T. Milner Gibson will take the chair.

Cantor Lectures.

The Second Course of Cantor Lectures for the present Session will be "On Painting," by S. A. Hart, Esq., R.A., late Professor of Painting at the Royal Academy, and will consist of Four Lectures, to be delivered as follows :—

Lecture I.—Monday, February 1st.

On the History of Portrait Painting.

Lecture II.—Monday, February 8th.

On the Practice of Portrait Painting.

Lecture III.—Monday, February 15th.

On the Suggestions offered by surrounding circumstances to the Artist.

Lecture IV.—Monday, February 22nd.

On Landscape Painting.

Each lecture will begin at eight o'clock. These Lectures are open to Members, each of whom has the privilege of introducing two friends to each Lecture. Tickets for this purpose are forwarded with this week's *Journal*.

FINAL EXAMINATIONS, 1869.

In order to avoid holding these Examinations on the same evenings as those of the Department of Science and Art, it has been decided to hold them, in 1869, on the evenings of

TUESDAY,	**the 20th**	**APRIL,**
WEDNESDAY,	**the 21st**	**,,**
THURSDAY,	**the 22nd**	**,,**
FRIDAY,	**the 23rd**	**,,**

From 7 p.m. to 10 p.m., instead of on the 27th, 28th, 29th, and 30th April, as announced in the Programme of Examinations for 1869.

In consequence of this alteration the Previous Examinations must be held earlier, and the Forms No. 2 and No. 4, referred to in par. 6 of the Programme, must of course be sent in a week earlier than the dates there fixed for receiving them.

It is very important that this alteration should be made as public as possible. For this purpose a number of small slips, to be inserted between pages 8 and 9 of every Programme sent out, have been forwarded to each Institution and Local Board. Large bills, to be suspended on the walls of the Institution reading-room, or in some other public place, will also be sent on application.

In reference to the subjects referred to in the notice at page 9 of the Programme, a sufficient number of applications from candidates in Conic Sections have already been received. A paper will therefore be set in that subject.

Candidates desiring to be examined in Navigation and Nautical Astronomy, Mining and Metallurgy, and Italian, should communicate their wishes without delay.

Elementary Examinations, 1869.

Secretaries of District Unions and Local Boards desiring to adopt the Society's scheme of Elementary Examinations, are reminded that they must apply to the Secretary of the Society of Arts before the 10th of February, stating the number of male and female Candidates respectively desiring to be examined in each grade.

Institutions.

The following Institutions have been received into Union since the last announcement :—

Greenwich (East), Science Classes, St. Mary's National School.

Ramsgate, Church Institute and Literary Society.

Spring Vale (Hammersmith, W.), Institute and Evening Classes.

Art-Workmanship Competition.—1868-9.

The works sent in competition for the Prizes offered this Session are now placed in the Great Room, for the inspection of Members and their friends.

The following is a catalogue of the works received :—

FIRST DIVISION.

1. (D.) Earthenware Slab, with figures painted in enamel colours. By J. B. Evans, Howard-place, Shelton, Staffordshire Potteries. Price £4 4s.
2. (E.) Earthenware Vase, with painted ornament in enamel colours. By the above. Price £8 8s.
3. (M.) Design in Ivory and Gilt Metal-work, for cover of an album. By George Berry, 31, Brewer-street, Golden-square, W.
4. (N.) Clock Case, in amboyna and purplewood, with inlay of ivory. By Thomas Jacob, 4, Upper Charlton-street, Fitzroy-square, W.

5. (N.) Marquetrie Panel. Designed and inlaid by F. Braun, 12, Star-street, Edgware-road, W. Price £9.
5A. (P.) Centre of a Chimneypiece, a combination of mosaic and inlay with carved stone. By John E. Daly, 33, Medway-street, Westminster, S.W.
6. (Q.) Panel for a Cabinet, consisting of six different woods. Designed, carved, and inlaid by Thomas Godfrey, 21, Chatham-road, Wandsworth-common, S.W.
7. (Q.) Panel for a Cabinet. By Charles Line, 41, Prince of Wales's-crescent, N.W. Price £12.
8. (Q.) Panel Frame, carved in various woods. Designed and carved by E. T. Grove, 130, Albany-street, N.W. Price £5.

SECOND DIVISION.

9. (A.) Cases of Specimen Clock Dials. Nos. 1 to 6 enamel painted; Nos. 7 and 8 dead surface suitable for public buildings, as not reflecting the light; Nos. 9 to 11 glass dials in imitation of engraved dials, and superior to them for durability in consequence of the work being at the back. All the dials can be produced in any size. By J. Thwaites, 38, Spencer-street, Clerkenwell, E.C.
10. (B.) Frame for a Miniature, of strongly-gilt gilding-metal and enamelled; solder of 18 carat gold. Designed, traced, engraved, and enamelled by Frederick Lowe, 13, Wilderness-row, E.C.
11. (C.) Ring Tray, similar in material and process to the above. By Frederick Lowe.
12. (D.) Slab, for insertion in the frieze of a chimney-piece. By J. B. Evans, Howard-place, Shelton, Staffordshire Potteries. Price £6 6s.
13. (D.) Ditto. By the above. Price £4 4s.
14. (D.) Ditto. By John Slater, Field-place, Stoke-on-Trent. Price £6 6s.
15. (E.) Tablet for Monumental or Commemorative Purposes (unfinished, but sent to show design). By James Griffiths, Field-place, Stoke-on-Trent.
16. (H.) Book Cover, enrichment in gold upon coloured ground. By C. Pfander, 28, Bayham-street. N.W. Valued at £3 10s.
17. (H.) Ditto, enrichment in cameo tints upon black and gold grounds. By the above. Valued at £3 15s.
18. (I.) Set of Fire-irons. By E. Millard, 35, Little Clarendon-street, Clarendon-square, N.W.
19. (O.) Pedestal for a Bust, forming a clock case, consisting of carved marble combined with mosaic. By W. H. Barrett, 2, Alma-terrace, Fentiman-road, S.E. Price £18.

Articles sent in for exhibition, but not in accordance with prescribed processes:—

Carving in Stone.

20. Bracket, carved in Caen-stone. By John Barker, 2, Paradise-street, Lambeth, S.E.
21. Panel of Flowers, carved in Caen-stone. By the above.
22. Panel, carved in Caen-stone. By the above.
23. Child's Head, carved in Stone. By John Wallace, 162, Grove-street, Camden-town, N.W. Price £4 10s.

Carving in Marble.

24. Boy's Head, in Relief, a Portrait. By W. X. D. Price £2.
25. Medallion Head of Michael Angelo. By W. X. D. Price £2.
26. Bust of Queen Adelaide. By G. Bool, 9, Warwick-place, Pimlico, S.W. Price £12.
27. Carving in Relief. By Owen Thomas, 66, Harewood-street, N.W.

Modelling in Plaster.

28. Bust, "Ophelia." By A. J. Smith, Great Northern Stone Wharf, Wharf-road, King's-cross, N.
29. Modellings, after Donatello, of St. Cecilia, and the Virgin and Child. By W. W. Price £5.
30. Portion of Ornament. By E. Gibbons, 5, Mary-street, Arlington-square, N.
31. Medallion, "Science Trimming the Lamp of Life," executed after cast of medal by Wyon. By R. C. Hindshaw, 23, Worsley-street, Regent-road, Manchester. Price £10.
32. Frame containing six emblematical figures of the Months. Designed and modelled by G. Morgan, 41, Pelham-street, Brompton, S.W.
33. Head of a Female, modelled from life. By the above.

Metal Work.

34. Reduced copy in steel of the above. By the same exhibitor.
35. Embossing in Copper of a Yacht in full sail. By Robert Taw, 8, Prince of Wales's-crescent, N.W.
36. Wrought Iron Work for Cabinet. Designed by B. T. Talbot. Executed by G. Emms, 2, King-street, Old Kent-road, S.E.
37. Repoussé Work in Copper. By J. Gwillim, 19, Sidney-square, Mile-end, E. Price £20.
38. Renaissance Ornament in Copper. By G. Deere, 23, Weston-street, Pentonville, N. Price £10.
39. Specimens of minute engraving. The Creed, the Lord's Prayer, and the Ten Commandments. Engraved by hand, in black letter, on threepenny pieces. By W. Roberts, 146, Stanhope-street, Hampstead-road, N.W.

Carving in Wood.

40. Head of our Saviour, carved in lime wood. By E. J. Broughton, 23, Queen-street, Webber-street, S.E. Price £6 10s.
41. Alto-relief in box-wood with ebony border, "Venus Genetrix." By Thomas Wills, New-road, Hammersmith, W. Price £15.
42. Bust of a Female in lime-wood. By William Cushing, 14, Cardington-street, N.W.
43. Panel of Flowers. Carved by Arthur Line, 19, Prince of Wales's-crescent, N.W. Price £4 10s.
44. Clock Case in walnut wood. By R. Flipping, 67, Charrington-street, N.W. Price £7.
45. Highland Dirk, carved in ebony. By John Sinclair, 6, Sutherland-street, West-end, Edinburgh.
46. Presentation Pipe, carved in sycamore. By the above.

Needlework.

47. Specimen of Needlework for a Book-cover. By Miss H. Pfander, 28, Bayham-street, N.W. Price £3 5s.

Painting on Porcelain.

48. "The Death of the Christmas Carol Singer." By J. J. Slater, Ricardo-street, Burslem, Staffordshire. Price £10.
49. Painted Birds, after Bouvier. By Frank Harris, Hartshill, Stoke-on-Trent. Price £1 11s. 6d.
50. Painted Trophies, birds &c., with green ground-laid border, with gilt raised ornamentation. By the above. Price £3 13s. 6d.
51. "The Death of Goliath." By John Eyre, 16, Newman-street, Oxford-street, W. Price £5 10s.
52. "The Virgin and Child;" after Titian. By "Pax."
53. Figures. By W. P. Simpson, 6, Queen's-road, Bayswater, W. Price £10 10s.
54. "Giving a Bite;" after W. Mulready, R.A. By the above. Price £26 5s.
55. Study from Life. By W. P. Rhodes, Liverpool-road, Newcastle-under-Lyne.
56. Flowers. Painted by J. Longmore, 14, Hardinge-street, Fenton, Stoke-on-Trent. Price £1 1s.

57. Portrait from a photograph, worked with a crayon on a glazed surface, and fired. By A. B.
58. Portrait from a photograph. By the above.
59. Head of Our Saviour, from an engraving by Sharp, after Guido, by the same process as No. 57. By the above.
60. "Pluto." Painted on blackware, after the style of the Limoges Enamels. By W. H. Slater, James-street, London-road, Stoke-on-Trent.

Proceedings of the Society.

Musical Education Committee.

This Committee met on Thursday, the 14th instant, and determined that before recommending any steps on the part of the Society, in reference to a standard musical pitch for this country, it would be desirable to ascertain whether any uniformity of musical pitch exists in the principal cities of Europe, and they resolved to take measures forthwith for obtaining this information.

Swiney Prize.

20th January, 1869.

A meeting of the adjudicators of this prize, appointed by the will of the late Dr. Swiney, was held this day at the Rooms of the Society of Arts, J. Risdon Bennett, M.D., in the chair.

The Secretary read the advertisement convening the meeting.

Read the following minute of the Joint Committee :—

A meeting of the Joint Committee of the Society of Arts and the Royal College of Physicians, was held at the Rooms of the Society of Arts.

There were present—

The Right Hon. the Lord Chancellor in the chair Sir William H. Bodkin Samuel Redgrave, Esq. Benjamin Shaw, Esq. Seymour Teulon, Esq.	On the part of the Society of Arts.
James Alderson, M.D., President of the Royal College of Physicians James Risdon Bennett, M.D. Frederick John Farre, M.D. Henry Alfred Pitman, M.D. Sir Thomas Watson, Bart., M.D.	On the part of the Royal College of Physicians.

Read the clause in the Will of the late Dr. Swiney referring to this bequest.

Resolved unanimously, to recommend that the award of the Prize be this year made in favour of William Augustus Guy, M.D., the author of a published work entitled "The Principles of Forensic Medicine."

(Signed) Hatherley,
Chairman.

Resolved, that the Prize, a Silver Goblet value £100, and gold coin in it to the same amount, be adjudged, and the same is hereby presented, to Wm. Augustus Guy, M.D., the author of a published work entitled "The Principles of Forensic Medicine."

Seventh Ordinary Meeting.

Wednesday, January 20th, 1869; Antonio Brady, Esq., Member of Council, in the chair.

The following candidates were proposed for election as members of the Society :—

Alabone, Edwin George, Earlswood-house, Hackney, N.E.
Barrow, Captain Robert Knapp, Naval and Military Club, Piccadilly, W.
Clare, Walter Frederic, 16, Trafalgar-road, Old Kent-road, S.E.
Davison, William, 1, Lupton-villas, Tufnell-park-rd., N.
Dipnall, Mathias, S.S., Christ's Hospital, E.C.
Jones, Robert, Manor-house, St. John's.wood-pk., N.W.
Proctor, George James, Newport, Isle of Wight.
Smith, John Whittet, Elvet-house, Clapham-common, S.W.
Stone, John Benjamin, F.G.S., Union Glass Works, Dartmouth-street, Birmingham.
Walker, Lieut.-Col. W. L., 84, Inverness-terrace, W.
Wright, Henry Edward, St. Mary's National School, East Greenwich, S.E.

The following candidates were balloted for, and duly elected members of the Society :—

Armstrong, George Frederick, C.E., 37, Norfolk-street, Strand, W.C., and 10, Albion-place, Doncaster.
Campbell, George, 60, St. George's-square, S.W.
Croll, Alexander, Sussex-house, Tudor-road, Upper Norwood, S.E.

The Paper read was—

PHOTOGRAPHY AND THE MAGIC LANTERN APPLIED TO TEACHING HISTORY.

By Samuel Highley, Esq., F.G.S., &c.

In January, 1863, just after the close of the International Exhibition, I had the honour of reading a paper before this Society on "The Application of Photography to the Magic Lantern Educationally Considered," on which occasion I demonstrated how every conceivable branch of science and art might be illustrated by lantern slides, produced by means of photography in a manner that at once raised that toy of the nursery, the magic lantern, into a valuable philosophical instrument and educational tool. I pointed out how, by aid of the ordinary, the astro, the spectrascopic, and the micro-photographic camera, we made Nature become our artist, and forced her to depict her wonders with her own pencil of light on our chemically prepared glass slides—how in this manner truthful transcripts from nature were delineated by a faithful and an unbiassed hand, where detail was a *sine qua non*, and in a manner that the hand painter could never approach, much less rival, even if we gave him a surface four times the size of that employed by the photographer, which then would entail projecting apparatus as cumbrous and costly as that employed at the Polytechnic Institution, alike unsuited for the convenience or the pocket of the travelling educational lecturer. In the one case all the details of a microscopic object of the most complex structure, the crevassed range of the Mer de Glace, or the wide-angled landscape of the Falls of Niagara, may be depicted with every detail within a three-inch square with a fidelity which the hand painter could not rival, if he could equal, within a six-inch square.

Another point on which I strongly dwelt was the impressive character of a large photographic lantern picture, on which the lecturer could fix the attention of his class, while describing the subject under discussion, as compared with the tiers of ordinary paper diagrams, over which the eyes of idle students listlessly wander.

The collection of slides then exhibited in illustration of the suggested system of instruction met with the strongest expressions of approval from the leading educationists of your Society, and the Photographic Society

of Scotland at a future period awarded them a special silver medal.

There is one thing, however, that photography could not do—it could draw our pictures, but it could not paint them; the day may come, however, when even that apparent miracle may be accomplished, for, recollect, that great master in science, Michael Faraday, who has lately passed from among us—not great in age, but great in the esteem of men—has bequeathed to Mr. Warren De La Rue the daguerreotype presented to him by Becquerel, whereon nature had reproduced a coloured figure from her own palette; and that precious specimen still exists, unfaded,—a promise for the future.

The paper to which I refer attracted the attention of a young officer in the Russian artillery, an amateur photographer, who has since become not only a distinguished professor, but Inspector of the Military Colleges of Russia. With the courage of youth, he determined to introduce the thin end of the wedge into the old system of instruction, where he had the power to use it, in his own lectures on General History by illustrating them with photographic slides and the lantern.

This notion is now *un fait accompli*, and I think it will be a step in the right direction, for though the lantern has been employed at institutions and in schools, it has never yet been used in colleges, and he would be a bold man who would venture to suggest to the Dons of Oxford or Cambridge the introduction of a magic lantern for illustrating the University courses on History. But why not? "Because it has not been done before" is not a sufficient answer in these days of rapid progress and wide reform. I think I shall be able to show you, that by a well selected and carefully executed series of pictures from authentic data, we may take the student back into time, and make him familiar with the aspect of the people of the various nations, their costumes, the buildings they erected, the chambers in which they lived, prayed, or died, the vases with which they decked them, the gods they worshipped, carved in ivory and gold and of prodigious size, their manners and customs, how they lived at peace and in war, their modes of attack upon an enemy, and in what grandeur they carried their illustrious dead to the grave. In thus appealing to the eye we establish a system of artificial memory, next best to the student having seen these records and relics of man's history on earth, in a manner that the most impressive, verbal, or printed descriptions could never convey to his mind, and so in these days, when a wider range of knowledge is expected from our educated classes, we may hope to establish a more rapid and impressive system of instruction, and of a kind not so likely to pass out of the student's mind after he has left school or college.

The time at my disposal this evening will only permit me to show you but a few examples, taken at random from the extensive series of designs that have been prepared to illustrate Col. Tchepelevsky's course of lectures on the "Manners and Customs of Nations, from the earliest Historical Periods to the Present Day," and this is how it came about that I am able to place these specimens of what has been done before you. At the beginning of last year this gentleman travelled through the Continent to see for himself who were the best producers of photographic lantern slides. Germany, France, and England were visited. Many halves of stereographs of subjects of historical interest were purchased on the Continent, but I am happy to say he found that the reproductions required from the great antiquarian works were turned out better in England than on the Continent, not only as to the brilliancy and clearness of the plain positives, but in the very important matter of brilliant and transparent colouring. In fact he found our Continental neighbours curiously behindhand in all matters relating to the lantern as an educational instrument, excepting for experimental physics. I may here state that the beautiful transparent positives of Ferrier and Soulier, and other continental photographers, sold in this country for lantern use, are not specially printed for that purpose, but are the perfect halves of broken or damaged stereographs that are thus utilized, which accounts for the density of many specimens that come into our hands, and the unsuitability of others for colouring. The samples I furnished being approved, the necessary lantern apparatus was ordered and supplied, and in the autumn of the past year I received a commission to reproduce 120 subjects, mostly of an elaborate character; these had to be re-drawn in a special manner for the nature of the work in hand, negatives made, positives printed and coloured in duplicate, and to be delivered in St. Petersburg within two months. Considering that the order was given at the worst season of the year, from a photographic point of view, it became a matter of anxiety as to how often the November fogs would make themselves "a darkness that would be felt." However, nature, artists, photographers, and colourers being propitious, the work was accomplished, the works known as the best authorities on Assyrian, Persian, Egyptian, Grecian, Roman, and mediæval history being ransacked to supply the necessary material, the officers of the British Museum courteously rendering me every facility for the artists I engaged on the work.

Before proceeding to show these views, I will give a rapid survey of what has been done in regard to lights and improvements in our projecting apparatus since the date of my former paper on this subject.

Sources of Light.—Many heads have been at work within the last five years, trying to discover compounds and forms of lamps that will give a great amount of light with the least amount of trouble and discomfort in preparation, to meet the requirements of amateurs who only require the lantern for occasional family use, or for those who are nervous as to employing the most powerful light-giving apparatus; others have been trying to obtain still greater power out of the oxy-hydrogen jet, and simpler or safer ways of manipulation; and a few to secure the most intense light attainable by man, that should even outrival and render him independent of old Sol as a source of light, who too often hides his bashful face in this our favoured clime of England, when we most want his assistance, and in this bold aspiration, almost as daring in thought as that of the builders of Babel, Wilde has been successful—for, from a pair of carbon points, ½-inch square, placed on the top of a lofty building, the light evolved was sufficient to cast the shadows of the flame of street lamps a quarter of a mile distant, upon a neighbouring wall; while at noon, on a clear day in the month of March, the direct rays of the sun took *one* minute to darken a piece of sensitive photographic paper, the light emitted at two feet from the reflector of this electric lamp darkened it to an equal degree in 20 *seconds;* and on a day in June, Mr. Crookes estimated that this electric light had three or four times the luminous and calorific power of the sun at mid-day, and this at a cost of only one half-penny per hour, practical not theoretical value, for the driving power of this giant induction machine of Mr. Wilde's invention.

Mr. Crookes further remarks that, "It would be an interesting problem to calculate what would be the result of driving the 32-inch armature required for a 100-ton magnet, with (say) a 1,000 horse-power steam-engine. If the power generated by this machine did not at once burn up the working parts, dissipate the electric lamp and conducting wires with a mighty explosion into space, and strike dead all the attendants with one lightning flash—if it were at all manageable, and were put on a high tower, it would probably give light enough to make London by night considerably brighter than London by day."*

Argand Burner.—We have tried to improve on the old fashioned camphorized sperm oil lamp, and to this

* See "A New Era in Illumination," by W. Crookes, F.R.S.—*Quarterly Journal of Science*, October, 1866.

end have employed paraffin oil, which gives a most brilliant light, but has the drawback that the vapour from the wick evaporates and covers everything within the lantern with an oily dew when not in use, and the oil itself oozes through the slightest flaw in the metal-work of the lamp, and produces a result alike unpleasant to smell and touch. If the lamps are constructed so as to place the reservoir outside the lantern, and proper samples of oil are employed, paraffin is perfectly free from danger. The pleasantest way, however, is to use the crystallized or solid paraffin. This gives a pure white brilliant light, is perfectly free from smell or danger, and if spilt immediately solidifies, and can then be peeled off anything it settles on; the only drawback is, it takes a long time to melt a mass of it, and this is not always convenient. Where house gas is always attainable, a naphthalized argand burner furnishes one of the most convenient lamps for all ordinary purposes, as it gives a brilliant light, requires no trimming, and is ever ready for use.

Magnesium Lamps.—This source of light has attracted considerable attention, as it emits a most intense beam; but, though from its richness in actinic rays it is admirably suited to the requirements of photographic enlargement, it has great drawbacks when applied to the exhibition of magic lantern pictures. Firstly, the dense white fumes must be removed by a cumbrous arrangement of stove pipes, for, as yet, we cannot absorb the vapours, as generated, by any practical chemical arrangement; secondly, the light is a flickering one, and a dancing landscape is not a pleasant thing to contemplate; and thirdly, the characteristic blueness of this light injures the tone of such pictures as require copper-coloured skies, or red sunsets; for it must be borne in mind that we cannot be always showing plain photographs, or coloured moonlight, ice, and snow scenes, for which, on the other hand, it is well suited. Two forms of magnesium lamp are now in the market; in one a ribbon of the metal is burnt, in the other magnesium powder mixed with sand falls on the flame of a spirit lamp or gas jet. This is known as Larkins's patent.

Oxy-hydrogen Light. —The oxy-spirit and oxy-house-gas jets still retain their old form, but the myth of "safety jets" is passing away—that is to say, the notion of securing safety by wire gauze or water chambers —as cases are on record where the mixed gases have passed back and exploded in the reservoirs. The whole secret of safety lies in a nut-shell. Keep the oxygen and hydrogen in separate bags; always have sufficient and equal pressure-weights on both bags, and never remove the weights from either bag while the gases are burning. I am now referring to all forms of jets where the gases are mixed just before they issue from the nozzle, and impinge in an ignited state upon the lime ball. If the above rules be followed, it is better to employ jets freed from all the impedimenta of longitudinal wires and cross fences of wire gauze, or safety-valves of other constructions; to paraphrase the well-known order, I would say—"Put your trust in Providence, but keep your pressure up." The bore of the nozzle, in relation to the pressure employed, is a matter of importance in the proper construction of a jet; for, if too large, the gases run back and burn within the nozzle tube, often causing a series of sharp explosions, which, if not dangerous, are unpleasant to the ears of a nervous exhibitor or of the audience.

Condensed Gas System. — Undoubtedly the usual arrangement of gas bags, pressure boards and weights, is a cumbrous one, though presenting advantages to the travelling lecturer in other ways. The Americans have lately advocated the method of condensing the gases in metal bottles, as presenting the advantages of compactness and extreme portability, economy, with the greatest amount of pressure attainable, which in other words means security from the gases mixing, running back and exploding, and also increased intensity in the light produced. By this arrangement the gases may be kept at hand any length of time, and ever ready for use which is not the case when the gases are stored in India-rubber bags, for by an endos- and exos-motic action, they pass through the pores of such receptacles, and become deteriorated and unfitted for use in the course of a few days. As regards comparative space occupied, while a single gas bag of 6 cubic feet capacity within its pressure-boards would measure 36 by 24 by 24 inches when filled, and its weights 17 by 6 by 5 inches, a pair of 6 cubic bottles would only occupy a space of 30 by 12 by 6 inches when packed in a stout travelling-case. As regards comparative cost, a stout gas bag with pressure-boards and weights would cost £4 14s., while a bottle in case would only cost £2 12s. 6d.; and the bottle will not wear out, while the gas bag must every now and then be replaced. As these bottles must be sent to the manufacturers to be pumped full, the cost of the generating apparatus is also saved. This leads us to the only drawback to the system; the bottles must be sent to be re-filled, as the pumping apparatus is costly, and requires the greatest care and experience in manipulation; in fact, the only danger in this system occurs at this stage of filling. But though, undoubtedly, this is a drawback to those who have to lecture night after night, the amateur, on the other hand, would regard the saving him the trouble of making the gases as an advantage; and he has only to make a point of returning the bottles to be re-filled immediately after each exhibition to obviate this one drawback, especially as he can obtain the gases cheaper than he could make them for himself. To the photographer this form of apparatus presents great advantages for enlargements, being ever ready for use. But this system is not a new one, for it was employed 20 years ago by Mr. Adams, the well-known lecturer on astronomy and physics. A pair of condensed gas bottles are before you, so that you may judge of the intense light obtainable. They consist of wrought-iron cylinders, 2½ feet 3 inches long by 4½ inches in diameter, capped with most carefully constructed valves worked by lever regulators, and are capable of holding 6 cubic feet of condensed gas. These are tested before sale to 60 atmospheres, or a pressure of 900lbs. on the square inch, and as the pumping pressure seldom exceeds 25 atmospheres, or less than half the test pressure, perfect immunity from danger is insured. *A priori*, we should fancy that as the pressure is always on the decrease, the light would also be decreasing, unless the valves were under constant regulation, but practically this does not happen; for, if properly manipulated, we have not to alter the taps more frequently than with the gas bag arrangement. The 6 cubic feet will last 2 hours, though by careless working they might be used up in 20 minutes, or even in as many seconds.

Lime Balls.—Though some samples of lime will last one, two, or three exhibitions, as a rule it is so hygroscopic that two must be used during one lecture, and if not kept carefully excluded from air by packing them in close-fitting tubes—and even then I have known them to swell and burst open the receptacle—wrapping them in waxed paper, or covering them with a thin skin of india-rubber by dipping them in a solution of rubber in benzole, they will swell and fall to pieces. To obviate this, magnesia has been proposed as a substitute. I have tried a composition of magnesia and plaster of Paris, but before the mixed gas jet it fused and frothed up, unless mixed with a saturated solution of bi-silicate of potash, which, however, imparted a pink tint to the flame; the same with meerschaum, a silicate of magnesia, producing just the opposite objection I raised to the blue magnesium light; probably pure magnesia, greatly compressed by a powerful hydraulic press, would produce the desired material, but it is difficult to obtain the use of such a costly machine for this purpose. Lastly, we have heard a great deal about the employment, in Paris, of a zirconia cylinder, which is said to be superior, not only as to its incandescent qualities, but as to its indestructible nature—a most important property, as it would save the expense not only of a multiplicity of

cylinders, but of the lime clocks we are forced to employ when great pressure is used with the mixed gases, to prevent the cylinders pitting, and so getting out of focus of the optical part of the lantern. As yet I have not been able to obtain a specimen of these zirconia cylinders, or I would have shown their qualities.

Oxygen Generating Apparatus.—As the lime-light lantern has come into extensive use among amateurs since photography has been employed in the production of slides—many gentlemen taking records of their tours with pocket cameras, and, from the negatives obtained, have transparent positives printed, and then show their friends these reminiscences of travel on a larger scale—it is judicious that the philosophical instrument maker should render the apparatus easy of manipulation, and make every possible provision against accident. To this end I have re-arranged the oxygen-generating apparatus, in such a manner as to provide against various contingencies:—First, I enclose my retort within a light iron jacket furnace, so that I not only prevent a great amount of heat being dissipated, but secure the upper surface of the mixture of chlorate of potash and oxide of manganese being melted as well as the lower portion directly over the charcoal or gas-burner, as I found that there was a great tendency for the light powdered manganese to separate and float upon the surface of the melted chlorate of potash, and when the oxygen bubbled briskly through the upper and cooler stratum, it carried this damp powder forward, and often choked the delivery tubes; I further got over this source of a blow off by using coarse-grained oxide of manganese, instead of the powdered, which answered equally well, as the action of the manganese is mechanical, not chemical, for sand, a non-oxygen yielding body, will answer in its place. In case, however, of the tubes becoming accidentally choked, I provide the retort with a metal safety valve, through which the oxygen finds vent. The second source of accident arose if the operator did not disconnect his retort from the wash bottle as soon as all the oxygen was given off from the mixture, for nature, abhorring a vacuum, sucked in the water from the wash bottle upon the red hot mixture, and, converting it into steam, a blow-up terminated the operation. This arose from the delivery pipe passing directly into the water, so I dispensed with this kind of action by dividing my wash bottle into two chambers, and arranging my tubes so that the one in connection with the retort did not come in direct communication with the washing water. A shield at the exit pipe prevented the spray being blown into and wetting the gas bag. Again, the oxygen sometimes came off with a rush, instead of in a quiet orderly fashion, and would blow off the rubber tubes, if it did no worse. This is provided for by arranging the jacket, so that it and its contained retort can be removed from the charcoal pan, or if gas is used, by simply governing too violent or torpid action by the tap provided.

Electric Light.—This, from the trouble attending the fitting up and charging a number of battery cells, which give off nitrous acid fumes, is seldom employed, excepting at institutions where an attendant is accustomed to the drudgery of this unpleasant operation; and even when Wilde's machine comes into more general use, from its cumbrous appliances this source of light can only be employed in fixed localities; nevertheless, it is *the* light of all others for optical experiments, and for the lantern microscope. The ordinary electric regulator provides for bringing a pair of carbon points in contact, and then separating them to a distance proportionate to the electric power employed, so as to produce what is called "the electric arc," that is, an electric flame carrying incandescent and vaporised carbon from one pole to the other, and whenever the striking distance between the two poles becomes too great, it automatically brings them nearer, or "makes up," as we say, or if the distance has been overstepped by the breaking off of a piece of the carbon poles, &c., then it brings them in contact again, and repeats the operation so as to produce and keep up a constant point of light. On the precision of this action depends the value of the regulator. Usually fifty battery cells, arranged for "intensity," are employed, seldom less than twenty cells. Of late we have heard that "an electric regulator," worked with six cells, produces a beam that will supersede the lime-light. Now, as a regulator in no way adds to the battery power, to those who have not been accustomed to get a quart of wine out of a pint bottle, this is rather a startling announcement, especially when we are told that a nine feet disc can be brilliantly illuminated by this small number of cells. The power being so small, a pair of very fine pointed carbon poles are kept touching each other, so that we may call this "the contact system" in contradistinction to the arc-producing method previously described. I will show you the contact light from seven cells, and then the light emitted from fifty cells, by means of a new form of regulator, on the usual system, which I have not hitherto publicly exhibited or described. This is an invention of Mr. Malden, one of our most expert public lantern exhibitors, though professionally a wood engraver, and is not only the most sympathetic, self-adjusting regulator, giving a steady point of light, central with any optical arrangement, for as long a time as the source of electric power remains constant, but is the simplest in construction and the cheapest I am acquainted with. In this arrangement the rod that carries the upper carbon is weighted, and rests upon an air-ball placed in a cylindrical chamber; an exit pipe from the ball is closed by a stopcock, which can be opened or shut by the action of an electro-magnet placed in the circuit on a lever arm fixed to the stopcock; a counterpoise spring being attached to the other end of the lever arm to adjust the action according to the amount of battery power employed. On the air ball being filled by a little bellows, the two poles of the regulator are separated, and a connection being made, the poles fall together, as the stopcock is open till such time as they touch, when a circuit being established, the armature of the electro-magnet is pulled down and then closes the stop-cock, but the poles at once separate to the striking distance of the battery-power employed, and, as they burn away, the stop-cock is slightly opened, so that a small quantity of air escapes, and thus allows the upper carbon gradually to descend, while by a pulley arrangement the lower carbon is simultaneously raised in the required ratio of the combustion of the upper to the lower carbon, viz., 2 to 1; thus securing centrality with the optical apparatus employed. Should a portion of carbon break off, the striking distance being over-stepped, the current is broken, and the stop-cock is again opened, when the poles are rapidly brought into contact, again to start apart in automatic adjustment. This arrangement is well suited for lighthouse purposes, as from its extreme simplicity of construction it could be readily kept in working order or repair by a man of ordinary intelligence, and this cannot be said of the beautiful, but complicated, regulators usually employed

New System of Lantern Apparatus.—Having given a *resumé* as to what has been done in improving our sources of light since 1863, I may state, that with the weaker ones, such as may be classed under the head of "hydro-carbon lamps," I found we must also look to our optical appliances to aid us in picking up all the light we could seize on to make the argand lantern what is desired for showing photographic transparencies, and for this purpose I introduced a triple condenser, which, in other words, means one of shorter focus than that in ordinary use, that enables us to get our light closer to it, and consequently to seize upon a greater number of the emitted rays. But this was not all. The sharpness and detail in photographic slides requires an achromatic lens for the necessary definition of the image on the screen, but a photographic portrait lens, or any double combination lens, absorbs too much of the light,

which we can ill-afford to lose, so I employed a single achromatic power of wide angle, to secure as large a picture as possible at a short distance from the screen, and I thus obtained a really brilliant and well-defined 10-foot picture, though I only aimed at an 8-foot one in the first instance.

The next point was to arrange all the apparatus in such a way as to bring it within the smallest packing compass, and render the lecturer as independent as possible of the ordinary obstacles that present themselves in a strange place. In the same box with the lantern, I packed a cabinet to contain the slides, so contrived that they were always kept in methodical order for use, were never exposed to meddlesome hands, and could be put under lock and key the moment the exhibition was over. Over this cabinet slipped a shell-frame, and when the case was unpacked all these parts could be clamped one above the other to form a stand for the lantern, which was then raised so as to be exactly central with the screen employed. The screen I use is opaque, white and seamless, having the appearance of flexible whitewash, and is the finest surface on which to exhibit views to the greatest perfection. This is obliged to be wound on a roller to preserve its face. The packing-case for this, likewise, forms a supporting framework, so that by the above system I am able to place all my apparatus in any position I desire, untrammelled by the presence of furniture or wall pictures, that would, under ordinary circumstances, have to be removed. The apparatus can be arranged in a few minutes—and I can pack it all away as quickly, thus giving the exhibitor the greatest amount of independence and the least amount of trouble in arranging his appliances.

I use a pair of the condensed gas bottles, arranged in connection with a gas dissolver, the invention of Mr. Malden,* but which I have since brought into very compact form, all being worked by a single cock and lever-arm. This arrangement dispenses with the use of the ordinary "dissolving fans," and gives the exhibitor far greater power in producing dioramic effects, for by the old method the lights in both lanterns were always and unchangeably of equal value, but by adjusting with a lever arm, this gas dissolver allows of an exact balance being established betwen the screen and the superposed "effect," while both gases are economised, for if "dissolving" from one scene into another, the oxygen is gradually turned quite off one lantern, and only a small jet of hydrogen is left alight, for obvious requirements.

I have now ended my survey of the last five years' progress in lantern appliances, and I will proceed to exhibit the series of historical slides. In conclusion, I must say that the honour of introducing this system of instruction into our collegiate establishments and higher branches of education is due to Colonel Tchepelevsky, backed by the Russian Government; thus, as I have said, in a foreign country he has introduced the thin edge of wedge, and I will use all my power to hammer it home.

Mr. Highley then exhibited in the magic lantern a series of fifty coloured views and photographs, illustrative of the architecture, art, costumes, and manners of ancient and mediæval times.

SOCIETY OF ARTS.

(*Continued from p.* 132).

South Kensington Museum.

Thus far I have attempted to indicate some of the steps taken by the Society to aid the object to which the surplus of the Great Exhibition was to be applied. But during the same period the Royal Commissioners were not idle, for they had invested their funds in the purchase of an estate at Kensington-gore, jointly and in co-operation with the government; the Schools of Design were removed from Marlborough-house to the Gore-house estate; and, the commissioners, in addition, had erected a temporary building in which were placed such specimens as had been presented to them at the close of the Exhibition of 1851, as the nucleus of an Industrial Museum. The Society also entered into an arrangement with the Royal Commissioners, and undertook the collection of a Trade Museum, consisting of a series of animal products, illustrative of their uses in manufactures.

The collection thus begun, the value of the collection now stored there and belonging to the nation, had yet to do its work; and it is due to Mr. Henry Cole, that I should state that it is to his unremitting exertions that the country is indebted for the museum as it now exists; it is to him also that the Society is indebted for much valuable aid both in suggesting and carrying through many of the works undertaken. By his co-operation with the other members of the Executive Council, the Great Exhibition of 1851 was carried through to a successful issue; and it is under his superintendence that the South Kensington Museum and the Schools of Design have attained their present proportions. Of the use which the students of the Schools of Design have made of the collection there gathered, it is not my province to speak; I must rather confine my attention to the Society of Arts. What, then, are the uses to which the Society has applied the collection at South Kensington? I have stated above that the Society endeavoured to promote a more perfect education of the people as a means of improving the arts and manufactures of the country. So soon, therefore, as the museum became available, the Society, by directing attention to the works of art there collected, has fostered a love of art in the workman, and by issuing examples either cast or photographed from objects in the museum, and offering prizes to art-workmen for the reproduction or adaptation of such arts and processes to modern manufactures, has led to the investigation of processes which, in combination with our present mechanical appliances, may be productive of new industries. It is here that we see the importance of scientific knowledge, and its bearings upon industry. Without chemistry, the nature of enamels and methods of producing colours and working metals are a mystery to the workman. Without a knowledge of mechanics, the power of multiplying and reproducing economically the tesseræ of the present day would, as well as many other products of industry, have failed. Without art and a thoroughly intelligent knowledge of the mechanical capabilities of the lace machine or the loom, and the means of combining the skill of the artist with the reproductive power of those machines, our fabrics would remain mere imitations produced by rule of thumb, after patterns handed down to us. The want of a higher scientific training on the part of the English as compared with the foreign workman, has again been brought prominently to view by the Great International Exhibition of 1862, and more recently by the French Universal Exhibition of 1867.

Exhibition of 1862.

The Exhibition of 1862, like that of 1851, had its origin within the Society; by it the preliminary steps were taken, and the guarantee fund of £400,000 was raised; by it the Charter of Incorporation was sought and obtained, and the executive, appointed by the Charter, was named. But, unlike its predecessor of 1851, it failed to produce a surplus profit —a result much to be deplored, as upon it a considerable sum was spent with a view to the permanence of that portion of the building in which the exhibition of pictures was held, and in the completion of which large sums would have been expended in the promotion of new art industries, and the development of new manufactures. The rapid advance which England had made in her art education, between the periods of 1851 and 1862, made itself felt by our foreign competitors; but the deficiencies of her scientific training of artizans were also much remarked upon. So great,

* See *The British Journal of Photography*, March 29th, 1866.

indeed, had been the advance of English art-workmanship in 1862, that a number of French artisans were sent by their Government to this country to visit the Exhibition, and to examine and report each on his respective trade.

Paris Exhibition, 1867.

Artizans' Reeports.—The Council of the Society, feeling that a like action in reference to the French Exhibition of 1867, would be equally beneficial to the workmen and manufacturers of this country, determined to create a special fund for the purpose of sending selected English workmen to visit and report on that Exhibition. This fund, which amounted to the sum of £1,039 19s. 6d. H.R.H. the Prince of Wales (President of the Society) opened with a donation of thirty guineas, the Society giving a hundred guineas from its funds, H.M. Government contributing £500, manufacturers and members contributing the remainder. The sum so raised enabled the Society to send about eighty workmen to Paris, who, on their return, each presented a written report, and the whole of the reports were published at the close of the year, forming an octavo vol. of upwards of 700 pages.

The result of those reports was practically this:—We, the workmen of England, are not afraid of our foreign competitors in reference to the majority of our staple products; but if we are to keep pace with our foreign rivals, in the artistic and scientific departments of industry, we must be afforded greater facilities for acquiring a larger amount of artistic and scientific instruction.

I must now go back to an earlier period, and refer to the establishment of the Society's Union of Institutions, which, however, I shall speak of more at length further on.

Seeing, then, that the Society's endeavours in connection with Exhibitions were to result in the application of the large surplus obtained from the Exhibition of 1851 in the promotion of the industrial education of the people as the most efficient means of promoting, improving, and extending the arts, manufactures, and commerce of the country, the Council of the Society of Arts felt it to be their duty to consider what steps they should take in order to aid so important a work. In November, 1851, Mr. Harry Chester, as one of the originators and President of the Highgate Literary and Scientific Institution, addressed a letter to the Council of the Society, proposing that an effort should be made to develop existing and to create new institutions of the class called Literary and Scientific Institutions and Mechanics' Institutes, and to affiliate them with the Society of Arts. "The exhibition," he said, "had given us some very significant hints that it is not only the education of our poor children that needs to be improved." In the address of the Chairman of the Council, read by Mr. Harry Chester, in November, 1853, it is stated, "The Council is thoroughly convinced that an improved education for the whole people, rich and poor, adult and child, is the first requisite for the improvement of manufactures, commerce, and art; that a liberal measure of science must enter into that education, and that it is the duty of the Society to promote vigorously that object."

As one means of bringing about this important result, the Council, at the suggestion and with the aid of Mr. Harry Chester, directed its attention to the condition of the Literary, Scientific, and Mechanics' Institutions established thoroughout the country, as suggested in his letter; and the managers of those Institutions, when addressed upon the subject, lamented with one voice that they were unable to maintain in efficiency their classes for systematic instruction. To aid the Institutions to accomplish an object so much desired, a Union of Institutions was established in connection with the Society, and the Council instituted a system whereby examinations are held, and the progress of the class students is tested. Prizes and certificates are awarded to the most successful among them. At a later period, His Royal Highness the Prince Consort, ever anxious to aid the Society in any good work, established an annual prize of twenty-five guineas in connection with the examinations then established, which is awarded to that student "who in this and the three preceding years shall have obtained the largest number of first-class certificates;" thus holding out an inducement to a continuity of study. This prize Her Most Gracious Majesty the Queen has been pleased to continue.

It is unnecessary that I should give further details as to the working of the Union of Institutions. I may, however, state that, in order to form the union, a conference of the managers was called, the result of which I shall speak of when I refer to the educational action of the Society.

Educational Exhibition.

The Society had, however, no sooner entered upon this work than it felt that the ignorance which generally prevailed in reference to the educational appliances, not only of this country, but also of the systems and appliances of foreign countries, required to be removed; and, with this object, it arranged and opened to the public, on the 4th July, 1854, an educational exhibition, in connection with which lectures were delivered, and the systems pursued in foreign countries and in America, and by the educational societies of our own country, were illustrated, and the methods of applying them pointed out. This Exhibition originated the permanent Exhibition of educational books and apparatus which is now a division of the South Kensington Museum, and Mr. Harry Chester must be recorded as the founder of it.

Industrial Instruction.

Nor was this action arrived at hastily, for in 1853 a committee was appointed "to take into consideration, and to report how far, and in what manner, the Society of Arts may aid in the promotion of such an education of the people as shall lead to a more general and systematic cultivation of Arts, Manufactures, and Commerce, the chartered objects of the Society." The inquiry thus directed was carried out most broadly. I cannot attempt to do more than state that merchants, manufacturers, mechanics, and agriculturists were unanimous in their call for a higher scientific and greatly-improved general education—views which were expressed to the Committee in writing—nor was the inquiry restricted to gentlemen unconnected with the practice of education, but communication was entered into with the masters of endowed grammar schools, private schools, and Mechanics' Institutions, with the same result. The report of the Committee, with its appendices, was printed in the form of an octavo book of over 200 closely-printed pages.

The Council of the Society, during the session of 1867-8, again appointed a committee to inquire into the subject of technical education, and the best means of promoting it, and the first report of that committee was laid before the Society in June last.

It is unnecessary for me to give, in greater detail, the step by step action of the Society since 1852, as the Society having published its weekly journal from that date, the whole of the facts are therein recorded.

Social and Sanitary Measures.

There are, however, other facts of social, sanitary and industrial importance, which have resulted from the Great Exhibition of 1851, to which I must refer; though with reference to the first—the Shoeblack Brigade—the Society had no part in its establishment, yet, as it was created to meet the habits and customs of foreigners likely to visit the Exhibition, it may be said to have grown out of it, and has continued ever since, with great advantage to the poor and industrious boys employed, and to the colonies, to which, after being educated, many of them have been sent, as well as to many classes of residents in the metropolis itself.

Another sanitary result of the Great Exhibition of 1851 was due to the following letter addressed to the Commissioners of Sewers:—

"8th November, 1850.

"My Lords and Gentlemen,—We, the undersigned, having regard to the great urgency which exists for the establishment of public water-closets and urinals in the metropolis, an urgency likely to be much increased by the visits of numerous foreigners, who are accustomed to the use of such conveniences in their own capitals, beg leave to request your attention to the following clause in the Metropolitan Sewers Act (11 and 12 Vic., c. 112):—

"'And be it enacted, that it shall be lawful for the Commissioners to provide and maintain water-closets, privies, and like conveniences, in situations where they shall deem such accommodation to be required; and to defray the expenses thereof, and any damage occasioned to any person by the erection thereof, and the expense for keeping the same in good order out of the District Sewers Rate.'

"We shall be much obliged if you will inform us whether you propose to provide these important conveniences, having reference to the great influx of foreigners to be expected next year, before the opening of the exhibition in May.

"In case you have not considered the subject in this aspect, we trust you will do so at your convenience."

This letter of request was signed by 57 persons.

The power which the Act conferred appeared at the time to have been overlooked, or at least had not been acted on up to that date; but it is unnecessary to add, the accommodation therein asked for has, in fact, been since largely provided in many parts of the metropolis and throughout the large towns of the country generally.

To the above statement I must add that the Society, at the cost of Sir Morton Peto, Bart., had two waiting-rooms fitted and opened for public use, one for gentlemen in Fleet-street, and another for ladies in the Strand; but the public did not largely avail themselves of them, being then unaccustomed to the idea of waiting-rooms, lavatories, &c., and the result was a loss of upwards of £900, which was paid by Sir Morton Peto.

The Patent Laws.

I must now travel back to the year 1849, when the Council resolved to appoint a committee to consider and promote, if possible, legislative recognition of the rights of inventors; and in November, 1850, it was announced "That a number of noblemen and gentlemen, members of the Society, have consented to act as a committee for promoting the legislative recognition of the rights of inventors, by means of an easy registration of them in accordance with the principles agreed on by the Council in 1849.

These principles were:—

"1. That inventors, designers, &c., ought not to be subjected to any other expenses than such as may be absolutely necessary to secure to them the protection of their inventions.

"2. That the difficulties and anomalies experienced in connection with patents should be removed.

"3. That the present term of copyright in designs for articles of manufacture, and the protection afforded to the authors and proprietors of inventions and of designs in arts and manufactures, are inadequate.

"4. That for carrying out these objects, the co-operation of all persons interested therein be invited.

"The points on which the committee wish particularly to obtain information are:—1st, the effect which the existing system of patents may have had in suppressing and thus depriving the public of the knowledge and the use of the inventions of those who are unable to bear the heavy expenses required under it. And 2nd, instances where the expenses have been fruitlessly incurred."

At the first meeting of the committee, held on the 19th Nov., 1850, the committee unanimously affirmed the principles on which they were constituted, and resolved to prepare at once the draft of a bill embodying them; and at the second meeting, on the 29th November, the following resolutions were passed:—

"1. That the present tribunals are insufficient for the trial of subjects of designs and inventions.

"2. That there should be penalties for using the title of patent or registered, where none has ever existed.

"3. That registrations of inventions shall be obtainable for a period of one year, on payment of £5; and shall be renewable for four periods, of five years each, on payment of £10 at first renewal; of £20 at second renewal; of £50 at third renewal; and of £100 at fourth renewal.

"4. That the surplus profits, after paying office expenses and compensation, shall be directly applied to some public purpose connected with invention, but not carried to the consolidated fund."

The first report of the committee was ordered by the Council to be printed and published, on the 2nd December, 1850. It reviewed the position of the inventor in this country. A British subject, it stated, has no right of property whatever in the intellectual labour which produces invention or scientific discovery, excepting such as can be obtained by petition from the Crown.

The inventor in France, in America, in Holland, and in Belgium, even in Austria and Spain, has his right recognised by declared law, but the Englishman has none. . . . .

That England presents the anomaly, that, whilst it is the greatest manufacturing nation in the world, possessing boundless capital and most active industrial energy, combined with a vast amount of inventive ability, to which the genius of the people gives the most practical development, the principles of jurisprudence which should regulate its inventive science and its manufacturing skill, are very far behind those of other nations inferior in civilisation to itself.

"The committee will proceed to determine those principles which it has appeared to them ought to regulate the jurisprudence of inventions. . . .

"The peculiar circumstances under which inventors are placed will be first examined. 'It may be impossible,' as a recent treasury report states, 'to ascertain with certainty when grants of letters patent for the sole use of inventors were first made in this country. . . . but the Crown has always been the source of that absolute power which determines rights not otherwise defined, and always possessed the full power of granting letters patent for inventions.' . . . .

"It has appeared to the committee unnecessary to show how the exercise of the royal prerogative since the first letters patent were issued in the third year of King John, A.D., 1,201, affected those rights which, by the progress of the nation, are no longer subjected to the will either of the Sovereign or of the ministry, which have become the responsible interpreters of it; but it must be noticed that whilst many rights and objects were formerly regulated by the legislature, still the Crown continued to exercise a power of granting all that class of smaller personal rights which were generally designated as monopolies. Even this power of granting monopolies became intolerable, and in the 21st of James I., it was taken away by Parliament from the Crown. . . . In the famous Act of the 21st of James I., c. 3, the power of granting monopolies was abolished; but the power of granting letters patent for inventions was left.

. . . . . .

"It must be clearly borne in mind, that no inventor or proprietor of an invention is in any position to claim any right whatever until he has passed through thirty-five official stages of cost and delay."

The committee then proceed to point out the difficulties by which persons holding patents were surrounded, if circumstances rendered an appeal to law necessary, in order that they might maintain their rights, as well as to the efforts which, during the past 20 years,

had been made to amend the system, but all experience had proved that it was hopeless whilst the present system of granting patents existed.

After an elaborate examination into the various views and opinions as to what constitutes an invention, and the conditions under which inventions should be protected by law, the report concluded as follows:—

"It would thus appear that it is simply the business of the state to provide an easy means of registration of claims which the law should regard as valid until they are proved to be otherwise, as it is the case in almost every civilized country but our own. And the establishment of any tribunal to investigate claims either before they are disputed or afterwards, appears altogether a separate and distinct question, quite independent of the policy of recognising the rights of inventors to the fruits of their labour."

Appended to the report was a comparative view of the laws for the protection of inventions in Europe and America.

On the 15th of January, 1851, Mr. Henry Cole, the Chairman of the Council, in his address said:—

"Already the members of the Society may be congratulated on the successful results of the labours of the influential committee of its members, which has been formed to promote the legislative recognition of the rights of inventors. It has been announced that her Majesty's Government are prepared to ask Parliament to confer the right on inventors, to exhibit their inventions at the Great Exhibition, without subjecting them to the pains and penalties for so doing which are entailed by the present system of patent laws, and there can be little doubt that this right, so consistent with honesty and common sense, will be continued beyond the period of the Exhibition. The labours of the Council will not be relaxed in affording every assistance to invest invention with its due rights and position as a science."

A special Act of Parliament was subsequently passed under which inventions were allowed to be exhibited at the Great Exhibition of 1851, upon registration and open to subsequent patent; and in the second report from the committee, printed 22nd of January, 1851, it is stated that, "in addition to the early results of their labours, the committee have received announcements of the formation of numerous committees established with similar objects of promoting complete reform of the patent laws. These committees have been formed in the metropolis, Manchester, Belfast, Birmingham, Leeds, and other places. They have also had brought to their notice the resolution passed at a meeting of the British Association, by a committee consisting of several of its most distinguished members. Some of the views expressed by these committees are announced in the appendix to the report."

The resolutions referred to as having been passed at the British Association were as follows:—

"1. That the patent laws as they now exist are capable of great improvement.

"2. That the right of property in inventions is entitled to as great a protection as the right of property in literature and the fine arts.

"3. That it might be expedient to remove the heavy expense now attending the taking out of patents, and adopt a graduated scale for portions of time renewable, and increasing from a lower to a higher rate.

"4. That previous inquiry by a competent tribunal should take place before granting patents."

The report of the Society's committee then proceeds:—

"The result of the deliberations of the committee has been the production of the following resolutions, which the committee venture to offer to the consideration of her Majesty's Government, as the basis upon which it appears to them that a reform of the present system should be promoted in Parliament.

"1. That everything in respect of which a patent may now be granted should be registered.

"2. That the benefits afforded by registration should extend to the United Kingdom of Great Britain and Ireland and the Channel Islands.

"3. That the registration should be considered merely as a record of claims, and not as any determination of rights between parties.

"4. That it should be competent to an inventor to make disclaimers, and to rectify errors in his specification.

"5. That registration of inventions should be obtainable for a period of one year on payment of £5, and should be renewable for three periods of five years each on payment of £10 at first renewal, of £20 at second renewal, of £50 at third renewal, and a fourth renewal should be obtained upon appeal, as at present, to the Privy Council. (The principle of renewed payments, increasing in amount, is proposed as a means of testing whether an invention is in use, and of removing useless inventive rights that might otherwise be obstructive of improvements.)

"6. That there should be penalties for using the title of "patent" or "registration" where none has ever existed.

"7. That the present tribunals are insufficient for the trial of subjects of designs and inventions.

"8. That it should be permitted to commence actions for infringement of the rights of inventions in the county courts.

"9 That inasmuch as, contrary to expectation, very little litigation has been created by the rights conferred by the Designs Act of 1842 and 1843, the committee is of opinion that a fair trial should be given to the working of the proposed system of registration of inventions, before any special tribunal to determine inventive rights is substituted for existing tribunals.

"10. That any tribunal before which proceedings are commenced should have power to refer any case for report and certificate to the registrar, assisted by competent and scientific persons.

"11. That upon the illegality of the registration being established by the judgment or order of a competent tribunal, the registration should be cancelled.

"12. That there should be only one office for the transaction of business connected with the registration of inventions and the payment of fees thereof.

"13. That every person desiring to register an invention should submit two copies of the specification of his claim, accompanied in every case, when it is possible, by descriptive drawings.

"14. That the mode and procedure of registration should be regulated by the Board of Trade, subject to a report to Parliament.

"15. That an annual report of all specifications registered, with proper indexes and calendars, should be laid before Parliament.

"16. That a collection of all the specifications should be made, calendared, and indexed, and deposited for public information in the British Museum.

"17. That it is highly desirable that such a collection should be printed and published.

"18. That the surplus profits, after paying office expenses, should be directly applied to some public purpose connected with invention, but not carried to the consolidated fund.

"19. That the importation of any patented invention practised abroad ought not to confer a title to registration, except in the case of the proprietors and inventors, within twelve months from the date of the foreign patent, and that no invention of which the patent has expired in any foreign country, or which has been published for a period of twelve months in any foreign country, or which is in free public use in any foreign country, ought to be capable of being registered in the United Kingdom."

The committee in their report review the objections which have been advanced against the principle of registration and progressive fees. They say:—"The argument that the present great cost of patents,

by rendering the rights few, is a benefit to the manufacturers, is unsound. The money test does not determine the merit or legality of the invention, but simply proves that the inventor could either afford to pay the fees, or that he could induce some one else to pay them for him. In short, the very reverse of the inconvenience prophesied may be expected from cheap registration of invention. Make little rights respected, and a better tone of morals is fostered towards all rights, both large and small. . . . . Recognise the rights of inventors, and invention will be elevated into a science. Those who fear such a result are those who fear the spread of education, and are like those who, in the middle ages, would have burned astronomers and metallurgists as witches, and who even within the memory of the present time denied the pretensions of geology or political economy to the rank of a science."

In December 1851, upon the opening of the Society's Exhibition of Inventions, the provisional Registration Bill passed by the Government is thus referred to—"The Act of 1851, allowing a provisional registration in the case of inventions exposed at the Great Exhibition, appeared to the Council to be a great public good, and a reform in the direction recommended in their two reports on the rights of inventors, and it was their wish, if possible, that permission should have been given to expose such inventions at the rooms of the Society after the close of the Great Exhibition, without prejudice to their future patentability; and, in other words, that the principle involved in that Act should be confirmed in other cases than the one which originally gave rise to it.

"As the Board of Trade did not see fit to accede to this request, the present collection has been deprived of a great number of articles of interest and scientific value.

"It is an evidence of the favour with which the public would receive a cheap patent law, such as that recommended by the Council in their two reports, that although the Act of 1851 only came into operation on the 22nd April, the registrations made under it amount to more than a third of the whole number otherwise registered and patented during the twelvemonths ending October 31st. Upwards of 700 persons availed themselves of the Act on this occasion, and registered and exhibited their inventions."

The third report of the committee, printed in January 1852, referred to the attempts made during the last session of Parliament, and the prospects of the present session in improving the patent law. The Council congratulated the Society that the Act passed before the opening of the Exhibition of the Works of Industry of all Nations recognised the right of property in invention, independently of the payment of any fee, upon disclosing the nature of the invention to the public; the simple registration of the right without any preliminary judgment passed on its novelty or merits; the policy of exhibiting and publishing the invention by which the interests of science, as well as those of the public and proprietors, are rendered reciprocal.

The committee state that they had under their consideration the patent bill, which was sent from the Lords to the Commons in the last session of Parliament, and take exception to the creation of a numerous commission of the high officers of state, and other matters in the bill referred to, call attention to the evidence printed in their second report, and add—"With all the experience of the past session, and after the very general discussion on the subject which has taken place, the committee see no reason to modify the resolutions by which they sought to establish the fundamental principles of jurisprudence which should govern improved legislation in the recognition of patent rights, and with increased confidence again submit them to the consideration of the Legislature."

The committee prepared the heads of a bill to embody these resolutions, accompanied with an explanation of the mode in which the system was likely to work.

A bill, embodying in the main the principles laid down by the Society's Committee, was soon afterwards passed by Parliament, and it still continues to be the Patent Law of England. Under it the people of this country have obtained protection at small cost, immediate publication of the specifications, a patent library of reference, and a museum of patents for consultation. This museum is arranged in a temporary building placed on the ground, bought by the commissioners of the Exhibition of 1851.

(*To be continued.*)

Fine Arts.

Discovery of Frescoes of the 13th Century.—A very interesting discovery has been made in Christian art in the department of the Gard, in France, by two archæologists of Avignon, the Abbé Pougnet and M. Canron, advocate; in examining the ancient crypt of the parish church of the village of Lirac, in the canton of Roquemaure, they discovered beneath the whitewash of the walls of this underground sanctuary some frescoes which they believe to be the work of artists of the 13th century. The portions which have been cleaned represent a bishop and an apostle, each with the aureola of the saints. The crypt is certainly as old as the thirteenth century, at least, and the architecture, which is excessively simple, is classed as belonging to the transition from the original to the secondary Roman style, but approaching more nearly to the latter than the former. It is probably the primitive church of Lirac; the oldest known documents relating to the village bear date 914.

Case of Artistic Property.—A rather curious question was tried in a law-court in Paris the other day, respecting proprietorship of a photographic negative. M. Yvon, the artist, exhibited some few years since a remarkable picture of the Battle of Solferino, in which a figure of the Emperor on horseback occupied the most conspicuous place. In order to make the resemblance of his Majesty as exact as possible, M. Yvon, with the permission of the Emperor, engaged MM. Bisson to proceed to the Tuileries, and there to produce for him, the artist, and under his directions, a portrait of the Emperor, from which he might finish his work. The portrait was very successful, and the proprietorship of the negative was the matter in dispute. MM. Bisson had since sold their business to M. Placet, who claimed the cliché as his property, but M. Yvon argued that he was the true proprietor, for MM. Bisson only in reality lent the use of their apparatus; he had ordered the portrait which he required, had superintended the pose, and it was to him that the negative should be delivered. The court took M. Yvon's view of the case, and ordered the cliché to be given up, but awarded M. Placet 300 francs by way of compensation.

A Statue to Lord Byron.—The municipal council of Missolonghi has decided on raising a monument to the memory of Lord Byron, who died there in 1824, in gratitude for his efforts in aid of Greek independence. The costs are to be defrayed partly by the municipality and partly by public subscription. A commission has been named to collect the necessary funds.

Manufactures.

Production of Lime in Italy.—The number of lime kilns in Italy in 1867 was 4,971, and produced 5,799,383 metric quintals of lime, of the value of 11,557,200 francs. The kilns for burning chalk for agricultural purposes were 891, and produced 1,080,372 quintals, of the value of 1,603,670 francs.

Manufacture of Gunpowder in Italy. — Previous to the extension, in 1866, of the monopoly by the state, of the manufacture of gunpowder, there were 90 private gunpowder mills in the various provinces exempt from the monopoly, viz., 69 in Tuscany, 5 in Romagna, 12 in the Marches, and 4 in Umbria. The preparation of powder in these manufactories was carried on in the oldest method, consisting of stamping the material with pestles in wooden mortars. The quantities of powder produced at the three Government manufactories from 1864 to 1867 were as follows :—

	Metrical quintals.
In 1864	11,760
„ 1865	13,454
„ 1866	16,441
„ 1867	14,278

This gives an average annual product of 13,283 quintals of various qualities, viz., 91 quintals finest sporting powder, 173 quintals of fine sporting powder, 537 quintals common sporting powder, 2,448 war powder, 9,579 blasting powder, and 1,155 common gunpowder. The annual cost of this manufacture averages 1,742,440frs., and the average cost per quintal, during the last four years, 126frs. The wholesale prices of sporting powder vary from 4frs. to 8frs. per kil., and retail from 4·50frs. to 8·50frs. per kil.; war powder, 3frs. wholesale, and 3·30frs. retail; blasting powder, 2fs. wholesale, and 2·20frs. retail. The following are the receipts of the sale of gunpowder during four years :—

Years.	Quantity.	Receipts.	Expenses of sale.
	quintals.	frs.	frs.
1864	9,745	2,403,090	135,938
1865	8,353	2,220,933	124,515
1866	6,778	1,798,185	80,240
1867	10,790	2,784,951	140,400

Besides the quantity of powder used by the army and navy, 2,200 quintals are consumed in public works carried out by Government; half this amount is used in the mining operations of the Mont Cenis Tunnel. During the war, in 1866, 13,500 quintals of gunpowder were imported by the War Department, of the value of 2,842,850frs. A Bill has recently been passed in Parliament to abolish the royal monopoly of this manufacture after the 1st January, 1869; private manufacturers will pay a tax on their establishments in proportion to their extent, and a tax of 50 centimes per kil. on all powder manufactured.

Commerce.

Commerce of France.—Late accounts have shown that the imports from France to England are increasing rapidly, but the same is not the case as regards the rest of the world. It appears, by official returns, that while the value of imports into France during the first nine months of the year have increased in the following ratio :—

	Francs.
1866	2,070,420,000
1867	2,230,003,000
1868	2,543,501,000

the exports, on the contrary, show an inverse ratio, the values being, in—

	Francs.
1866	2,375,365,000
1867	2,089,006,000
1868	2,080,555,000

The deficit is very slight, however, as compared with 1867. The excesses and deficits are naturally not uniform on all articles; in the case of timber there is an increase of more than seven millions of francs in the imports, accompanied by a diminution of nearly three millions in the value of the exports. In the case of marble, stone, bricks, slate, and other building materials, the imports remain very nearly the same, while the exports show an increase of just a million of francs. In metals of all kinds the case is far more favourable to French manufacture, there being a diminution of twelve millions in the imports, side by side with an increase of nearly three millions in the exports. In the case of pig iron the exports have reacted considerably more than fifty per cent. of the imports, while the rails exported give a total of 204,198 francs, against a trifling import of 9,096 francs. The copper trade also progresses rapidly, the export of copper in masses, bars, and sheets amounting to more than five millions of francs, against twenty-six and a-half millions imports, while hammered and rolled copper, and copper wire, show four millions of exports, against 364,397 francs imports. As regards the whole account for timber, stone, marble, metals, &c., the returns show imports amounting to 208 millions of francs, against forty-seven and a-half millions of exports.

New Tin Mines in Siam.—Another tin district is about to be opened at the Isthmus of Kra. The immense value of the tin workings at Junk, Ceylon, or Phuket, supposed to be not less than 150,000 tons per annum, has incited a Chinese merchant to propose the active development of the Kra mines, and as tin is supposed to abound along the whole range of mountains of the Malay peninsula, there are many who believe in his success. He is to have the government of the district to enable him to carry out his designs. The river of Kra is the southern boundary between British Burmah and Siam, and it would not be surprising were the trade ultimately to flourish better on the British side of the river.

Employment of Cotton Waste as Manure.—M. Dupont-Poulet, a French cotton spinner, has for the last ten years used his cotton-waste for seed beds and early crops. He mixes it carefully with stable manure, and thus avoids, as he says, the burning and the chills which manure alone often causes. M. Dupont-Poulet's example has been followed by his neighbours, some of whom have gone beyond him; one of them had the idea of using cotton in the forcing of asparagus, that is to say, he spread a layer of cotton-waste, about eight inches thick, over one of his asparagus beds, and found that the snow when falling upon it disappeared very rapidly; he was able, without any other covering but the cotton, to gather fine, tender, well-flavoured asparagus in the midst of winter.

Pulse Oil and Cake.—An enormous trade is carried on in China in the manufacture of oil cake from one or two descriptions of pulse. The oil is used both for eating and burning, but principally for the latter purpose. The circular cakes, made from the marc or residue, are largely in demand throughout China as food for live stock and for manure. The peas are ground in a mill, and the oil is pressed out in a rude press, by means of wedges, driven under the outer parts of the framework with mallets. Steam machinery by Messrs. Platt and Co., for the establishment of a pulse cake and oil factory at Newchang, have recently been sent out, and we may shortly expect to see in full operation the novel, interesting, and, as there is every reason to hope, successful experiment of a British steam factory in Manchooria competing with the native manufacturers in the fabrication of one of the chief exports of that extensive region.

Colonies.

Farming Prospects in Victoria. — The *Australasian*, of the 10th November last, says :—" The agricultural prospects of the country are excellent; the corn crop is now fast ripening, and if the present hopes of the farmers are realised, we shall not only have bread materials enough for our home consumption but some-

thing to spare, perhaps, for other countries. The great question on which the future of Victorian agriculture mainly depends, namely—whether we can grow wheat for sale in the English market at a profit will consequently have to be decided before long. If the price of wheat in London were to keep up to 64s. a quarter, and the price of agricultural labour here to decline somewhat, as it is likely to do, our corn production might be greatly extended with advantage no less to ourselves than to our distant customers. And in some important respects we are well prepared to extend this branch of our business. There have been several agricultural shows lately, and these proved the colony to be extraordinarily rich in many of the principal requisites to agricultural success. As for the machinery exhibited, we doubt if any other new country could make such a display. The high price of hand-labour here, and the affluence of the agriculturists as a class, have combined to make our implement manufacture a very important and extensive local industry, and at the principal spring shows of the year the products of the Melbourne and Ballarat shops worked side-by-side with some of the best implements shown at the Grand Paris Exhibition without shaming their makers. Our soil and the climate are well adapted for the growing of corn for exportation, our farmers are sufficiently skilful, and our farm workmen as expert as any in the world."

Progress of Ballarat, Victoria.—The national show of agricultural stock produce implements and machinery, which was opened at Ballarat on October 22nd last, was successful beyond precedent. Rich in mineral wealth, and surrounded by one of the finest agricultural tracts of country in the colony, Ballarat is peopled by an active, energetic, and speculative community. Nowhere is the spirit of enterprise more fully developed, and nowhere are there to be found more solid evidences of prosperity, or more signs of progress, than are to be met with in the metropolis of the gold fields. Wonderful as has been the growth of Melbourne, perhaps that of Ballarat is still more surprising, regard being had to the fact that it dates from 1851 only, and, although the jealousies and rivalries of the two municipalities into which it is divided occasionally tend to lessen the success of some of the public movements undertaken in that town, yet there are times in which the inhabitants act together as one man, and communicate an impulse to anything they are bent upon helping forward which is perfectly irresistible. This seems to have been the case with the National Show, and so great was the interest felt in it, that upwards of 10,000 visited it the second day, and over £505 was received at the doors. Among the machinery and implements exhibited were several which proved the inventive genius and mechanical skill of the metal workers and ironfounders, while the live stock and dairy produce sent in excited the commendation of experienced judges, and showed to what a great extent local industry has rendered the inhabitants of Ballarat independent of external sources for the supply of articles of daily consumption, most of which were formerly imported from the other end of the world.

Paper Making in Melbourne.—Since operations were commenced at Mr. Ramsden's paper mill in May last, the manufacture has gone on continuously, no accident having occurred to interrupt the process. The hands employed at the mill have now acquired the requisite familiarity with the work in which they are engaged, and such manual dexterity as considerably lessens the cost of the manufacture. Another improvement is that the raw material is now supplied in greater abundance, new sources of supply having been discovered, such as waste hemp or tow from the adjoining rope works. Experiments have been made with native grasses and fibrous plants which have been so far successful as to show that paper can be made from them, but, hitherto, the cost of working them up has rendered them ineligible as a paper material. Another interesting fact in connection with this new industry is that several native earths have been found of value as colouring matters.

Obituary.

George Lowe* closed his long, valuable, and honourable career on Christmas-day, at his residence, in St. John's-wood-park, in the 80th year of his age. Mr. Lowe's father was a brewer, at Derby, and his son George was for some years engaged in the same occupation. His attention was at the same time directed to the illumination by coal gas, which was being rapidly developed and extended, and several articles written by him on the subject in Tilloch's *Philosophical Magazine*, which appeared about fifty years ago, showed that he had considered the subject with a clear and comprehensive mind. The knowledge he displayed of the science of gas-making seemed to fit him peculiarly for undertaking the duties of gas engineer, and in 1821 he was appointed one of the engineers of the Chartered Company, which was then beginning to make known the advantages to be derived in the metropolis from the introduction of gas-lighting. That office he continued to hold till the year 1862, when, in consideration of his long and valuable services, the directors of the company gave him a retiring pension equal to the full amount of his salary. Mr. Lowe married about three years before his engagement as engineer to the Chartered Company, and he lost his wife, to whom he was devotedly attached, in 1843. In conjunction with the late Mr. Telford and Mr. (afterwards Sir William) Cubitt, Mr. Lowe aided in the formation of the Institution of Civil Engineers, and he was for many years a member of the council of that institution. In 1835 he was elected a Fellow of the Royal Society, for which honour he was indebted to the production of Prussian blue from ammoniacal liquor and from the refuse lime liquor of gas-works, specimens of which, made by him, attracted the notice of the Duke of Sussex, who was at that time president of the society. Mr. Lowe entered actively into various fields of scientific inquiry, and was elected a Fellow of the Geological, of the Chemical, and of the Microscopical Societies, and he was also elected a corresponding member of the Franklin Institute, which was an honour he much prized, it having been conferred upon him altogether unsolicited. In addition to the responsible office of engineer of the Chartered Company, Mr. Lowe fulfilled at the same time the duties of consulting engineer of the Imperial Continental Gas Association, of the European Gas Company, of the Dublin Alliance Gas Company, and of many other gas companies at home and abroad. The activity of Mr. Lowe's mind developed itself in numerous inventions for improving the manufacture and the illuminating power of gas, of which the Patent Office contains the records. The first invention patented by Mr. Lowe was that known as his "reciprocating retort," dated October 12, 1831. In that invention long retorts were first employed. The usual charge of coal was put in at each end of the retort to half its length, so that the gas of inferior illuminating power evolved from the charge of coal first introduced might mix with the richer gas evolved from the charge introduced subsequently. The same patent comprised the introduction into the furnace of highly-heated atmospheric air, for the purpose of igniting the gases and vapours arising from the lime and ammoniacal liquors placed under the bars of the furnace, the products of which were to be conducted into condensers to produce sulphurous acid, to be afterwards applied to purifying the gas. The specification of the patent further included a means of generating hydrogen gas by passing steam through the incandescent coke withdrawn from the retorts, the gas produced being afterwards enriched by

* Quoted from the *Journal of Gas Lighting* for January 5th.

the process since called carburetting. In the next patent, dated June 9, 1832, the process of carburetting was applied to increase the illuminating power of ordinary coal gas, and with it was combined a process for the production of Prussian blue from ammoniacal liquor and from the refuse lime liquor. A third invention included in the same patent consisted in a means of collecting the tar of different degrees of specific gravity, by self-acting syphons placed at different parts of the condenser. Seven years afterwards a joint patent was obtained in the names of George Lowe and John Kirkham, which comprised five inventions. The first was a modification of Mr. Lowe's reciprocating retort applied to a combination of several retorts. The second invention was a combination of clay and iron retorts, which principle has since been extensively amplified by others. The third related to a mode of applying heat to retorts, during the first hours of distillation, by means of a blast of air into the ash-pit of the furnace. The fourth invention consisted in a mode of employing tar as fuel, by mixing breeze with the tar, which was then introduced into a retort, and the distilled products were conveyed by a pipe to the fire in the furnace. The fifth invention, specified in the same patent, consisted in setting the retorts nearly vertical, and so arranged as to be charged at the upper ends, and from time to time drawn at the lower ends. The novelty of this invention is described as consisting "in so constructing such retorts as to cause the gas evolved from the fresh charges to descend, and pass amongst the highly-heated charges, and mix with the gas evolved therefrom." In March, 1841, Mr. Lowe was again in the Patent Office, with an invention for "improved methods of supplying gas under certain circmstances, and of improving its purity and illuminating power." The specification of this patent was divided into five parts, the three first of which related to improvements in gas-meters, and included Mr. Lowe's motive-power meter, and the means of purifying gas in passing through meters by the introduction into them of alkaline solutions. The fourth part related to the purification of gas in dry purifiers, by causing the gas to pass over a series of shallow trays, containing sponge impregnated with a caustic alkaline solution. The fifth part of the invention consisted in a mode of increasing the illuminating power of coal-gas, by passing it over similar shallow trays containing sponge impregnated with naphtha. A fifth patent, dated October 8, 1846, was granted to Mr. Lowe for "improvements in the manufacture and in burning gas, and in the manufacture of fuel." In this invention blocks of dried peat were immersed in melted resin or pitch in a closed vessel, from which the air was pumped out, to form a material for making gas. It included, also, the application of revolving perforated pipes for distributing water or purifying liquor in gas-washers; and the improvements in burning gas consisted in the adjustment, by screws, of the air supplied internally and externally to the flame of an Argand burner, a button being employed internally to deflect the air on to the flame, and the conical shape of the chimney caused the current of air to be directed on the flame externally. The last appearance of Mr. Lowe's name in the records of the Patent Office is on the 20th of January, 1852, when, in conjunction with Mr. F. J. Evans, he patented an invention for the purification of gas by "anhydrous peroxide of iron," the energies of which might be renewed again and again by exposure to the atmosphere. This patent was dated four days before that of Mr. Hill's for the purification of gas by hydrated oxides. These various patented inventions for improving the manufacture of gas prove that Mr. Lowe's powers of mind were remarkably active and inventive, and that he possessed extensive knowledge of the principles on which the production and purification of gas depend. It will be seen from this cursory survey of his ingenious and well-devised plans, that many subsequent inventors and patentees have derived from Mr. Lowe not only their ideas but the methods by which they were practically applied. In addition to those inventions which he secured by letters-patent, Mr. Lowe contrived many other very useful appliances which he gave to the public, among which is the bladder-valve, that is found so useful in preventing the escape of gas during the laying of mains; and his "jet photometer" is to be found in all well-managed gas-works. It is not, however, by his inventions alone that Mr. Lowe's influence on the progress of gas-lighting is to be estimated. His sound judgment, his varied and practical scientific knowledge, rendered him an authority to be applied to in all questions of doubt; whilst his amiable disposition and courteous manners imparted additional value to his opinions and advice. We fear it will be long before the profession of gas engineering will adequately supply the place once filled by the lamented George Lowe.—He was elected a member of the Society of Arts in 1820, and for many years took an active part in the proceedings of the Society and its various committees.

Publications Issued.

The Register and Magazine of Biography. (*Nichols and Sons.*) The first number of this periodical appeared at the beginning of the month, and is intended to be continued monthly. The object of the work is to furnish a public and permanent record of births, marriages, and deaths, probates of wills, and other interesting personal and domestic events, accompanied with indices, which will afford the inquirer a ready access to whatever information of this nature he may look for. Obituary memoirs of all persons, whose position or actions may be of sufficient importance to entitle them to notice, will be given.

Spon's Dictionary of Engineering. (*E. and F. Spon.*) The first number of this work was issued at the commencement of the year, and it is to be completed in about sixty fortnightly numbers. It will comprise all matters relating to civil, mechanical, military, and naval and technical terms in French, German, Italian, and Spanish. It is very fully illustrated with numerous woodcuts.

Notes.

Working Men's Clubs at Mulhouse.—The president of the Industrial Society of Mulhouse, at its last meeting, read a long report, bearing the title "Des Cercles d'Ouvriers àpropos des Working Men's Clubs d'Angleterre." After having sketched the history and development of such clubs, the author of the paper, M. Siegfried, dwelt upon the incalculable advantages that such clubs presented as regarded the morality and education of the poorer classes, and the happy influence which they ought to have upon the relations of employers and workmen, and concluded with the hope that such clubs, having for their object the recreation, as well as the social, intellectual, and moral welfare of the working classes, might be established in France, and especially in Mulhouse. The proposition was received with unanimous approbation by the members of the society present, when the president read a letter from M. Siegfried, in which that gentleman offered to the society, in case his views should meet with approval, the sum of four thousand pounds, for the installation of such a club at Mulhouse. The offer of M. Siegfried was at once accepted, and the prefect of the department being present, promised his assistance in carrying the plan into execution. The Committee of Public Utility has been charged with the examination of M. Siegfried's memoir, and of the series of documents attached to it by way of appendices.

French Fisheries.—The statistics of the sea fisheries of France for the year 1867 have recently been published by the Marine Administration in Paris. It appears that the value of the fish taken during the year was £2,649,804, or £316,527 more than during the previous year. The augmentation is attributed principally to the abundance of sardines at certain points, and to the fact that the amount of the sales of these fish had previously been estimated at too low a rate. The cod-fishery is the most important of all the fisheries, and yielded in 1867 £586,608; the sardine fishery stands next, and represents £545,432; the value of the herrings is given at £309,480; of mackerel, £94,317; anchovies, £11,474; shell-fish figure for the sum of £142,618, in which oysters are represented by less than £40,000, and mussels more than £50,000. The small amount set down for oysters is explained by the fact that it only includes those taken from the public beds, and not the whole of the oysters consumed, of which a large part are obtained from beds in private hands. The crustaceans amount to the total sum of £72,868. During the year 1867, 17,544 French fishing boats, manned by 70,125 men were engaged in the fisheries on the coasts of France, the east coasts of England, and in the vicinity of Newfoundland and Iceland. Of these 448 boats and 11,583 men were engaged in cod-fishing.

Agricultural Invention in Russia.—Under the title of a Permanent Exhibition of Inventions and Improvements, a new section has been added to the museum of agriculture. The object of this new section is to supply those who have invented or improved agricultural machines, implements, or methods, with ready means of communication with agriculturists and the public. The machines, models, plans, or drawings are to be exhibited gratis for six months, at the expiration of which time they will be returned to the inventors or destroyed, unless they should have been purchased for the museum.

Postal Statistics of Italy.—The number of Post-offices in Italy up to the 1st January, 1868, was 2,634, including 10 railway post-offices and 2 on board steamers. In 1867 the total number of letters posted was 79,780,750 (being an increase on that of the previous year of 4,740,691), of which 72,519,427 were stamped, 6,154,805 unstamped, 992,496 registered, and 114,022 insured for the amount of 102,354,292 francs. The number of letters free of tax was 29,816,212; printed matter, 64,271,258, of which 55,731,023 were newspapers and periodicals. The number of money orders issued was 2,373,166, amounting to 126,775,051 francs. The number of money orders sent abroad was 44,225, amounting in value to 4,906,634 francs; whilst the foreign money orders paid in Italy were 56,024, amounting to 4,397,142 francs. The number of postage stamps sold was 91,012,558 for the amount of 12,435,520 francs. The greatest number of letters were posted at Florence, being 5,192,000 in all. The gross receipts of the post amounted to 15,452,430 francs, of which 13,931,827 francs were for letters and stamps, 998,064 francs for money orders, 292,971 francs for newspapers, and 55,828 francs for passengers carried by mail conveyances. Sundry receipts 173,740 francs. The expenses amounted to 16,581,832 francs.

Imperial Society of Natural Sciences, Moscow.—This society, whose object is the fitting out of scientific expeditions, the establishment of museums of natural history, and the organization of exhibitions, has just held its fifth annual meeting, and seems to have been actively employed. An expedition into Turkistan has just been arranged with the assistance of General Kaufmann and M. Henis, and three other expeditions have recently been fitted out at the expense of the society—one along the banks of the Black sea, a second to the lakes of the district of Riasan, and a third to the lake Fresta in the Moscow district. It proposes, with the aid of M. Daschkoff, an honorary member, to establish an aquarium at a cost of 30,000 roubles.

Correspondence.

Musical Pitch.—Sir,—The movement for obtaining a reform in the musical pitch of Great Britain, and for establishing a standard to be accepted by makers of musical instruments and musical societies, is acquiring new vigour. No important steps have hitherto been taken for the settlement of this question. Circumstances of late, however, have induced fresh energy into those most interested in this reform, and it is to be hoped that a speedy success may be the result of the endeavours made. At the present time the ultimate purpose appears to be not only the reduction of the musical pitch in Great Britain, and rendering it nearer to what it was some hundred years ago, when some of the most important pieces of musical composition were written, but to the fixing of a standard in England uniform to the pitch now generally adopted in foreign countries. The musical pitch in Handel's time was 419 vibrations per second to produce the note A. It is now as high as 455. This rise, therefore, although in the opinion of great musicians it is considered to give to orchestral music much greater brilliancy, places many passages for the human voice out of all possibility of execution, and causes the rendering of others difficult, at the same time straining the voice of the singer in an unusual manner. The Sacred Harmonic Society, the one society in London who should thoroughly give proof of their high appreciation of what is now somewhat scarce, namely, a good tenor voice, are foremost in upholding a very high musical pitch. The resignation of Mr. Sims Reeves from the staff of artistes is at once a practical proof that, in the opinion of the best tenor singer, the musical pitch at present is too high. It can hardly be allowed by any one, even the most ignorant, that the human voice is to be subservient to the manufactured musical instrument. Still, from existing facts, it appears that such an admission is made by persons regarded as the great musical *cognoscenti* of Great Britain. Unfortunately for the English nation, all musical matters have to be settled as best they may be by those most interested. In foreign countries having musical conservatoires supported and conducted by the State, in order to obtain a reform of a palpable musical error, it is but necessary to send in a well-supported representation of a mistake about which there can be no doubt, and the probability is that it is at once inquired into and rectified. In the absence, however, of such an advantageous system, the best means that can be devised for producing a reform in the musical pitch of Great Britain, and rendering it uniform with that which most foreign countries have adopted, is to influence the most prominent musical societies to adopt in their own orchestras a musical pitch, which shall be more convenient to vocalists than the present one, and which shall correspond to the one adopted as the standard in Paris, Berlin, Vienna, &c., and by this means set an example which minor musical bodies must follow eventually. The six concerts to be given by Messrs. Novello and Co., at St. James's Hall, will be a good inauguration of the commencement of musical pitch reform. The oratorios are to be performed according to the musical pitch of France, and Mr. Sims Reeves will thus, doubtless, with greater facility and less fatigue than heretofore, enable the public to hear him render Handel's sacred tenor solos with even better effect than that to which they have been accustomed at Exeter Hall. That an attempt has been already made by the Society of Arts, as far back as 1860, to reform musical pitch, must not be ignored. Then, however, the result of the deliberations was the recommendation, by a large and influential meeting of the musical profession and amateurs, of a pitch of 528 vibrations for C, and Messrs. Cramer and Co. undertook the manufacture and sale of a tuning-fork of this pitch, which, however, has not hitherto been largely adopted. This is, perhaps, fortunate, as, in my opinion, the object now to be attained

appears to be the establishment of a pitch corresponding to the one fixed upon by France and Germany generally.—I am, &c., A. S. C.

MEETINGS FOR THE ENSUING WEEK.

Mon.....Geographical, 8½. 1. Dr. G. Bidie, "Effects on Climate of Forest Destruction in Coorg, Southern India." 2. Capt. Vine Hall, "Description of the Island of Rapa."
Entomological, 7. Annual Meeting.
Actuaries, 7. The President, "On the Mortality Experience of Life Assurance Companies collected by the Institute of Actuaries."
Medical, 8.
London Inst., 6.

Tues ...Royal Inst., 3. Mr. Westmacott, "Fine Art."
Civil Engineers, 8. 1. Mr. Henry Hooper, "On New Ferry and New Brighton Piers." 2. Mr. James R. Mosse, "The Mauritius Railway: Midland Line."
Ethnological, 8. Mr. Hyde Clarke, "On the Proto-Ethnic Condition of Asia Minor, the Chalybes, Idæi Dactyli, &c., and their Relations with the Mythology of Ionia."

Wed ...Society of Arts, 8. Mr. Wm. Dean, "Xylography, or Printing and Graining from the Natural Surfaces of Woods."
Geological, 8. 1. Mr. W. H. Baily, "Notes on Graptolites and allied Fossils occurring in Ireland." 2. Mr. W. H. Baily, "Notice of Plant-remains from the county of Antrim." 3. Mr. G. T. Clark, "On Basalt Dykes on the Mainland of India, opposite the Islands of Salsette and Bombay." 4. Dr. Sutherland, "On Auriferous Rocks in South-eastern Africa."
Archæological Assoc., 8.

Thur ...Royal Inst., 3. Prof. Rupert Jones, "Protozoa."
Royal, 8½.
Antiquaries, 8½.
London Inst., 6.
Zoological, 8½.
Philosophical Club, 6.
Artists and Amateurs, 8.
Society of Fine Arts, 8. Mr. Hurlstone, "On the Don Quixote of Cervantes."

Fri .....Royal Inst., 8. Mr. Ruskin, "Flamboyant Architecture of the Somme Valley."

Sat .....Royal Inst., 3. Prof. Odling, "Hydrogen and its Analogues."

Patents.

From Commissioners of Patents' Journal, January 15.

Grants of Provisional Protection.

Air pumps—3982—A. Barclay.
Animal and vegetable substances, preserving—9—F. Perry.
Boilers—6—T. Green.
Bon-bons—43—A. Tyler.
Bookbinding—16—J. G. Tongue.
Boots and shoes—2800—B. D. Godfrey.
Calendars—3696—J. S. Capelle.
Candlesticks—15—A. Carter and C. R. E. Grubb.
Casks—3947—J. Eldridge and J. Smith.
Casks, &c.—7—T. Green, W. Burrows, and R. Turner.
Circular-saw benches—3650—A. Ransome.
Corn, &c., elevating on to stacks—3951—H. Yorath.
Cotton, &c., machinery for manufacturing—3972—P. and R. Gornall.
Electric telegraphy—3932—J. H. Johnson.
Elevators—3966—J. and A. Hutcheson.
Eyelets—3628—A. N. Burton.
Fabrics, manufacturing in lace machinery—3654—W. Brookes.
Fabrics, producing devices on—3—S. Lyons.
Fabrics, tipping pile—3915—B. Norton.
Fabrics, &c., compound for sizing and dressing—3602—A. M. Clark.
Fabrics, &c., preparing impermeable paper for manufacturing—3970—C. Monestier and I. Bang.
Fibrous materials, combing—10—M. Henry.
Fire-arms—14—W. G. Rawbone.
Fire-arms, breech-loading—36—S. Remington.
Fire-arms, &c., breech-loading—3981—F. A. K. W. von Oppen.
Fire-arms, &c., revolving—3987—W. E. Newton.
Fuel economisers—3749—R. Needham.
Gas-fittings—3975—J. Gedge.
Gum lac, operating upon—3967—T. F. Henley.
Hair ropes, untwisting and separating the fibres of—3980—W. R. Lake.
Hats—3990—J. Seelig.
Horses, knee caps for—3047—R. Ramsay.
Horses, &c., clipping—5—G. Smith.
Horses, &c., shoes for—21—J. McKenny.
Iron and steel—3983—B. Samuelson.
Iron and steel—18—H. A. Bonneville.
Kilns for burning bricks, &c.—13—A. Batchelar.
Lathes, &c., gearing for—1—J. Heap.
Legs, artificial—3913—H. H. Bigg.
Linen, &c., plaiting, &c.—38—J. Stevens.
Madder root, extracting the colouring matter of—3959—G. T. Bousfield.
Mechanical telegraphs—40—J. S. Gisborne.
Mineral teeth—3652—H. A. Bonneville.
Oils, &c., purifying and bleaching—26—W. Prosser.
Ordnance—3797—W. J. Murphy.
Ores, &c., separating—3971—G. Davies.
Paddle wheels—25—S. Bateman.
Paper-making machinery, &c., conducting paper from—3905—G. Tidcombe, jun.
Plants, &c., treating—44—W. Pidding.
Puddling furnaces—4—W. M. Williams.
Purses, &c., fastenings for—17—M. Wolfsky.
Racks, self-acting—3835—J. T. Hall, G. Critchley, and H. B. Fox.
Railway buffers—3989—T. Gibson.
Railways and street tramways—3977—C. de Bergue.
Railways, fixing the rails of—3646—W. MacLellan.
Reaping machines—3790—R. Norfolk.
Rotary fans—27—E. W. and J. Voce.
Scales—3957—J. Gillman.
Screwing and tapping machinery—3963—J. Laurie and J. Whittaker.
Sewing machines—3969—W. Winter.
Sewing machines, &c.—31—J. H. Johnson.
Show cards, &c.—8—B. G. George.
Silk, &c., winding—3726—A. M. Clark.
Slabs, &c., manufacturing decorative, &c.—41—E. Robbins.
Smoke, consuming—33—G. Smith.
Spanners and wrenchers—3760—W. Gray and T. Biggin.
Spinning machines—3979—W. R. Lake.
Steam engines—35—W. Dawes.
Stone, &c., engraving letters, &c., on—3953—J. A. A. Landa.
Sulphuric acid—42—K. Walter.
Taps and valves—12—S. Smithson, G. Senior, and J. Inman.
Tatting shuttles—3991—C. Shales.
Tobacco pouches—3949—A. S. Harington.
Travelling bags, &c.—3955—I. Pick.
Valves or cocks—20—S. J. Peet.
Vapours, &c., apparatus for inhaling—30—J. Balbirnie.
Velocipedes—11—J. H. Johnson.
Ventilating apparatus—3974—E. T. Noualhier.
Vessels, propelling—3988—R. Griffiths.
Washing machines—3986—H. E. Newton.
White lead—22—J. Major, H. Trigg, and W. Wright.
Wool, &c., paper tubes employed in spinning—3968—J. H. Johnson.
Wrenches—3985—G. M. Wells.
Xyloidine, compounds containing—3984—D. Spill.
Yarn, preparing—2—T. Singleton.

Patents Sealed.

2238. T. Shackleton and H. W. Ripley.
2243. W. R. Lake.
2244. W. R. Lake.
2248. E. Funnell.
2257. S. Deacon.
2263. C. G. Johnson.
2265. J. Thomas.
2266. W. Berry.
2270. H. B. Barlow.
2279. R. Brett and G. Daniels.
2281. C. Hodgson.
2299. W. T. Hamilton.
2301. W. T. Hamilton.
2303. S. H. Hadley.
2372. J. Simpson.
2420. J. E. Outridge.
2427. G. Wilson.
2434. G. T. Bousfield.
2735. S. Sharrock.
2948. G. Ritchie.
3292. T. Mordue.

From Commissioners of Patents' Journal, January 19.

Patents Sealed.

2271. T. W. Gray.
2272. W. Winter.
2273. W. J. Cunningham.
2276. C. P. Wilcox.
2278. L. Rose.
2284. C. Weekes.
2287. T. Deschamps.
2293. T. Gibb.
2294. G. Martin.
2306. T. F., J., C. H., & E. Firth.
2308. F. H. Hambleton.
2318. M. T. Shaw & T. H. Head.
2322. J. S. Bromhead and J. Whitmel.
2332. W. E. Gedge.
2334. J. H. Johnson.
2353. C. J. Laurendeau.
2393. J. Duguid, jun.
2453. A. V. Newton.
2456. H. Churchman.
2471. B. Hunt.
2497. A. V. Newton.
2506. J. H. Johnson.
2526. G. A. Buchholz.
2528. W. E. Newton.
2536. H. Steffanson & J. Hadley.
2849. F. F. Greenwood.
2872. W. Clissold.
3007. G. T. Bousfield.
3255. E. Wimbridge.
3278. W. Mort.
3331. S. Ault.
3396. W. Manwaring.
3475. H. A. Bonneville.
3483. J. Hare.

Patents on which the Stamp Duty of £50 has been paid.

108. J. M. Napier.
168. G. Spencer.
186. G. T. Bousfield.
202. W. Jeffries.
210. J. Stringer and G. Birch.
138. D. F. Lecocq.
140. C. H. Roeckner.
148. R. Cherry, E. Crossley, and W. Bower.
155. C. J. Crondace & J. Field.
169. W. Hibbert.
172. W. Sumner.
209. G. B. Woodruff.
226. J. Howard & E. T. Bousfield.

Patent on which the Stamp Duty of £100 has been Paid.

140. W. S. Mappin.

Journal of the Society of Arts.

FRIDAY, JANUARY 29, 1869.

Announcements by the Council.

Ordinary Meetings.

Wednesday Evenings at eight o'clock :—

February 3.—"On the Useful Application of Waste Products and Undeveloped Substances." By P. L. Simmonds, Esq.

February 10.—

February 17.—"On the Efficiency and Economy of a National Army in Connection with the Industry and Education of the People." By Henry Cole, Esq., C.B. On this evening the Right Hon. T. Milner Gibson will take the chair.

Cantor Lectures.

The Second Course of Cantor Lectures for the present Session will be "On Painting," by S. A. Hart, Esq., R.A., late Professor of Painting at the Royal Academy, and will consist of Four Lectures, to be delivered as follows :—

Lecture I.—Monday, February 1st.

On the History of Portrait Painting.

Lecture II.—Monday, February 8th.

On the Practice of Portrait Painting.

Lecture III.—Monday, February 15th.

On the Suggestions offered by surrounding circumstances to the Artist.

Lecture IV.—Monday, February 22nd.

On Landscape Painting.

Each lecture will begin at eight o'clock. These Lectures are open to Members, each of whom has the privilege of introducing two friends to each Lecture. Tickets for this purpose were forwarded with last week's *Journal.*

FINAL EXAMINATIONS, 1869.

In order to avoid holding these Examinations on the same evenings as those of the Department of Science and Art, it has been decided to hold them, in 1869, on the evenings of

TUESDAY,	**the 20th**	**APRIL,**
WEDNESDAY,	**the 21st**	,,
THURSDAY,	**the 22nd**	,,
FRIDAY,	**the 23rd**	,,

From 7 p.m. to 10 p.m., instead of on the 27th, 28th, 29th, and 30th April, as announced in the Programme of Examinations for 1869.

In consequence of this alteration the Previous Examinations must be held earlier, and the Forms No. 2 and No. 4, referred to in par. 6 of the Programme, must of course be sent in a week earlier than the dates there fixed for receiving them.

It is very important that this alteration should be made as public as possible. For this purpose a number of small slips, to be inserted between pages 8 and 9 of every Programme sent out, have been forwarded to each Institution and Local Board. Large bills, to be suspended on the walls of the Institution reading-room, or in some other public place, will also be sent on application.

In reference to the subjects referred to in the notice at page 9 of the Programme, a sufficient number of applications from candidates in Conic Sections have already been received. A paper will therefore be set in that subject.

Candidates desiring to be examined in Navigation and Nautical Astronomy, Mining and Metallurgy, and Italian, should communicate their wishes without delay.

Elementary Examinations, 1869.

Secretaries of District Unions and Local Boards desiring to adopt the Society's scheme of Elementary Examinations, are reminded that they must apply to the Secretary of the Society of Arts before the 10th of February, stating the number of male and female Candidates respectively desiring to be examined in each grade.

Committee on India.

The Council have resolved that a Committee be formed "to organize meetings for the discussion of subjects connected with the Arts, Manufactures, and Commerce of our Indian Empire."

The following gentlemen have been already invited to serve on this Committee:—

Archibald Campbell.
George Campbell.
Edwin Chadwick, C.B., Member of Council of Society of Arts.
Hyde Clarke, Member of Council of Society of Arts.
Sir Daniel Cooper, Bart., Member of Council of Society of Arts.
Sir William Denison.
Maj.-Gen. Sir Vincent Eyre, C.B., Member of Council of Society of Arts.
C. H. Fielder.
W. S. Fitzwilliam.
George Moffatt.
Sir Robert Montgomery, K.C.B., Vice-President of the Society of Arts.
Colonel Sykes, M.P.
Captain Edward Thackeray.
Sir Charles Trevelyan, K.C.B.
Dr. J. Forbes Watson.

In addition to these gentlemen, the East India Association has been requested to nominate three of its members to join the Committee.

The Secretary of the Society of Arts will be glad to receive the names of any members of the Society taking an interest in Indian questions, in order that they may be invited to attend the meetings above referred to.

Subscriptions.

The Christmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Eighth Ordinary Meeting.

Wednesday, January 27th, 1869; George Godwin, Esq., F.R.S., in the chair.

The following candidates were proposed for election as members of the Society:—

Cow, Peter B., jun., Streatham-common, S.W.
Firbank, Ralph, 4, Rockhall-terrace, Cricklewood, N.W.

The following candidates were balloted for, and duly elected members of the Society:—

Bate, John, 16, Northumberland-street, Strand, W.C.
Falcke, Philip, 23, Bedford-square, W.C.
Learmonth, Dr., Clapham-park, S.W.
Smith, Frederick, 23, York-street, Lambeth, S.E.

The Paper read was—

ON XYLOGRAPHY, OR PRINTING AND GRAINING FROM THE NATURAL SURFACES OF WOODS.

By William Dean, Esq., Sen.

The subject which it is my privilege to bring under the notice of your Society this evening, is a process for taking impressions from the grain of wood, and transferring those impressions on to other surfaces, and has been called "nature printing."

Before entering on a description of this process, will you pardon me for making a few remarks of a somewhat personal character. This I should not have presumed to do, but, in submitting my specimens to Mr. Foster, your excellent and courteous secretary, in the conversation which followed, some of the incidents which I am about to refer to were mentioned, and he suggested that I should refer to them in my paper, feeling assured that you would be gratified to hear them, connected as they are with the operations of two such eminent men as the late Mr. Herbert Minton, the distinguished potter and encaustic tile manufacturer, and the late Mr. Charles Hullmandel, the father of lithography in this country. The facts will, I think, be all the more acceptable to you, inasmuch as they have never yet been made public.

I think it was about the year 1833 when the late Mr. Minton added to his other large operations that of making encaustic tiles. From the first it was felt that pattern sheets of the tiles—which in those days were all of one size, six inches square—would have to be printed, to send to architects and others, for the purpose of illustration. These were printed from wood blocks, the size of the tiles, and were engraved, I believe, by Mr. Barr, of Birmingham. They were printed on buff paper, which represented the groundwork of the tiles, in red and black, which represented the ornament, these being the only colours then in use. The practical inconvenience of patterns of this size will be obvious, and so it was felt at the manufactory, and Mr. Minton decided to reduce the size of the patterns, and to have them printed from stone, under his own superintendence. But at that point he met with this difficulty, there was not a lithographer in the county. With his accustomed energy and promptness, he determined that he would have a lithographic press in his own town; and, in the arrangements which were made to carry out that decision, it so happened that I was selected to go to London, to learn the lithographic printing, and, early in 1835, I entered the establishment of Mr. Hullmandel, of Great Marlborough-street, as a pupil. After a residence of some months in London, I returned to Staffordshire and commenced operations. In working out these pattern sheets for Mr. Minton, I received valuable aid from Mr. Hullmandel, and I remember well, when Mr. Minton introduced the deep blue on buff ground on the tiles, the difficulties I had to contend with in printing blue on buff paper, for as you are all aware, no doubt, the result was buff and green, and not buff and blue. Trials almost without end were made. I was greatly perplexed, and Mr. Minton became very impatient, for it so happened that he was engaged in getting up a design for the floor of a church for the Marchioness of Lothian, in which tiles with a blue ornament on a buff ground were introduced, and we were within three days of the date when the design had to be forwarded. In a state almost of desperation, and while casting about for help, in a happy moment I thought of Mr. Hullmandel, and decided to write to him by that night's post, in the hope that he might possibly help me through the difficulty. The return post from London was due on the day the design had to be forwarded; the morning came, and with it a letter from Mr. Hullmandel. It was very brief, but very characteristic of the man, and was as follows:—

"Dear Sir,—Print in varnish, and dust with dry colour. "Yours truly,
"C. Hullmandel."

I need scarcely say that the design was forwarded in time, greatly to the delight of Mr. Minton. To some present this may seem strange enough, but it must be borne in mind that, at the time I am speaking of, chromolithography was not introduced, but, even then, lithographers in London, and some in the country, were steadily working in that direction, and you all know what wonderful results have since been achieved.

During my pupilage with Mr. Hullmandel, in a conversation I had with him on the Staffordshire Potteries, he remarked that he thought it possible to decorate earthenware by impressions taken from stone instead of from copper. I arranged for the requisite materials, and he prepared for a series of experiments. For about two months he bent the energy of his great mind to the task; package after package of biscuit earthenware was forwarded from Stoke-upon-Trent, decorated, sent back, glazed, fired, and returned to town, each package more successful than the preceding one. When the last package arrived, Mr. Hullmandel sent for me into his private office, where the articles were spread out, and he inquired what I thought of them. I told him I considered them very successful. "Yes," said he, "in one sense they are;" and he added, "but in all these processes there are two questions to be answered: the first is—Have we succeeded? That can be answered in the affirmative. The second is—Will it supersede the present method? The answer to that is, No. So you perceive that the process breaks down commercially." Thanking me for the help I had given him, he said, "As far as I am concerned, nothing more will be heard of it." Some four years later, Mr. Ducote took out a patent for the same process. He spent probably not less than two years in the Potteries, making experiments, and, after a great expenditure of time and money, it broke down, precisely as Mr. Hullmandel had predicted. Some two or three years subsequently to this period, Mr. Hullmandel took out a patent in connection with the manufactures of the Potteries, of an entirely different character, and two of the largest houses in the district were licensed to use it; that failed, but in my judgment not on its merits, but from causes which have wrought ruin to many an inventor—want of a fair trial. But here I must forbear. I may, however, remark, in closing these observations, I feel that, in my own case, the old points—quality and cost—will have to be fully

looked at, and frankly dealt with, and I would fain hope that the result of the investigation may be alike satisfactory to myself and my audience.

Apologising for detaining you so long from the consideration of the questions which have more immediately brought us together, I proceed to remark that, in showing my own patented process in different places, I have often heard it observed, "How very remarkable it is that this has never before been discovered," and indeed in that light I myself regard it, especially when I reflect on the fact that pieces of oak, such as I now hold in my hand, called by letter-press printers "reglet," have been in use by them for, I should say, at least a century, and probably for a much longer period, and that there never occurred to the thousands of masters and workmen, who, during that period, must have seen imprinted the veining of those reglets, the idea of turning the fact to practical account, and giving to it a commercial value. Yet such appears to be the case.

Before I enter on a detailed description of the process, I will glance at the range of the process, and point out those branches of industry to which it is specially applicable. These are as follows:—for transferring impressions from wood to plain deal, or to painted surfaces, either flat or moulded, in buildings of all descriptions, where an accurate transcript of the more costly woods is desired, and for house and bedroom furniture generally; for japanned goods, made in metal or papier maché; for enamelled parqueterie tiles, and for articles in earthenware, such as garden seats, oyster and flower tubs, spirit casks, flower-pots, tea-urn stands, &c.; for enamelled slate, for paperhangings, and for oil cloths.

Having thus briefly indicated the nature of the process, and the range of its application, I proceed to state the methods by which these results are arrived at. Select a piece of wood of fine quality about five feet long, twelve inches wide, and a quarter of an inch thick; it is, to use the technical phrase, cleaned up by the cabinet-maker on both sides, and is well sand-papered down. By having both sides of the board cleaned up, two patterns are obtained from the same board. A chemical preparation is then applied to it, which has the effect of opening the pores of the wood, and, at the same time, of hardening the surface, and, when the board is thoroughly dry, it is ready for use, and is, in fact, a wood-plate, "not graven by art or man's device," but by the Great Designer and Architect of the Universe, whose works, the most stupendous as well as the most minute, are all perfect. The material used for taking the impression is prepared in oil, and is specially adapted for the purposes of transferring. The paper, too, is manufactured for the purpose, is very thin but tough, so that it can be successfully applied to any irregular or moulded surfaces, and it is sized to prevent the colour from becoming incorporated with the body of the paper. A small wood roller is used for spreading the colour on the board, and a large, broad, flexible palette-knife is used for taking the superfluous colour off. That being done, the sized paper is placed on the board, and both are passed through a small machine having turned-iron cylinders, the upper one being covered with double-milled flannel; the paper is then taken off the board, its printed surface is applied to the article to be decorated, the back of the impression is lightly rubbed with a piece of soft flannel, the paper is removed, and an exact *fac-simile* of the board from which the impression is taken is given. But that is not all, for a second and a third transfer are frequently obtained from the same piece of paper, and sometimes a fourth, a fifth, and a sixth. This is one of the remarkable features of the process, and, as you will not fail to perceive, must have a very marked influence on the rapidity of its application, and, consequently, on its cheapness. The thought may occur to the minds of some present, "but in taking off the impressions does not the board get foul, and the pores of the wood clogged up?" The thought is a natural one. My answer is, that with the colour properly prepared, and adapted for its purpose it does not, any more than does the plate of the copper and steel plate printer; but such a result would occur in both cases if the material used was not suitable for its purpose. When a board has been used it is treated as all other plates are, a cheap material is used for dissolving the printing colour, a handful of fine sawdust is then rubbed over it, which most effectually draws out of the pores of the wood the dissolved colour, and leaves the board clean, and ready for further use when required. Another question may arise in some minds, "but what about the durability of the boards?" The answer to that question may, at first sight, appear startling, but I am satisfied it is correct. The fact is that, under the same conditions, provided no accident happen to it, the board will be far more durable than either the copper or steel plate. I have arrived at that conclusion, not only from close observation, but from actual experience, for it is a fact that there are boards at Messrs. Thomas Simmons and Son's, Manchester, at Messrs. Minton and Co.'s, Stoke-upon-Trent, and at the carriage works of the North Staffordshire Railway Company, which have been in something like regular use for nearly three years, and my conviction is that they are in as good a working state at the present time as they were the day they were first used. Nay, more; I believe that some boards, with careful and constant use, improve rather than deteriorate.

There is one other point I will allude to before passing to the other important branch of the subject, and that is with respect to variety of pattern. That question has sometimes met me in a very blunt form. I have been told that there would be either great sameness in the work, or I must take a timber-yard with me. My answer to this is, not necessarily either the one or the other. For example, I take a board of the size already named (5ft. long and 12in. wide), this I use on both sides, and from one such board I obtain 10ft. superficial variety of pattern, and in applying the impressions it does not follow that they should all be applied precisely in the same way; so that half-a-dozen boards of the size named would give 60ft. superficial of variety of pattern, and that variety would be trebled by judicious application, and would give ample variety for the largest room in a nobleman's mansion. But there is no necessity to limit the number, if greater variety is desired, the boards being cheap enough, only costing about half a-crown each.

The second division of the subject, and the one to which I shall now direct your attention, is the important one of quality and cost. In dealing with them, instead of giving my own opinion, I shall give that of others—persons of refinement and taste, and of large practical experience. Of the quality of the work you will be able to judge from the specimens it is my privilege to submit to you; and this, perhaps, may be a fitting time to make the statement, that I have had specimens at three industrial exhibitions; at two of them I was specially requested to meet the adjudicators of the prizes to explain the process to them, so as to enable them to form an opinion as to whether the patent possessed any commercial value, and in all three cases I was awarded either a prize or a certificate of merit.

I have taken considerable pains to bring my specimens and process under the notice of architects, both in London and in the provinces; in some cases an audience has been denied me, by some I have been told plainly enough that they hate all imitations, but by others I have met with a very courteous and, sometimes, a flattering reception. I will content myself with giving three illustrations in connection with architects; one of a large building firm in your own city, and two of practical grainers of eminence, one in London and the other in Manchester.

Messrs. Thomas Simmons and Son, builders and decorators, of Manchester, were among the first to adopt

my process, and, after three years' experience of its practical value, have arranged with me for an exclusive license for the city of Manchester and Salford. Shortly after they introduced it they were employed to erect a mansion for a gentleman who had seen my specimens, and who wished to have the graining done by this process. The architect objected to it, but the proprietor persisted and carried the point. When the mansion was completed, the architect, the proprietor, the builder, and the patentee met to look over the work. After the inspection, I took the architect to the entrance-hall, to a point where the imitation was worked up to the solid oak, and where we had a good view of both; and, while looking at the work from that point, I asked the architect whether he thought there was more than one person in a hundred who would be able to say where the solid ended and the imitation commenced. He replied very frankly that he thought there was not. I replied, that being so, I thought my process ought to have fair play, and it ought not summarily to be put out of court. He said he quite agreed with me, and that it had worked out much better than he thought it would do. You will readily imagine that I was perfectly satisfied with the result. I had fought the battle of imitation and won. The next illustration I shall cite took place in one of our largest provincial towns. The architect has attained to considerable eminence in his profession, and the case afforded me some amusement. After a careful examination of my specimens, and listening to what I had to say in their favour, he called his chief assistant, and pointing to the specimens, asked him what he thought those were. He replied very promptly and emphatically, "I suppose, sir, you will call them shams." His reply was, "No I shall not, these are not shams, they are a transcript from the wood itself, and, therefore, must be both true and natural." Before we separated, he thanked me for bringing the subject under his notice. The last professional illustration has reference to Mr. Robson, the Corporation Architect, of Liverpool. In that town new public offices have been erected, and about two years ago the question arose as to what material and design should be adopted for decorating the dados in the corridors and staircases. After mature deliberation, and having had several specimens put in position, Mr. Robson decided to apply the enamelled parqueterie tiles manufactured by Messrs. Minton and Company, as licensees under my patent. When the work was finished, Mr. Robson expressed his opinion that the parqueterie tiles had worked out very much to his satisfaction.

The building firm whose opinion of the quality of my specimens I shall now have the pleasure to quote, is among the most famous in your city; I allude to the builders of the new Foreign Offices, Messrs. George Smith and Co., of South-street. Judging from the solid oak work inside that building, I may safely say, that if any persons in the kingdom are competent judges of quality of work, they are; and I esteem the opinion expressed by Mr. Taylor, of that firm, of the utmost value to me. While Mr. Taylor was examining my specimens, Mr. Smith, jun., of that firm, came into his office. Mr. Taylor, after directing his attention to them, remarked, "This is what we are got to now; we cannot tell the solid from the imitation of it. I think I know as much about wainscoating as most men, and I defy any man to tell these specimens from solid wood." It is gratifying to me to be able to give two illustrations of practical grainers, inasmuch as that class is the most sensitive on the subject. The first is that of Mr. Mannooch, a name well known in London to the trade, and any opinion of his on the subject of graining, I am happy to know, is received with great respect. In showing my specimens to him, he remarked that he should like to see the process applied; and, as he was erecting a house at St. John's-wood, it was arranged that I should grain the drawing-room oak. The question of price per yard was left to him. When the work was completed and varnished, he told me he should pay me 2s. per yard for it—which was double what I expected; that if he had known of it 30 years ago, he could have made a fortune out of it; and that I might with pleasure use him as my London referee. The other illustration is that of Mr. Bardsley, of Manchester—perhaps as good a grainer as is to be found out of London. I showed the process in Manchester to four gentlemen, of whom Mr. Bardsley was one. The article decorated was a piece of furniture. When I had finished, Mr. Bardsley said that I had done as much work in ten minutes as he could do in a day, to do it of the same quality. One of the other gentlemen replied, "Mr. Bardsley, you could not do it of the same quality as that if you did take a day to do it." Mr. Bardsley smilingly said, "Well, perhaps I could not;" and added, "the simplicity of the process has taken me more by surprise than the quality of the work."

It would be easy to multiply illustrations, but I fear that I have already trespassed at too great length on your patience, and I must hasten on to deal with the question of cost, although you will not have failed to perceive that my last illustration touches both quality and cost.

I shall deal with the question of cost as I have dealt with the question of quality, and point out what has been done under the patent in a given time. I may, however, remark here that there are plenty of painters, in London and the country, who say that they can get graining done at 5d. and 6d. per yard. I do not deny the statement, for I heard one gentleman say that the men who did his graining got through a great deal of work, for they did it with whitewash brushes, and, for aught he knew (or perhaps cared), it answered as well as if it were more costly. There are others, however, who are candid enough to admit that, for good oak-graining, they have often to pay 2s. and 2s. 6d. per yard. Among the latter I have pleasure in mentioning Mr. Foxley, of London. I have it on the authority of Mr. Crossley, of Newark, that he paid to a London grainer £50 for graining 50 doors for him, in a house he was decorating in the metropolis for, I believe, a Nottinghamshire gentleman; but Mr. Crossley declined to affirm that the hand-graining he paid so high a price for was equal in quality to my specimens.

A painter in Burslem was anxious to see some work done by the process in his own house; a man and boy were sent over to do some, and they grained two six-panelled doors in twenty minutes by the clock. The wife of the painter told me she watched the clock with the special object of ascertaining how long it took to do them. The same man and boy grained an octagon pulpit for another painter, about three miles from Burslem, in an hour and twenty minutes. Both these painters purchased licenses. When Messrs. Simmons and Son, of Manchester, purchased a second machine, I gave one of their men instructions in working the process, and, after three days' practice, I asked him about the quantity of work he could do as compared with hand graining, and he informed me that he was quite sure he could do one-third more than by hand, and much more easily and pleasantly to himself. At the North Staffordshire Railway Company's works, when giving instruction to their foreman, I myself grained ten square yards of imitation East India teak in two hours by the watch, and this was done in the same compartments with solid teak, and had to match it. I had a young man to assist me, such as the hand grainer has to rub his colour in for him.

Perhaps, after all, the most conclusive illustration of success in price is supplied by its application to japanned goods. You are all probably aware that the graining on that class of goods is of the commonest kind. In Wolverhampton, I was told by the leading manufacturers that successful competition in price with hand graining on their goods was out of the question. From that conclusion, however, I dissented, and I told them

so. From Wolverhampton I went to Birmingham. There I met a gentleman from London, unconnected with the japanning trade, who bought the exclusive licence for that class of goods as a speculation, and he re-sold it in less than a week to Messrs. Hopkins and Sons, of Granville-street, for a price which left him a very handsome profit. I need not hesitate to affirm that if the process will compete successfully in price with hand graining on japanned goods, it will compete in price with any class of goods; and Messrs. Hopkins and Sons would not have given the price they did for an exclusive license if they had not satisfied themselves on that point. Fourteen months ago I supplied them with one machine and set them to work, and in about six months after they wrote to me to forward them two more machines.

The question of durability has been raised, and properly so, as that is a point of great importance to the public. To enable you to judge, I may say that the hand-grainer works in distemper, I in oil colours, and it resolves itself into the old question, which is the more durable, water colours, or oil colours? After all, the test of experience is the most conclusive and satisfactory; and here again I must refer to my specimens, as the large one has been done more than three years, and has had a good deal of knocking about at exhibitions, and travelling through the country. If a good sound varnish is used I have no hesitation in saying that the work will be very durable, and much more so than work done by hand.

In applying the subject to the exigencies of our condition as a commercial country, shall I be far from the truth if I hazard the remark that in this department of our operations there is great room for improvement? I am supported in this view by what occurred in a conversation I had with an architect in the provinces. Substantially, it was as follows:—I said to him, "The painters and decorators tell me that graining is going out; that architects will not have it, and are either staining the plain deal, or using parti-colours instead in their decorations." He replied, "To some extent that is true, and the chief reason is, not so much that they object to graining in the abstract, as that they object to the kind of graining they have done for them. They would only be too delighted to have it done as good as your samples, for these are beautiful and true to nature." Now, God has implanted in the human mind a love of the beautiful and the true; hence the merchant hastens away, and, amid the beauties of nature, forgets for the time the cares and anxieties of the counting-house and the exchange, and the artisan the toils of the workshop; each rejoices in beholding the loveliness of the landscape, and contemplates with delight the gorgeous and varied verdure of the trees, but how few there are who reflect and ponder on the marvellous internal structure of those trees which grow in our woods and hedgerows, so full of elaborate ornament, feathered, flowered, striated, and dotted, in patterns of perfect, and sometimes of complex beauty, to an extent that no graving done with the graver's tool can equal in gracefulness of design or in strength and delicacy of touch. Hitherto these patterns of wondrous beauty have been imitated by the cunning hand of man with his pencil or his graver; but this process will inaugurate a new era, and these exquisitely beautiful patterns will be re-produced in almost endless variety. The letter-press printer re-produces old and scarce books, and the chromo-lithographer re-produces rare and costly pictures, and this at a price that places them within the reach and means of the general public. So this process is designed to make accessible to the community in general copies of the more than artistic beauties of a part, though it be but a small part, of the glorious works of God. I flatter myself that I can, even at this early stage of the process, produce as fine a copy of a choice piece of Baltic billet oak, as the chromo-lithographer can produce of Stanfield's "Venice," Turner's "Polyphemus," or any other fine work of Art.

In conclusion, will you permit me to say that in dealing with the subject under consideration, I have, to a large extent, kept my own opinion of its merits in abeyance; I have asserted little with respect to it, feeling that any statements of mine in that direction would be considered as *ex-parte*, but I have deemed it the more prudent, as it must be the more satisfactory course to you, to let my specimens speak for me, and then to give you the opinions of others with respect to the process, and those not of partisans or friends, but mainly of persons whose first feelings in regard to it were not favourable, but whose views were entirely changed when they saw it worked out. I have told you not so much what can be done by it, as what has been done, and it still holds true that "what has been done can be done again." It is no mere theory that I have brought under your notice, but a process which has for the last four years been subjected to the sharp and searching test of experience, and such is the confidence Messrs. Simmons and Son have in its quality and capabilities, after three years' experience, that they have authorised me to say that they are open to undertake contracts for this class of work in any part of the kingdom, not excepting London, and so great is the interest they take in its success, that nothing but the sternest necessity has prevented Mr. William Simmons from being present this evening. A better testimony to its practical value it would be difficult for me to give you. To that firm I have great pleasure in thus publicly expressing my indebtedness, for they not only lent me a helping hand when help was of more value to me than it is to-day, but they readily permitted me to refer to them, and gave themselves the additional trouble of taking persons in the trade from other towns to see the work they had done under the patent. I feel myself also greatly indebted to Messrs. Minton and Co., Stoke-upon-Trent, and to Mr. James Johnson, Engineer, and Mr. J. B. Mellor, carriage superintendent of the North Staffordshire Railway Company, all of whom were so satisfied with the results of the process, that they very kindly permit me to refer to them.

DISCUSSION.

The Chairman remarked that the mention which had been made of Mr. Herbert Minton and Mr. Hullmandel must have brought to the minds of many present the idea of what immense progress had been made within the last thirty or thirty-five years in many of the useful arts. At the period alluded to in the paper chromolithographs were unknown, at least in England, and encaustic tiles were not in use, whilst the large trade in both these articles was now patent to everybody. Still, there was much room for further development, especially in the matter of encaustic tiles, which were, he had almost said, shamefully expensive in many cases, and were the price reduced there could be no doubt but that their use would be largely increased. These things, however, were not the only matters in which great progress had been made during the period he had named, and, although their native land was often spoken of as Old England, she might be regarded as still in her youth, so far as progress was concerned. They had only had a Royal Academy for about a hundred years, and steam-engines, railways, and the electric telegraph had been introduced within the memory of most persons present. Coming more immediately to the subject of the evening, he must beg leave to take exception to the name that had been given to the process described, for "xylography" meant wood engraving, as any dictionary would show. He had no great love for graining himself, although he did not go quite the length of some who abominated all shams. Graining, under some circumstances, was no doubt defensible, but the inexcusable character of some shams which had been put forward had had the effect of inducing many men who were anxious to associate architecture only with what was noble and honest, to set their faces against all imitations whatever.

Putting aside that consideration, and looking at the matter commercially, it appeared to him that this new process had many advantages, not the least of which was that it would have, he hoped, the effect of banishing that wretched apology for graining which sometimes was seen disfiguring and disgracing people's houses. He should like to hear from Mr. Dean whether the harder woods could be imitated in this manner, as the majority of the specimens appeared to be oak; and he was not certain whether mahogany, rosewood, and the harder woods could be imitated. He should also like to know whether the paper from which the impression was produced must be taken from the original on the spot, or whether it could be taken by workmen at a distance; and he did not understand whether the specified times within which a given quantity of work had been done included the printing of the paper, or only the transferring of the impression to the wood. Mr. Dean had just handed him a specimen of imitated baywood, which was certainly commendable, as there was a quietness and modesty about it not always seen in grained work.

Mr. J. Blore (taking from the table a tile with a wood pattern upon it) could not quite see the advantage of manufacturing tiles in imitation of wood, though the invention was very ingenious, and would, no doubt, prove exceedingly useful.

Mr. Bottomley said the process of printing from the grain of wood on paper was not new, as it had been in use some time by the French for paperhangings, which had been imported into this country rather extensively during the last few years.

Mr. Blore would also like to know whether the durability of this system for external work had been tried.

The Chairman observed that this would probably depend on the varnish, and that there seemed nothing in the process itself which would make it differ in this respect from other graining.

Mr. Morant inquired whether the graining was applied to the wood direct, or whether a "ground" had first to be prepared.

Mr. Bottomley said, in correction of one statement in Mr. Dean's paper, that the best oak graining was now not done in distemper, but always in oil; the inferior work was done in spirit.

Mr. John Land said the process had been mentioned as being more durable than ordinary graining; but he saw nothing in it to render the effect more lasting than graining in oil. He saw nothing in the specimens exhibited beyond what he had seen produced on paper in distemper, which, when applied to woodwork and varnished, had exactly the same appearance. He should have liked to have seen more variety in the specimens, and did not doubt but that many other kinds of wood could be imitated. He begged leave to call Mr. Dean's attention to the beautiful specimens of wood in the museum at Kew, some of which would be very difficult indeed to imitate by hand, and, therefore, if they could be copied by this process, there would be a real advantage in it. At present they were confined to two or three descriptions of wood for interior work in houses, owing to the difficulty of imitating others, which, in some cases, would no doubt render the copy as costly as the original; therefore, if some of these beautiful woods, both English and foreign, could be imitated at a reasonable cost by this process, decorators would have their means of ornamentation much extended. He understood from Mr. Dean that the cost of his process was about a shilling per yard.

Mr. Laing said he had had an opportunity of inspecting the specimens by daylight, and was very much pleased with them indeed; one feature about the work which had struck him particularly, was that the mouldings were as elaborately finished as the plain work, which was not the case with graining done by hand, where mouldings and such like parts were simply run down with the comb. Of course, the men being paid by the piece, their object was to get through as much work as possible in the time, and the more difficult parts, such as mouldings, were accordingly done just so as to pass muster; in the specimens exhibited, however, one part was as good as another. It had struck him that the light and dark specimens were clearer and more distinct than the intermediate shades. To his mind, the great advantage of this process was that graining of first-rate quality could now be executed in the provinces, where it was at present difficult, if not impossible, to obtain the requisite skilled workmen to do it by hand, and thus many country-houses would now be decorated in this way, where, hitherto, such a thing would have been out of the question.

Mr. Yardley thought there were one or two inaccuracies in the paper which he should like to correct. It was said that there was a reluctance on the part of architects to employ graining, on account of the bad manner in which it was often done; but, he believed, the real reason was the desire, which had been alluded to by the Chairman, to avoid everything in the nature of a sham, and also the question of expense. It was much cheaper to stain deal, which, in many cases, showed a very beautiful grain through the stain, than to have it painted and grained. He should like to know whether Mr. Dean's process was applied to the wood plain, or whether it required painting first, because, of course, if the latter were the case the cost would be increased. Mr. Dean had spoken of 2s. and 2s. 6d. a yard being paid for graining, but he had never known more than 2s. or 2s. 3d. being allowed by an architect, including the preliminary painting, and two coats of varnish afterwards. He should like to know whether the process was applicable to delicate woods, such as bird's-eye maple and satin wood.

Mr. Miller asked if the process could be applied in imitation of parquet flooring, and if so, at what expense?

Mr. Dean, in replying to the questions which had been put, referred first to that put by the Chairman as to the imitation of hard woods. A specimen of bay wood was on the table, and there were also specimens of Hungarian ash; and bird's-eye maple was in process of trial. The fact was, however, that he had not as yet been able fully to experiment on many of these kinds of wood, from being engaged in carrying out his patent commercially, and also from the difficulty which was experienced in getting suitable specimens of wood with which to experiment. He thought the question as to the applicability of the process to encaustic tiles had been made sufficiently evident in the paper by reference to the case of Mr. Robson, of Liverpool, who had used nearly 1,000 yards of tiles embellished in this manner in the dados and staircases of the new public offices. Mr. Bottomley had stated quite correctly that for some years past the French had transferred the natural grain of wood to paper for paperhangings, but they had not gone beyond that, whereas he had succeeded in re-transferring the impression from the paper to either a painted or plain deal surface, the latter being specially applicable for churches. He had carefully examined the many beautiful specimens of woods in the museum at Kew, and he had not the smallest doubt that very many of them could be successfully employed in this process; but experiments would have to be made, which would take some little time. He had had great difficulty in procuring specimens of bird's-eye maple and Hungarian ash suitable for his purpose. These difficulties would no doubt vanish by degrees, but still they were sufficient to show that time was required for the perfecting and development of the invention. At Bradford, in Yorkshire, while in conversation with one of the principal painters and decorators, it was suggested to him that his system would be very useful to men who were not in a position to employ first-rate grainers; his reply to that was, that in a week he could put these second and third-rate men in a position to compete with, if not to surpass, those who employed the best grainers money could procure. As to the price, he had given pretty full details in

the paper, and he would add that Mr. Crossley, of Newark, had told him he had paid as much as 5s. a yard for graining alone. He did not think the system was applicable to parquet flooring, for floors were intended to be walked upon, and however good might be the varnish the pattern must be rubbed out in a comparatively short space of time. The encaustic tiles in imitation of parquetry had, however, been used to a considerable extent, and for the borders of rooms appeared particularly applicable. It was only right, however, to say that many persons had taken exception to the application of the process to tiles, and he had for this reason mentioned its employment by Mr. Robson, at Liverpool, where it had been considered very successful.

The Chairman then moved a vote of thanks to Mr. Dean, which was carried unanimously.

Proceedings of Institutions.

Yorkshire Union of Mechanics' Institutes.—*Woodhouse Mechanics' Institute.*—The eighteenth anniversary of this Institution was held on January 4th, in the hall of the Institute, under the presidency of Mr. James Kitson, who was supported by Mr. E. Baines, M.P.; Mr. R. M. Carter, M.P.; Dr. Frobisher; Mr. McCarthy, president of the Woodhouse Temperance Association; Mr. Henry H. Sales; Aldermen Hornby, Addyman, Joy, and Shepherd; Councillors Gallsworthy, Wood, J. W. Smith, Gaunt, Thompson, and Dixon, and other gentlemen. The committee reported that the classes had been attended by 104; the average weekly attendance had been 100; and there were 12 gratuitous teachers and one paid teacher, two superintendents, and two librarians. The committee were glad to report a better attendance this session; the female classes especially had been better attended than in any previous session. This satisfactory result the committee attributed to the strict and diligent attention of the three ladies who had the management of the class. The committee expressed their best thanks to these ladies. The Mechanics' treasurer commenced the present financial year with a balance in hand of £1 2s. 11d.; his receipts had been £71 12s. 3¾d.; disbursements, £70 10s. 1¾d., leaving a balance in hand of £1 2s. 2d. This amount being deducted from an old outstanding account of £25, owing to the Sick and Benefit Society, left a balance against the committee of £23 17s. 10d. The classes for males were elementary and advanced writing, ditto reading, arithmetic, and mensuration. There was also a drawing class conducted by Mr. Rawlinson (one of the certificated teachers from the School of Art), who kindly gives his services. The class numbers 15 pupils. After an address by the Chairman, and the adoption of the report, special addresses were given by Mr. E. Baines, M.P., "On the Pleasure resulting from the Proper Use of our Faculties;" Mr. R. M. Carter, M.P., "On Scientific Instruction;" Mr. Henry H. Sales, "On Education Promotive of true Independence," and Mr. E. Grubb, "On Temperance." The subjects were previously selected for the speakers by the committee of the Institution. *Calverley Mechanics' Institute.*—A crowded meeting of the members of the Institution was held on January 6th, in the lecture hall of the Institute, under the presidency of Mr. Reuben Walton, and an address was given by Mr. Henry H. Sales, "On Scientific Instruction, and the means for its attainment." *Marsden Mechanics' Institute.*—The annual soirée was held on January 7th, in the Mechanics' Hall. Mr. E. A. Leatham, M.P., occupied the chair, and amongst those who took part in the proceedings were Mr. R. M. Carter, M.P., Mr. L. R. Starkey, Rev. D. Robinson, Rev. T. W. Holmes, and Mr. J. B. Robinson, the President of the Institute. The Chairman delivered an address, in which he deprecated the introduction of compulsory education, and the imposition of an educational local rate. *Brighouse Mechanics' Institute.*—The twenty-second annual meeting, under the presidency of Lord Frederick Cavendish, M.P., was largely attended. His Lordship was supported by Sir Francis Crossley, Bart., M.P., Mr. H. W. Ripley, M.P., and others. Judging from the report, the Institute flourishes. The members number 292, being more than were ever previously on the roll, and an increase of 107 over last year. The number of class members is 186, and the average attendance 143. At the last examination in elementary education in connection with the Yorkshire Board of Education seventeen candidates competed, to whom twelve certificates—two in the higher and ten in the lower grade—were awarded. A chemical class has lately been commenced, and there is a newsroom and library containing nearly 1,000 volumes. Lord F. Cavendish, in his opening speech, said that all who had heard the report read must feel that those who addressed them must do so in a series of congratulations. It seemed to him that the history of that Institution was very much the same as the history of kindred organisations. Although there was a difficulty encountered in respect of elementary instruction when such Institutions were started, yet, to take the country through, it would be found that this difficulty had been overcome, and that the higher grades of education were being taught; and he had to own, therefore, that it was with some surprise and shame when, being on a Parliamentary Committee last year on the subject of technical education, he found how very far the West Riding had allowed itself to be beaten by Lancashire. What the cause of this was he had not been altogether able to learn. He had received no explanation but this—that the attention of the people of Yorkshire had not been turned to the subject to the same extent. The attention of Yorkshire had, however, now been directed to the matter, and with results that promised every success. In Yorkshire, at the present moment, there were more than 100 schoolmasters who were being trained to teach scientific subjects in their schools, and while last year there were only twelve or thirteen scientific classes, within the last two months twenty-two new classee for scientific instruction had been started. This showed that if it was owing to attention not having been directed to the subject, it was not from any undervaluing of its importance that Yorkshire had allowed herself to be superseded by Lancashire. If we would maintain our pre-eminence as an industrial nation, our working men must be trained technically as well as practically in the labour that they undertook. Mechanics' Institutions were admirably fitted to impart such instruction; but it must be remembered that high and important as was manufacturing pre-eminence, there were other things of equal if not greater importance, which such Institutions were fitted to aid—they were calculated to promote the well-being and elevate the character of the people. He would ask the ladies if their husbands who were members of that Institution, and attended its classes and read its books, were not, as a consequence, better heads of families than were those who wasted their spare time in the beer-shop or the public-house. Institutions fitted to give this training were of the greatest importance, now that there was no class in the kingdom which could not say that it possessed all the rights and privileges and duties of citizenship. He had noticed that out of 460 competitors who had entered into the last examination of the Yorkshire Board of Education, only some 200 succeeded in obtaining certificates—or, in other words, that only four out of every nine were successful. Of the candidates connected with the Brighouse Institute six out of nine succeeded, so that they had been half as successful again as the average number of successful competitors from all the Yorkshire Institutes. His lordship then presented the certificates awarded by the Yorkshire Board of Education. Sir F. Crossley, Bart., Mr. H. W. Ripley, M.P., and others afterwards addressed the meeting. *Halifax Mechanics' Institute.*—The annual meeting of this Institute was held in the

lecture-hall, on January 12th, under the presidency of Viscount Halifax, who took exception to the speech of Mr. E. Leatham, M.P., on compulsory education and local rating, delivered at the soirée of the Marsden Mechanics' Institute. The most noteworthy feature of the evening was the presentation to the president, Mr. Stansfeld, sen., of his portrait by the members of the Institute. Lieut.-Col. Akroyd, M.P., on behalf of the subscribers, spoke in the highest terms of Mr. Stansfeld, and begged his acceptance of the memorial of their regard. Mr. Stansfeld having replied, other addresses were given by Mr. Stansfeld, jun., M.P., Sir Francis Crossley, Bart., M.P., and others.

SOCIETY OF ARTS.

(*Continued from p.* 147).

Drawing and Modelling Schools.

Another subject of inquiry, which grew out of the Exhibition, viz., drawing and modelling schools, is thus referred to in the address delivered by the Chairman of the Council—on the 15th of January, 1851.

"Already a stronger connection between the artist and manufacturer is springing up, beneficial to both. It will be the duty of the Council to foster this connection, and they are considering a plan by which a friendly meeting for the discussion, investigation, and best means of promoting the union of art and manufactures may take place every year, in some one of the great manufacturing centres, somewhat on the principle of the British Association and the Archæological Societies. Connected with such a union, the Council feel that much remains to be done to educate the mass of the people in the perception and practice of art—a fact which the Exhibition is likely to make but too apparent—and, taking advantage of the lesson we are likely to be taught, the Council propose making an effort to establish elementary drawing and modelling schools throughout the country. They have submitted this proposition to H.R.H. the President, and they have the satisfaction of knowing that he thinks it may prove very useful."

About the same date the attention of the members was requested to the following proposition of Council, on the subject of elementary drawing and modelling schools:—

"Society of Arts' Elementary Drawing and Modelling Schools.

"The Council of the Society of Arts propose that the aid and influence of the Society should be engaged to promote the establishment of elementary drawing and modelling schools, chiefly for artisans.

"The Council are strongly impressed with the desire of our young artisans to obtain a knowledge of drawing, and the many advantages which they may derive from it; at the same time the Council are aware of the great difficulties which are at present interposed, from the want of efficient instruction within the reach of the artisan.

"The Council do not limit their appreciation of the advantages of drawing and modelling solely to those improved facilities in manufacture which they unquestionably afford to mechanics; but the Council trust that these useful arts will be found to occupy the young in pursuits tending in every way to their improvement, and to provide them with the most wholesome sources of instruction and enjoyment.

"The Council are of opinion that this project, while it forms one of those useful undertakings which may properly emanate from the increased progress and influence of the Society, will be found entirely within its original scope and objects. The assistance and co-operation of the Society are made dependent upon the following conditions:—

"1. That such schools shall be called by the names of the localities in which they are established: 'The Drawing and Modelling School for Artisans, under the superintendence of the Society of Arts.'

"2. That localities, whether represented by corporate or parochial authorities, or by a committee, shall engage to provide, keep clean, warm, and light a suitable room, and fittings, for the use of the school; and also to insure a sum of not less than £50, by subscriptions, donations, and students' fees, for the support of the school for twelve months.

"3. That each locality shall appoint a committee of management, which shall consist of subscribers of not less than ten shillings each per annum, and shall include some of the members of the Society of Arts (not less than three) residing in the neighbourhood.

"4. That this committee shall adopt the general rules framed by the Society for the government of their affiliated schools, and that all such schools shall be under its superintendence.

"5. That the committee shall be responsible for the custody and safe return of the property of the Society which is lent for the use of the school.

"6. That the committee shall appoint a secretary and treasurer, who shall keep minutes and accounts; and that the committee shall annually make a report to the Council of the Society of the state and progress of the school.

"Upon a compliance with these conditions, the members of the Society engage to render every support and facility in their power, and to use their influence to insure the success of the schools established. They propose:—

"1. To prepare a concise code of general rules, which shall form a useful manual of management and instruction.

"2. To recommend a suitable trained instructor, who shall attend and give instruction two hours in each of three evenings weekly, during the appointed period of session.

"3. To provide and lend, until the school is self-supporting, suitable drawings, models, and examples; and, occasionally, books of reference.

"4. To appoint a rotation of visitors well qualified to superintend the course of instruction and the conduct of the school.

"5. To give, at their annual distribution, by the hand of their president, medals and rewards to those students who have distinguished themselves by ability and good conduct."

In February, 1852, a committee was appointed by the Council to carry out the establishment of elementary drawing and modelling schools for artisans and mechanics. The Council had put forth a statement of its views and intentions, from which the following are extracts, and to which the committee desired to direct the attention of the members of the Society generally:—

"The Great Exhibition has materially strengthened a growing conviction that one of the most serious disadvantages under which ornamental British manufactures are produced, is the want of artistic knowledge and executive ability on the part of the artizans engaged in producing them. Every one competent to judge admits that the ornamental productions of the French exhibit more ability on the part of the French workmen in drawing, modelling, chasing, &c., than of our own. The Council believe that a radical cure for many imperfections of British manufacture will be found in a much more enlarged and liberal system of art education than at present exists—an education which shall make the power of drawing at least as easy as that of writing, and shall begin at an early period of life. The Council are convinced that there is hardly any handicraft in which a workman can be engaged—as a carpenter, mason, smith, tailor, &c., which would not be greatly improved by an ability to perceive the form of objects correctly, and represent it with precision.

"At present the schools of design are supported partly by a Government grant, partly by students' fees, and partly by voluntary subscriptions.

"Under this system, most of the schools of design are in debt, and the progress of them is rendered doubtful and disheartening.

"As some time must elapse before it can reasonably be hoped that elementary drawing and modelling schools can be altogether self-supporting, some assistance will be required, temporarily, at least, in the provision of suitable house accommodation. Having the experience of the present state of the schools of design before them, the Council venture to advise those localities which desire to possess the advantage of elementary schools not to rely on subscriptions as any permanent source of income, but rather to obtain powers from the Legislature of raising a moderate rate, and to reject the system of canvassing for subscriptions, or the expectation of obtaining an adequate endowment. It may be estimated that a very moderate rate indeed, not exceeding a penny in the pound on the rental, in the majority of instances, would enable many hundreds of localities to have the benefit of an elementary school. But as some time must necessarily elapse before the requisite powers can be obtained from Parliament to levy a rate* (this power has since been obtained), the Council recommend that the school be established in the mean time by means of subscriptions and donations, aided by fees from the students, which, at the beginning, ought not to exceed a penny for each time of entering the school to receive a lesson.

"The Town Council of Bradford, Yorkshire, a most important manufacturing centre, as yet without a School of Design, have invited a deputation of the committee to attend a public meeting there, on Monday, the 2nd February, 1852, that the inhabitants of the borough, and persons engaged in the staple manufacture of the district of the West Riding, may have an opportunity of hearing and considering the views and explanatory statements of the Council.

"This meeting, and an adjourned meeting convened for the evening of the same day, will be attended by gentlemen from the neighbouring manufacturing towns of Leeds, Halifax, Huddersfield, &c.

A deputation, consisting of Gen. Sir Charles Pasley, K.C.B., Mr. Henry Cole, C.B., and Mr. Owen Jones, accordingly attended the meeting held at Bradford, a full report of which was published by the Society at the time. The chair was taken by the Mayor, when, after several addresses, a resolution was moved by Mr. Titus Salt. In doing so he said, "As a manufacturer engaged in the trade of this district he would readily admit that improvement in the art of design and the arrangement of colour was much required. It was clearly shown in the Great Exhibition that we were far behind many of our Continental neighbours. . . . He thought the time had now arrived when they should exert themselves to improve the beauty of their designs. . . . He moved—That this meeting fully recognises the great advantages derivable from a self-supporting institution, calculated to improve the art applied to the manufactures of Bradford and its neighbourhood and the general taste of all classes, and especially of an elementary, drawing, and modelling school, as an integral part of it, and in connection with the Council of the Society of Arts, will take vigorous measures for giving effect to the same." The resolution was seconded by Mr. Robert Milligan, and supported by Mr. Alderman Rogers.

The proposal submitted was to erect in Bradford a self-supporting Art-Manufactures Institute; and at a second meeting held in the evening, and attended chiefly by the working classes and members of the Mechanics' Institute, the plan and objects of the proposed institute were fully set forward, and a prospectus submitted for raising a capital of £6,000.

* Mr. Ewart's "Museums Act" gives the rating power to municipal bodies for many Institutions, but, unfortunately, omits to secure Schools of Design or Drawing Schools, though they are evidently within the purport of the Act. This should be remedied by a short Declaratory Act, adding them especially to the list of institutions.

The following resolutions were unanimously passed at a public meeting held in Halifax on the 4th of the same month, which was attended by Mr. Yapp, as a deputation from the Society.

"1. That a committee be formed of the directors of the Mechanics' Institute and the merchants and manufacturers of the town and neighbourhood, with a view to obtain ample accommodation for a drawing school in connection with the Society of Arts, and to place themselves in communication with the Society for the purpose of promoting the objects of practical utility, recommended by the deputation from the Society.

"2. That Samuel Waterhouse, Esq., mayor; Henry Edwards, Esq., M.P.; the president (James Stanfield, Esq.,) and vice-presidents (John Crossley, Esq., and the Rev. W. Turner), and directors of the Mechanics' Institution, *ex-officio*, and the following gentlemen, form a committee—Edward Akroyd, Esq., John Baldwin, Esq., John Sheppard, Esq., H. McCrea, Esq., John Whitworth, Esq., with power to add to their Number, and that Mr. G. Schischkor and Mr. James Dennison be requested to act as secretaries."

In addition to the above, the Council received applications for advice and assistance, of the kind offered in the paper lately circulated by them, from Exeter, Marylebone, and Kensington; and they at once set on foot the preparation of elementary copies, and of models of solid forms, to be used in the elementary schools, and took measures to procure materials for the use of the scholars, of the best quality, and at a low rate of cost.

The following letter was received from the residents of the borough of Marylebone, and was duly considered by the Council:—

"We, the undersigned residents of the borough of Marylebone, being convinced that great advantages would arise from the establishment of an Elementary Drawing and Modelling School on the system proposed by the Society of Arts, request you to inform the Council that we are willing to co-operate with them in any proceeding that may tend to promote Art-Education in the locality for which we are interested."—Signed by 29 residents, chiefly manufacturers.

While this action was being taken by the Society, the Government was re-modelling its Schools of Design, and in February, 1852, the Department of Practical Art was established, and on the 10th March, 1852 a letter by the Superintendents of the Department of Practical Art (Mr. Cole and Mr. Redgrave) was addressed to the Right Hon. J. W. Henley, M.P., President of the Board of Trade, in which they say—

"In entering upon the duties of this new department, we venture to suggest that a leading principle of its future management should be the endeavour to make the department, as far as practicable, self-supporting in all its branches. We apprehend it will be found, on the one hand, as the department responds to the wants of the people, so on the other, the public, as individuals, will be ready to pay, to a considerable extent, for the educational advantages which it offers. We think it is apparent that in the most successful institutions in this country the public use them and pay for the use of them according to their sense of their value, and thus render extraneous aid in a great measure unnecsssary.

"The minutes of the Board of Trade, of the 16th February, point to three principal objects as constituting the business of the new department:—

"1. The promotion of elementary instruction in drawing and modelling.

"2. Special instruction in the knowledge and practice of ornamental art.

"3. The practical application of such knowledge in the improvement of manufactures."

They then proceed to point out what steps are necessary in order most efficiently to carry out these objects, and they say in paragraph

"14. In order to assist both the establishment of additional schools on a principle of self-reliance, and to increase the interest of the localities in the existing school, we think it right to notice a suggestion frequently made, that the legislature should give power of levying a moderate local rate for the support of schools of ornamental art until they become self-supporting. We are of opinion that a dependence on local rather than general taxation is calculated to awaken the greatest amount of local interest and attention to the subject, and we think that a higher and more practical development would be given to such schools by enabling them to connect themselves with the museums of art which, by the existing law, may be supported by local rates."

And at the Council Chamber, Whitehall, on the 31st March, 1852, the following minute was passed "by the Right Honourable the Lords of the Committee of Council appointed for the consideration of all matters relating to trade and foreign plantations; present, the Right Hon. J. W. Henley, M.P., the Right Hon. Lord Colchester." Read (the above) letter from the Superintendents of the Department of Practical Art:—

"My Lords are pleased to express a general agreement in the views developed in this letter, and consider that it will be desirable that the same should be communicated to the Managing Committees of the Local Branch Schools for their information.

(Signed) "J. W. Henley.
"Colchester."

The Government having thus taken the subject up, the necessity for further action on the part of the Society ceased; but it must ever be a source of satisfaction to the Society that it took so active a part in initiating the drawing and modelling schools, which have proved of so much practical utility to the art industries of this kingdom.

Union of Institutions.

I have already stated that on the 28th November, 1851, Mr. Harry Chester addressed a letter to the Society of Arts in reference to the formation of a Union of Institutions. The following is the letter referred to:—

"Highgate, Nov. 28th, 1851.

"Sir,—Being desirous that the attention of the Society of Arts should be drawn to a subject which I am persuaded is of considerable importance, and consistent with the Society's objects, I beg leave to request your perusal of the following exposition of my views, in order that, if you coincide in the opinion which I have just expressed, you may take a fitting opportunity of presenting the subject to the Council.

"I have to propose that an effort should be made to develop existing, and to create new, Institutions of the class commonly called Literary and Scientific Institutions, Mechanics' Institutes, &c., and to affiliate them to the Society of Arts.

"As some excuse for what may be deemed my temerity in making such a proposal, I may mention that I have had considerable experience in reference to National Education; and that I was one of the originators, and have been (from the origin of the Society) the President, of the Literary and Scientific Institution in this place.

"There is now scarcely a town, or considerable village, which has not its Institution under some form and name; but, with very rare exceptions, the Institutions are generally in a languishing condition, both as to funds and as to usefulness. I do not mean to assert that they are of no use, but merely that they are not half as useful as they might be.

"The Exhibition has given us some very significant hints that it is not only the education of our poor children that needs to be improved; high and low, rich and poor, old and young, have all an education question to be solved; have all a very real and urgent need of knowledge, and of knowledge of that kind which a Literary and Scientific Institution, if fully developed, is well calculated to assist in affording.

"I conceive that there are three grand defects which impede the usefulness and the strength of the Institutions.

"1st. They are not sufficiently practical in their aims.

"2ndly. They are isolated and have no means of combining with other Institutions for the common good.

"And 3rdly. They have no connexion with the great central associations which pursue under national auspices the objects of Literature, Science, and Art.

"1st. They are not sufficiently practical. I conceive that a Literary and Scientific Institution ought systematically to investigate and diffuse information respecting objects of practical utility.

"The Highgate Institution some years since fully investigated the subject of Cottage Gardens and Allotments; and the result was the establishment here of a considerable number of allotments upon a plan which has worked with complete success.

"We are now making an inquiry into the domiciliary condition of our poor, and collecting information respecting the best means of improving it. The Institution itself will not undertake any building or other operations with a view to their improvement, but will ensure a full ventilation of the subject; and the result, in all probability, will be that (as in the case of the allotments) the business of improvement will be effectually taken up by some of those who will be moved to the work by the information which the Institution will furnish.

"I need not point out how rapid a progress would be made, in all parts of the country, in improving the dwellings of the poor, in sanitary measures, and in the use of scientific inventions, if the Local Institutions throughout the country could be led systematically to aim at these very important objects. Questions also of political economy (not politics) and social law, I conceive should be treated in the theatres of these Institutions. How much the passing of useful laws would be facilitated if this were the case! Not to be tedious, I would instance the laws of partnership, of bankruptcy, of patents, of master and servant, as suitable for discussion by competent persons in such places. And, again, how little are the great mass of the middle classes acquainted with the useful inventions which (*e.g.*) receive medals from the Society of Arts! Why should not these be systematically introduced to the notice of the Institutions?

"The Highgate Institution has entered upon this branch of duty, and is preparing to have a descriptive exhibition of the various applications of gas to lighting, warming, cooking. How very few persons have ever seen a gas-cooking apparatus! what ludicrous prejudices are entertained on this subject! I cannot but think then that the strength and usefulness of the Institutions would be greatly increased if they could be moved to be more practical in their aims, and to labour (in due proportion) in the directions to which I have adverted.

"2ndly. They are isolated, and have no combination for the common good. The evils of this isolation are too obvious to need any comment, and many attempts have been made to combine the Institutions for the purpose of engaging lecturers, obtaining the use of apparatus, and putting into circulation books, works of art, natural objects, &c.

"In Yorkshire a considerable association of Institutes exists; and I believe it is productive of good.

"What we want, however, is a central office in London, to which we could apply for advice, information, and assistance. Such an office might form an extensive staff of lecturers, men eminent in their special subjects; might collect illustrative specimens and diagrams; and on application supply the local Institutions with lecturers and lectures on almost any subject. By judicious geographical arrangements the most distant Institutions might be supplied at a reasonable rate with lecturers whom they now are entirely unable to remunerate because they cannot ensure to them other engagements in the same neighbourhood.

"Whether such an office as I have alluded to should be created for the purpose, or whether any existing body,

such as the Society of Arts, could undertake it, I am unable to say.

"But 3rdly. The local Institutions have no connection with the great Central Societies.

"If the Institutions could be connected with the British Museum, the Association for the Advancement of Science, the Geological, Botanical, Zoological, and other Societies, whose objects may fairly be considered to come within the scope of the Institutions, I cannot but think that great good would result both to them, and to the Central Societies.

"Above all others, the Society of Arts appears to me to be a Society with which Institutions might unite, by affiliation, with mutual advantage.

"I refrain from entering fully, at present, into this subject, because the Council, if they should approve of the idea, would not need my exposition of its merits; and because I am unwilling to add to the length of a letter, too long already.

"If you should be of opinion that the subject is one which the Council of the Society would be likely to entertain, you will have the goodness to make such use as you may think fit of what I have written in this letter.

"I have the honour to be, Sir,
"Your obedient servant,
"Harry Chester.

"George Grove, Esq., Secretary, Society of Arts."

A committee was appointed to consider and report on the proposed Union of Institutions, and, on the 18th May 1852, a Conference was called at the Society's House in the Adelphi, the Marquis of Lansdowne, K.G., in the chair. At the close of the Conference in the evening a public dinner took place at the Freemasons' Tavern, over which the Earl of Carlisle presided, at which the delegates and members of the Society cemented still further the union formed during the day. Shortly after, the following report to the Council was made by the Committee appointed to consider the proposed union with Literary and Scientific Institutions and Mechanics' Institutes.

"We have arrived at that stage in the important matters referred to us, which we think renders it essential at once to submit our proceeding formally to the Council, with a view to obtain its sanction to the ulterior steps which now become promptly necesssary.

"After having obtained, by means of a circular of interrogatories, the opinions and concurrence of nearly 400 of these bodies, as to the general advantages which might be derived from a union with this Society, we solicited the attendance of their representatives at a general Conference.

"This meeting was held on the 18th inst., under the presidency of the Marquis of Lansdowne, and was attended by no less than 140 representatives from Institutions in every part of the country. We append for your information a full report of the proceedings, and beg your particular attention to the following resolutions, which were then unanimously adopted; as well as to such more detailed views as we have formed respecting them after a further Conference which we held with the representatives on the following day:—

"1. That the success of Literary and Scientific Institutions, and Mechanics' Institutes, in the cultivation of literature, science, and art, and in the diffusion of useful knowledge, might be powerfully promoted by the combination of many Institutions in Union with the Society of Arts, on the basis of perfect security to the continued independence of the Institutions, and the freedom of their self-government.

"2. That this meeting accepts the "Memoranda of Replies, &c." as a sufficient statement, in general terms, of the advantages which may be expected to result from the proposed combination and union; and requests that the Society of Arts will appoint a special committee to carry out the foregoing resolutions; and that every institution in union with the Society will nominate a representative, to form one of a representative council, which shall have quarterly, or other Conferences, with the said special committee.

"3. That the pecuniary conditions of union should be calculated to protect the Society from loss, and to afford to the Institutions the full value of the payments which they may make.

"4. That this meeting is of opinion that Literary and Scientific Institutions, and Mechanics' Institutes, are calculated to promote the interests of religion and morality, by the cultivation of literature, science, and art, and by the diffusion of useful knowledge; and that this meeting earnestly invites all classes to unite in supporting and improving such Institutions and extending their powers of doing good.

"With respect to the mode of carrying out the third resolution we suggested to the representatives, that the best and most simple pecuniary arrengement would be—that the president of each Institution entering into Union should be elected a member of the Society of Arts; and that the usual members' subscription of two guineas a year paid by him should be deemed a sufficient remuneration. We proposed this after mature consideration, as admitting to the most intimate and honourable connexion with the Society. But we found that some Institutions would be best pleased to pay the subscription of two guineas from their funds, and elect their own representatives to attend the quarterly or other conferences to be held. We therefore propose that either course may be left open to them; but that in either case they should also elect their representative—and we think that provided a sufficiently large number of Institutions enter into Union the subscription of two guineas will indemnify this Society.

"We entered as fully as we were able, into the question of the advantages which might be received by Institutions received into Union. The periodical conferences would not only bring them into connexion with this large central Society—but, what is of not less importance, would be the means of intercommunication and union with each other. They would receive the weekly paper of proceedings, printed by the Society, during the Session; and all the transactions and publications of the Society. We think also that to each Institution three admissions to all the Society's meetings and Exhibitions might be given—and that the members of distant Institutions when in London might be introduced at all times, on application, without limit as to number, to the Society's meetings, Exhibitions, and Library. The Institutions would also correspond with the committee, and receive such advice, information, and assistance generally as it is in the power of the Society to give. These are the immediate benefits which we hope would at once be secured by the annual subscription of two guineas.

"We speak with some diffidence as to the further assistance which may be immediately rendered. We think that some time will be required to develop fully the advantages to arise from the union, and that much will depend upon a zealous and kindly spirit of co-operation (on which we rely) upon the part of the Institutions. The first step to be taken, and one in accordance with the wish most generally expressed, would be to organize for the ensuing autumn some plan of lectures, which, without necessarily superseding such lectures as the Institutions may themselves provide, should afford them the option, at a stated price, of lectures of practical utility, by lecturers whose competence is well recognized in the various branches of literature, science, and art. We would also advise that catalogues should be circulated of the models, works of art, and books belonging to the Society, and that, under well-defined conditions, these should be lent to Institutions, to illustrate any lectures, conversazioni, or occasional exhibitions which they may get up.

"Another step would be to make known and place within the reach of Institutions, the Society's box of

water colours, price 1s.; the cases of mathematical drawing instruments, price 2s. 6d. and 6s.; and to stimulate the production of other materials, books, &c., at prices which may be warranted by the number required, and the new wants created, but not by so doing to interfere, in any way, with the ordinary course or channels of trade.

"As the plan would develop itself in its successful working, we trust it is not taking too sanguine a view of the resources of the Society of Arts to expect that exhibitions may be assisted and facilitated; that the Institutions may be brought into close and useful communication with the Society, and with each other; that the Society's paper of proceedings may be gradually enlarged, till it takes the form of an Institutional periodical; that the lectures may be extended and systematised; that an annual report may be prepared, combining the most valuable statistical information with reports of the working of the Institutions, their difficulties, wants, progress, and resources; and, in fine, that the chief advantages referred to in the 'Memoranda of Replies,' with many others, may be secured.

"(Signed) on behalf of the Committee,
"Harry Chester, *Chairman.*"

Middle-Class Examinations.

It is not necessary that I should trace the action of the Union then established through all the stages which it passed. It is sufficient to say that it gave rise to the system of examinations which have been for many years actively in operation, with results of yearly-increasing importance, and the details of the working of which are fully reported in the Society's *Journal.* I may, however, add that the middle-class examinations of Oxford and Cambridge grew out of the Society's action, having been proposed by members of the Society's committee as an extension of the Society's system to other classes than the members of Mechanics' Institutes.

While Mr. Harry Chester was thus actively at work in one direction, Mr. Thomas Twining, a member of the Society, addressed a letter on the 21st August, 1851, to the Right Hon. the Earl of Shaftesbury, on means for improving the efficiency of British artisans, in which he proposed the establishment of a national institution, to be called the "Albertine College of Trades," and indicated the rules which should guide the management, and the nature of the technical instruction, comprising scientific knowledge of a general nature, which should be taught. Copies of this letter were distributed gratuitously through the Society by Mr. Twining. Mr. Twining has continued actively at work ever since, and though he has not succeeded in establishing the proposed college, he has at his own cost erected an economic museum for the benefit of the working classes, and more recently established courses of lectures on science in relation to industries and every-day life, and he is now extending his plan with a view to testing, by means of examinations, the value of the lectures delivered.

Colonies.

While these measures were being carried on with reference to our home industries, arts, and education, our colonies were not lost sight of; for, in addition to the many medals and premiums offered by the Society for colonial products, His Royal Highness Prince Albert added to the list, in 1849, the offer of his own gold medal for the best account of any new and improved machinery or processes employed in the cultivation or preparation of sugar in the British colonies, economising labour and increasing production.

This medal was awarded to Mr. J. A. Leon for his treatise, which was ably written and fully illustrated with working drawings of machinery, and was published for the information of the general public.

Other medals were also offered by His Royal Highness for home productions, and, in 1852, the Council resolved on the appointment of a Colonial Committee, to consider the best means of making the Society useful in advancing the knowledge of the resources and capabilities of the numerous British colonies in all quarters of the world, and in furnishing the colonies themselves with such information as might be required on subjects connected with arts, manufactures, and commerce.

On the 26th February, 1852, a deputation from the committee had an interview with Sir John Pakington at the Colonial Office, to ask the assistance of the Government in reference to the issue of a circular to the colonies with a view to collecting information, and the reply of the Colonial Secretary having been favourable, a letter was accordingly issued to the governors of the British Colonies, through the Colonial Office. It resulted in the collection of much valuable information, which was published in the Society's *Journal* from time to time. In the first number will be found a letter from British Guiana, and in the year 1853, the Council received a communication from the New Zealand Society, in reference to New Zealand flax, placing fifty pounds at the disposal of the Society of Arts, but the Council, not having been called upon to award this premium, directed attention to the offer made by the New Zealand government, of prizes amounting to £4,000, of which particulars were also published in the Society's *Journal.*

The following were the prizes offered:—

"£2,000 to to the first person, and £1,000 to the second person who shall, by some process of their own invention, produce from the *Phormium Tenax*, or other fibrous plants indigenous to New Zealand, one hundred tons of merchandise; and £200 to each of the first five persons, other than those entitled to the first and second rewards, who shall by any process, whether of his own invention or not, produce from the *Phormium Tenax*, or other fibrous plants indigenous to New Zealand, twenty-five tons of merchandise.

"The merchandise must be saleable as an article of export from the Colony of New Zealand, and have been produced at a cost not exceeding 75 per cent. of its value at the port of entry from which it is exported; and the process used must be fully made known with a view to the discovery being at once made available to the public."

With reference to this subject, as well as to the general products of this Colony, the Council arranged for a paper to be read before the Society.

The paper referred to was written and read by Mr. William Stones, and Lord Lyndhurst, upon seeing it in the *Journal*, thought it so able a production that he called at the Society to make inquiries relative to its author. Mr. Stones was one of the parties to the treaty made and signed between the natives of New Zealand and Her Majesty's Government at Waitangi on the 6th February, 1840.

Committees.

A committee for conducting foreign correspondence, and thirty committees, whose business it was to discuss matters relating to trade, were also appointed, but as these were to be worked by voluntary reporters they naturally failed in efficiency, and were soon discontinued. Nevertheless, this showed that the desire of the Council was to broaden the base of the Society's action. The system of voluntary service failed to produce a result, and though I do not think it would be well at present to propose the appointment of thirty paid officers to carry on investigations relating to the application of the sciences and the progress of mechanics as bearing on the Arts, Manufactures, and Commerce of the country, I see no reason why, if in the future it were thought desirable, even that number should not be appointed. It must be remembered that the more agents the Society employs to collect information for it the greater will necessarily be the result of the Society's action to the members themselves and to the country at large.

It is unnecessary to point out the rapid advances which art and science, in their relation to the progress of

industry, have made in foreign countries. England, through the instrumentality of the Society of Arts, set the example of gathering together the people of all nations for the purpose of exhibiting to the world the products of their respective countries. The example of England was soon followed by France, Italy, and many European states, by America and the colonies, while, in Ireland, international, and in our own country, local exhibitions have been held in almost every county, I might almost say in every town of importance. Some of the exhibitions, both foreign and local, the Society visited as a body, but as a full record of the most important exhibitions has been printed in the Society's *Journal*, it is unnecessary to refer further to them here.

It is much to be regretted that many of the acts first done, as well as many valuable communications received by the Society at its foundation were never published—and the same may be said of the Society at the beginning of its second period—and feeling that in the future it would be next to impossible for anyone to trace the course of the Society's action during a period full of important results, I have endeavoured, however feebly, still to the extent of my ability, to supply the missing link. I have not attempted to carry in detail what I have said beyond the 26th November, 1852, at which date the *Journal* was first published.

I have already stated that the Society, when it entered upon its enlarged action as a chartered body, proceeded to investigate the anomalies of the patent laws, and also inquired into and reported upon the postal system of this country and the colonies, and a modified system, both in reference to colonial postage and also in reference to the parcel post, was largely induced by its action. Many other important questions affecting the industries and commerce of the country have also been dealt with, such as the advertisement and paper duties, the laws relating to both of which have been materially modified; but during some of these inquiries the Society was without funds sufficient to enable them to publish other than a weekly circular. The publication of "Transactions of the Society" had been suspended for several years for the same reason; but in the year 1851, after the close of the Exhibition, it felt that it was impossible to carry on the business of the Society with advantage to the members and benefit to the public unless some speedy means of publication was established.

The *Journal of the Society of Arts* was accordingly established, and has been regularly issued to the members. In it have been published the papers read, and the discussions which have ensued upon them at the weekly evening meetings. To attempt to recite here the contents of the sixteen volumes of that work, consisting, as it does, of upwards of 25,000 columns of closely printed matter, would be madness. It is sufficient to say that in its pages are recorded most of the attempts which have been made during late years to promote Arts, Manufactures, and Commerce. Many of the accounts appeared, as they should do, at a time when the public mind was unprepared to receive and discuss the feasibility of the propositions brought forward; but nevertheless, the seed sown has in many cases taken root, and after several years has borne valuable fruit.

Food Supply.

As one striking instance I would refer to the address of the Chairman of Council, read in 1853, in which attention was directed to the importance of improving the food supply of this country by seeking out a means of preserving and importing from Australia and other colonies the food there wasted. The Society never lost sight of that important object; it offered prizes and varied the form of the offer from time to time, with little result; but at length some attempts were made, and processes suggested or exhibited in the Society's rooms, and the Society, nearly three years since, appointed a committee to inquire into the best means of improving the food supply of this country. The committee, for two years past, has met once or twice a week during the session, investigated, taken evidence, and reported in the *Journal* the results of its inquiries; and now, within the last few weeks, articles have appeared in the papers referring to several attempts at importation which have been made, and the public are beginning to look with interest to Australia, South America, and other districts, for an increased food supply. I am glad to be able to say that the Society is continuing its investigations, and I hope, at no distant date, will be in a position to report that the results of the experiments now going on have been successful; but of this I feel sure, that so important a question cannot be allowed to remain unsolved, either in the interest of the colonies or of the mother country.

I might refer to other cases of a similar nature, but as each volume has been fully indexed, and an analytical index of the contents of the first ten volumes has long since been published, I must refer those who desire to trace up the Society's action in fuller detail to the *Journal*, in which, if they will look to the addresses of the Chairmen of Council, the reports by the Secretary, and reports of the Council to the Society therein recorded, they will find that much which is now matter of history has been foreshadowed.

MUSICAL PITCH.

The following has appeared in the *Athenæum*:—

This question has now become so prominent that probably a few general remarks on it may be interesting to your readers.

The pitch of a musical note is defined, as is well known, by the velocity of the vibrations causing it,—the pitch being higher as this velocity is greater, and *vice versa*. Thus the note c, on the third space of the treble clef, corresponds to a number of double vibrations per second, varying from about 500 to 550, according to the pitch adopted; and when it is explained that at this point of the scale an increase of about 32 vibrations corresponds to a rise of a semitone, an idea can easily be formed of the variations between one pitch and another.

It is said that in Handel's time the pitch was c = about 500; this now appears very low, and probably the evidence of it is not conclusive; but we know that in 1813, and for about thirty years afterwards, the Philharmonic pitch was fixed at c = 518. During the last quarter of a century it has been constantly rising, and it has been found lately, in our chief orchestras, nearly 550, or a semitone higher that in 1842.

I need not say how intolerable this high pitch has become. It was publicly protested against ten years ago by many eminent singers and musicians, with Madame Goldschmidt at their head; but it required a very determined effort to overcome the reluctance to change; and this, fortunately, has now been supplied by Mr. Sims Reeves.

The height of the pitch appears to me, however, to be a less evil than its uncertainty. At present we are really unable to form any distinct idea of what any note of music means; and hence it is not enough that the pitch should be lowered, but, if a change is to be made, a definite uniform standard ought to be agreed on, and, as far as possible, made of universal application.

The question then becomes, what ought this standard to be? The choice lies between three, all possessing good claims to consideration.

The first is what is called the philosophical pitch, in which the note c is assumed to have a number of vibrations corresponding to the powers of the number 2, so that the treble c = 512. This pitch is strongly advocated by Sir John Herschel and many scientific men, as well as by Mr. Hullah and other practical authorities. It is rather low compared with our present notions, but is one-third of a semitone higher than

Handel's, and only one-fifth of a semitone lower than the Philharmonic pitch of 1813—43.

The second is the French pitch, established by law in that country; it is c = 522, about one-eighth of a semitone above the old Philharmonic. No reason appears to have been assigned, as far as I know, for the choice of this particular number.

The third is the German pitch, which was fixed on by a congress of musicians at Stuttgart in 1834, and has become, I believe, universally adopted throughout Germany. This is c = 528; one-third of a semitone higher than the old Philharmonic, and one-fifth of a semitone higher than the French pitch, but still two-thirds of a semitone below our present operatic scream. It has also some recommendations on theoretical grounds.

Practically, I do not think it matters which of these three may be adopted, as either of them would bring us back to a reasonable pitch. It may, perhaps, be a question for orchestral players whether it would be most convenient for them to assimilate to the French or the German standard; but the latter has the advantage that it has been already adopted to some extent in this country, on the recommendation some years ago of the Society of Arts, and that standard tuning-forks, regulated according to this number of vibrations, are in ordinary sale.

The Committee who drew the Report (of whom I had the honour to be one) appeared generally to prefer the philosophical pitch of 512; but it was thought inexpedient to recommend so great a change; and the German standard was adopted as an intermediate measure, more likely to be acceptable to the musical world.

William Pole, F.R.S., Mus. Doc. Oxon.

Athenæum Club, January 16, 1869.

A member, writing to the Editor of the *Journal of the Society of Arts*, says:—In last week's *Journal* was a letter rather advocating the adoption in this country of the musical pitch in use in France. The inquiries which the Society is instituting abroad will probably show that even in Imperial France, where Imperial gold and Imperial will are omnipotent to issue an authoritative tuning fork, the pitch is not the same at all institutions, even in Paris. A letter, drawing attention to several important facts in connection with the musical pitch has recently been published, and some portions are worth recording in the *Journal*, so I send you some extracts:—

"The old battle between vocalists and instrumentalists has been revived in this country on the vexed question of a sonorous standard to be adopted, to be applicable universally; or, in other words, to establish the uniform musical pitch. The progressive elevation of the diapason has, in all ages, been the standard complaint of singers who are approaching the natural termination of their musical career. The elixir of life and the philosopher's stone not having yet been discovered, the human voice has its limits of action and duration, and time will tell its tale on the strongest of organs. The improvements in the making of the wind instruments, the competition amongst military bands to acquire increased brilliancy, the rivalities of leading singers to eclipse each other in extent of compass, were irresistible temptations to composers to seek for novel and startling effects. The elevation of the pitch was, therefore, a natural consequence of a new order of things; but with the progressive tonality the questions arose what was to be its standard? where was it to stop? and what could be done, seeing that no two musical capitals could agree as to a pitch to establish uniformity? And here is a curious fact to be noted, that whereas the most distinguished musicians of all nations have agreed and do agree as to the fixing of one sonorous standard, the differences as to the *modus operandi* cannot be reconciled. Everybody preaches uniformity, but still there is no unanimity, so far as theory goes. Practically this country, without any act of Parliament, without any police intervention, without any musical congress, has the uniform musical pitch. As in many of our social regulations, the public is its own police in the matter. What is called the opera pitch has existed here nearly a quarter of a century without being disturbed either in town or country. An attempt was made in 1834, at a congress of musicians at Stuttgard, to fix the musical pitch, but it was very partially acted upon. The various governments of the Confederation cared more about a normal diapason than they did about German unity, and the directors of each musical institution in Teutonic land took his own line as to the pitch-fork. In France, however, since Duprez startled the world with his '*ut de poitrine*,' a sad state of things was created. The French school of singing has been always credited as being that known by the name of '*criard*,' and in order to attain the elevation of the great tenor, no end of ambitions singers lost their voices. Contemporaneously with the *criard* movement in France, came the Verdi screaming of the sopranos in Italy, in addition to the shouting tenors and bawling barytones. The forcing of the voice was attended with the most disastrous results both in France and Italy; the true art of vocalisation gave place to declamatory violence. The Opera House managers in Paris took fright at the prompt extinction of singers after a few nights of trial, and the movement was set afloat to lower the pitch, and they fell foul of the instrument makers as the main cause of the evil. The composers in Paris coalesced with the opera directors, considering that a growing evil could only be checked by official intervention. The Imperial government granted the formation of a committee to establish in France the uniform musical pitch. The members of the commission were Meyerbeer, Rossini, Ambroise Thomas, Halevy, Auber, and Berlioz, all members of the Institute; MM. Despretz and Lessagous, professeurs de physique at the Faculty of the Sciences; M. Camille Doucet and M. Edouard, connected with the ministerial management of the theatres; General Mellinet, who was chief of the organisation of military music; and M. Pelletier, of the Ministry of State, who was named president of the commission, which was formed in July, 1858, and its report published in the *Moniteur* of July, 1859. The conclusions arrived at by the commission were adopted by Imperial decree, signed by Achille Fould, whereby the 'pitch' in France was fixed under the title of diapason normal, on the basis of 870 vibrations per second for the A, equivalent to our standard of A 435—C at 522. The report is curious in the facts given in evidence of the variability of the pitch; out of 25 tuning forks, 15 were below the Paris pitch. The majority of authorities went for the lowering of the pitch and for the uniformity, but differed materially as to the gradations. More encouragement was received from Germany than from Italy, where the pitch is to this day much the same as our opera pitch, the highest being in Belgium, in the military bands. Scarcely two towns in France were agreed as to the diapason. The maximum elevation of the pitch was the music of the famed band of the Guides in Brussels, the minimum diapason was in Carlsruhe and Toulouse. France, however, in 1859, adopted the 'diapason type,' executing 870 vibrations per second at the temperature of 15 degrees centigrade. The standard is regulated by administrative verification. The French pitch has travelled little beyond the frontiers. It has not been accepted either in Italy, Germany, Belgium, Holland, Spain, or Portugal, in which countries there are varying standards. . . . . The origin of the present agitation arose from the failure of a French tenor who made his *debut* last season at the Royal Italian Opera as *Arnold* in Rossini's 'William Tell.' His *fiasco* was ascribed to the 'high orchestral pitch,' ingenuously put forth as an excuse for the introduction of a singer who ought never to have been engaged; but the best joke with the apology is that the music of the duo, trio, and air was expressly transposed for him. Transposition, indeed, at the Italian Opera House, naturally took place when a singer was out of voice, but the pitch under which Madame Persiani, Grisi, Malibran, Jenny Lind, Rubini, Mario, Lablache, Tamburini, Bosio, Patti, Lucca, and others sang for years was that not only of London but throughout the United Kingdom. It was reserved for a tenor who has won his fame under this pitch to attack it, after singing for more than twenty years without protest. But Mr. Sims Reeves sang recently at Leeds, Liverpool, Manchester, and Birmingham, within a fortnight, and, according to all accounts, was in splendid voice. But if Mr. Sims Reeves conscientiously believes that the present standard is so detrimental, how is it that he has invariably deviated from Handel's scores to bring out his favourite A? The upper A given out with such brilliancy by him in 'Thou shalt break them,' in 'Sound an alarm,' and 'The enemy said,' is not in the scores of the 'Messiah,' 'Judas Maccabœus,' and 'Israel in Egypt.' Mr. Sims Reeves of his own free will thought it expedient for effect to throw out his pet high note. If his reverence for Handel now influences him to sigh for the tuning fork of 1740, ought not similar respect to be paid to Handel's notation? If the musical institutions of this country would not fall in with the recommendation of the Society of Arts how can it be expected that the French diapason will now be adopted, with the question of compensation to instrumental performers and makers yet unsettled? The adoption of one pitch for the musical world is, in fact, attended with as many practical objections as the acceptance of the universal decimal theory for accounts and measurement, and an international coinage. There are too many conflicting interests at stake, and too many theories afloat, to secure uniformity and unanimity." . . . . .

THE RACES OF INDIA AND THEIR ARCHITECTURE.

It may be hoped that some fruits of the measures taken by the Government of India to send specimen casts of the different styles of ancient architecture will soon be seen in this country. The members of the Society hardly require to be reminded of Mr. Fergusson's paper on the subject, and the discussion which followed (see *Journal*, Vol. XV., p. 71). In elucidation of the several divisions of the races of India, and the better to understand their architecture, the following observations will be useful:—

Aryans (pronounced Arr-yuns).—There is every reason to believe that the great plains of Asia north of India

were, in remote ages, occupied by a numerous nation, chiefly pastoral, and that they sent out successive swarms, which spread over the west of Asia and nearly the whole of Europe, Afterwards the great body of the nation crossed the Himalaya chain of mountains, and conquered and occupied most of what is now called India, expelling or enslaving the original inhabitants. Some of these, however, were able to maintain their independence in certain mountainous districts, and a considerable number remained at the southern extremity of India, especially on the eastern coast, just as the Britons occupied Cornwall after the rest of the country had been subdued by the Saxons. To these southern tribes and their languages the name of Dravidian has been given; and the latter, though mixed with many Sanscrit words, are plainly derived from a different stock. The *Santhals*, about whom a good deal was said a few years ago, are also a remnant of the old inhabitants. Nothing whatever is known of the history of the invaders previous to their crossing the mountains, except what can be learnt from the affinities of language, since they had then no written records or public buildings.

Not long, probably, after the descent into India, or about 1,500 years before our era, the sacred hymns which they had brought with them were committed to writing; These are now termed the Rig Veda.* Afterwards two other Vedas were composed, or, as the Hindoos say, revealed, for all these are considered to have a divine origin. These other two, the Yajur Veda and Sama Veda, are founded mostly on the Rig Veda, the former having reference to sacrifical ceremonies, the latter having the hymns arranged for chaunting, with, of course, much additional matter. There is another veda, the Atharva Veda, which is chiefly rubrical, containing minute directions for the performance of the numerous religious ceremonies. This is regarded as inferior to the others, which are especially termed the Veda Triad, or three vedas.

Probably soon after the Vedas had been written, the spoken language, which had altered considerably (so as to differ from the Vedic language quite as much as the English of the 14th century differs from Anglo-Saxon), was fixed and regulated by numerous and minute rules, and has ever since been the subject of a very large number of grammatical commentaries. The oldest grammarian, Panini, whose works still exist, lived probably at least seven hundred years before Christ, and he refers to older grammarians. This language, the previous name of which is unknown, was then called Sanscrita, "The perfected or arranged," and it has ever since been the literary language of India, just as Latin was of Europe in the middle ages; and it still keeps its ground, for, though like the Latin a dead language, it has a certain amount of vitality, since it admits of new compound words to any extent, and is, therefore, able to express new objects and new ideas. It is usual to speak of languages being derived from the Sanscrit; this is incorrect, and only a convenient form of saying that they are derived from that language of which Sanscrit is the nearest representative. From this ancient language then are derived a considerable number of the Indian languages, Persian, Greek, Latin, and all the languages of Europe except Turkish, Hungarian, Finnish, Basque, and perhaps Lapp. As the name of the nation is unknown so is that of their language, but since they called themselves Arr-yas—(literally worthy or noble), in contradistinction to the conquered races, whom they termed Mléchas, or barbarians—this word has recently been employed to designate the whole race.

Hindoos.—In the Rigveda Agni, fire is the chief deity, and the objects of worship and invocation are mostly the various natural powers or phenomena—sun, moon, wind, clouds, &c. Somewhat later a trinity was worshipped—Brahma, Siva, and Vishnu, three in one. Vishnu had numerous avataras or incarnations. Two of the most famous of these are Ganésa and Krishna. The images of the former have always an elephant's head. The latter is represented quite black. Besides these there is a vast array of inferior gods, the chief of whom is Indra, corresponding with the Greek Jupiter, as wielding the thunderbolt and dispensing rain, &c. The inferior gods correspond with the nymphs, fauns, satyrs, &c., of Greece. Then there were numerous Rishis or saints, to whom many miracles are attributed, and to some of whom the Scriptures were revealed. The Hindoos believe that every human soul is an emanation from Brahma, and will ultimately return to and be absorbed in him, the interval being long or short according to the piety or otherwise of the man's life, the wicked entering successively into numerous bodies, not only of men, but of brutes. The prayer of every pious Hindoo is therefore for Moksha, or liberation from a mortal body. At the same time they believed that for a time numerous spirits of the good inhabited Swarga, a heavenly paradise. Their notions of time are very extravagant, since they reckon by Kalpas, each of which is more than four thousand million years.

The doctrine of caste is not to be found in the Vedas. It was first embodied in the laws of Manu, a work which contains most minute directions on the subject, and which is certainly of a later date than the Vedas. The Hindoos imagined that by bodily penance and mental abstraction a Brahman might raise himself above the inferior gods; and allusions are often made to obstacles thrown in the way of such penances by the gods, who were jealous of the possible result. As an instance of the extent to which penance was supposed to be carried, one of their greatest saints is represented as lying quite still on the ground so long that his body was almost buried by ant hills, and the birds built their nests in his tangled hair.

The *Jains* did not accept the Vedas; they especially worshipped or honoured a deified saint, Arhat. They were remarkable for their excessive regard for life, taking care not to destroy even the smallest insect.

Somewhere about the fifth century before Christ there appeared a remarkable man, Gautama or Sakya Muni, afterwards called Buddha (literally, the instructed or intelligent). He preached a much purer religion than the prevailing one, and, while admitting the authority of the Vedas, utterly ignored all distinctions of caste, declaring that all men were equal in the sight of God. He also laid great stress on brotherly love and works of charity, and set an example by giving up high rank and great possessions, and going about preaching. His success was so great that at last a great part of India was converted to his opinions. Some time after his death, however, the Brahmins regained their influence, and Buddhism almost ceased to exist in India; it had, however, spread to Ceylon, Thibet, and China, where it continues to flourish to this day, though its followers have long departed from the simplicity and purity of the religion as laid down by its founder.

* "Rich" is the Sanscrit for verse—ch at the end of a word becomes k; and k g, before a soft consonant. Veda is from the verb *vid*, to know, English wit, Latin *video*.

Fine Arts.

Fine Art Exhibition at Metz.—The Society of the Friends of the Arts of the Moselle have decided that an exhibition shall take place at Metz this year. It is to open on the 1st day of May, and to close on the 20th of the same month, in order that the artists exhibiting there may have the opportunity of sending their works to the Strasburg exhibition, which opens soon afterwards. The Metz exhibition is open to artists of all nations, and works are to be sent in to the Hôtel de Ville of Metz five days at least before the opening day. The society pays the carriage of works for exhibition both ways on the following conditions:

—That the distance shall not exceed forty myriamètres, or about eighty leagues; that the packages shall not weigh more than 150 lbs., and that they shall be sent by the most direct route. Letters of advice must also be sent to the secretary of the society, Rue et Hôtel de la Bibliotheque à Metz, containing an exact description of the subject for the catalogue, and, if for sale, the price of the work. Engravers, lithographers, and photographers are invited to send their own productions or reproductions of original works, but the space devoted to these is, if possible, not to exceed a square mètre for each exhibitor. A portion of the funds of the society will be applied to the purchase of works exhibited.

MEETINGS FOR THE ENSUING WEEK.

Mon.....Society of Arts, 8. Cantor Lectures. Mr. S. A. Hart, R.A., "On Portrait Painting."
Farmers' Club, 5½. Mr. J. Trask, "On Pauperism and Vagrancy."
Social Science Assoc., 8. Mr. Barrow Rule, "On Scholastic Registration."
Royal Inst., 2. General Monthly Meeting.
R. United Service Inst., 8½. 1. Lieut.-Gen. W. N. Hutchinson, "Recoil Utilised." 2. Lieut. C. P. Stone will exhibit Models illustrative of his new Gun Platform.
Entomological, 8½.
British Architects, 8.
Medical, 8.
London Inst., 6.
Tues ...Civil Engineers, 8.
Pathological, 8.
Anthropological, 8.
Syro-Egyptian, 7½.
Royal Inst., 3. Mr. Westmacott, "Fine Art."
Wed ...Society of Arts, 8. Mr. P. L. Simmonds, "On the Useful Application of Waste Products and Undeveloped Substances."
Pharmaceutical, 8.
R. Society of Literature, 4½.
Obstetrical, 8.
Thur ...Royal, 8½.
Antiquaries, 8½.
Royal Inst., 3. Dr. M. Foster, "On the Involuntary Movements of Animals."
London Inst., 6.
Linnæan, 8.
Chemical, 8.
Royal Society Club, 6.
Society of Fine Arts, 8. Exhibition of the Drawings and Sketches of Thomas Girtin. Paper by Mr. H. Warren.
Fri .....Geologists' Assoc., 7½. Annual Meeting.
Philological, 8¼.
Royal Inst., 8. Mr. J. Fergusson, "Tree and Serpent Worship."
Archæological Inst., 4.
Sat .....Royal Inst., 3. Prof. Odling, "Hydrogen and its Analogues."

Patents.

From Commissioners of Patents' Journal, January 22.

Grants of Provisional Protection.

Anchors, weighing, &c.—50—F. R. A. Glover.
Artificial flowers, &c., manufacturing—39—H. L. Vallée, H. A. Dourlet, and A. M. H. Armand.
Ball valves—95—G. V. Osborne and A. J. Peerless.
Boilers—2882—J. Smith and J. Dewdney.
Boilers, apparatus for feeding—48—H. Davey.
Boxes, &c., manufacturing from paper pulp—83—J. H. Johnson.
Chandeliers, &c.—19—W. A. Biddell and J. Redgrave.
Coal, &c., compressing and solidifying—54—H. G. Fairburn.
Coffee, &c., preparing—56—J. Maugnall.
Copying ink, manufacturing—47—J. F. Cooke.
Cotton, &c., preparing—57—W. Tatham.
Counterpanes, &c., weaving—76—J. Knowles.
Cranes—73—A. Baumann.
Discs having designs formed around their circumferences, moulds for casting—103—L. Hannart.
Elastic rubbers—101—L. Sterne, J. A. Jaques, and J. A. Fanshawe.
Fire-arms—79—J. B. Palmer.
Fire-arms, &c.—88—A. Henry.
Food tablets, concentrated—51—J. H. Johnson.
Gas—45—G. Eveleigh.
Hats, apparatus for manufacturing—3604—H. Swithenbank.
Hydrocarbon oils—32—A. Mason.
Indian corn, treating—84—F. C. Matthews.
Iron and steel—53—J. J. Bodmer.
Iron and steel, &c.—66—J. Henderson.
Jute, &c., treating—52—W. Webster.
Knitting machinery—92—A. V. Newton.
Ladies' umbrella and dress suspender—86—C. McDougall and C. H. Eden.
Lamps—96—H. Aitken.
Lamps for diving operations, &c.—3724—C. F. C. Cretin & J. Watson.
Land, ploughing and cultivating—3736—T. Speir.
Lifting apparatus—61—A. B. Brown.
Looms—74—J. Holding.
Looms—87—W. E. Gedge.
Lubricators—59—J. Daglish.
Milk cans—85—C. Newsome.
Milk, &c., apparatus for cooling—3716—I. E. Woolf.
Motive-power—68—R. Legg.
Motive-power—102—J. Parker.
Napthaline, producing colours from—89—A. P. Price.
Pipes or tubes, uniting the ends of—105—W. R. Lake.
Ploughs—60—R. Wigram.
Portraits, &c., exhibiting—58—T. P. Lucas and G. H. J. Holt.
Railway breaks, &c.—55—C. Kendall.
Railway carriages, &c.—82—C. W. Spong.
Railway chairs, securing wooden keys in—99—P. M. Barnett.
Reaping and mowing machines—3566—T. Culpin.
Reaping and mowing machines—97—S. Jellymann.
Refrigerators—70—M. Saunders and H. Forrest.
Rotary engines, &c.—72—T. Moore.
Saccharine matters, treating—62—W. T. Waite.
Sewing machines, &c., giving motion to—49—F. N. Gisborne.
Shafting and gearing—93—D. L. Coates, Q. Dunlop, and W. Orr.
Ships, &c., defending against injury from projectiles—91—F. Sykes.
Ships, &c., protecting the bottoms of—106—C. P. Coles.
Signalling by compressed air—81—W. H. Penning.
Steam engines—3815—P. Kotzo.
Steam engines, &c, packing for—104—J. Schlösser.
Stench traps—46—J. Mansergh.
Sweatmeats—3978—W. E. Gedge.
Vessels, propelling—77—J. Jordan and J. Jordan, jun.
Water-closets, substitute for—100—J. Steel.
Water meters—90—B. Hunt.
Window blinds, &c.—78—T. A. Warrington.
Wood, treating—3758—A. Matthiessen.
Wool, &c., washing—80—J. Petrie, jun.

Invention with Complete Specification Filed.

Railway carriages, locomotives, &c., wheels for—175—W. R. Lake.

Patents Sealed.

2310. J. Bowron and G. Lunge.
2312. E. T. Hughes.
2325. F. H. Danchell.
2338. J. Greenhalgh.
2349. J. A. Hogg, jun.
2350. G. R. V. Loughton and E. B. Jackson.
2351. J. Higgin.
2365. G. Hodgson, H. Bottomley, and E. Cockroft.
2383. S. C. Lister.
2384. J. Jeffreys.
2387. A. Watkins.
2389. S. C. Lister.
2390. T. H. Roberts and B. C. Cross.
2396. T. Prosser.
2406. P. N. J. Macabies.
2407. B. Sharpe.
2426. C. Geoghegan.
2428. J. Scott.
2430. S. Plimsoll.
2463. A. M. Clark.
3089. T. Heacock.

From Commissioners of Patents' Journal, January 26.

Patents Sealed.

2363. T. Hydes and J. Bennett.
2364. J. Webster.
2366. J. Bullough.
2367. C. A. La Mont.
2368. W. R. Lake.
2369. S. M. Martin & S. A. Varley.
2373. F. Winser.
2374. J. Mabson.
2376. W. R. Lake.
2377. W. R. Lake.
2381. J. Radcliffe.
2386. G. Woodhouse and J. G. McMinnies.
2398. J. and H. A. Gwynne.
2429. H. O. Robinson.
2433. G. N. Shore.
2438. T. Ward.
2449. F. W. Kitson and P. Chalas.
2466. A. V. Newton.
2498. D. Fruwirth & A. Hawkins.
2549. J. Fletcher, sen., J. Fletcher, jun., & W. Fletcher.
2588. F. Braby.
2601. A. V. Newton.
2621. W. R. Lake.
2649. S. Morris.
2763. A. R. Stocker and J. A. Edgley.
2769. J. Stewart & J. Nicholson.
3338. L. Berenger.
3610. W. R. Lake.
3723. W. R. Lake.

Patents on which the Stamp Duty of £50 has been paid.

243. W. Clark.
203. T. Rowatt, jun.
227. E. Hopkins.
238. G. Hinchliffe.
257. F. L. Roux.
321. A. Murray.
425. B. W. Farey.
303. R. Clayton, J. Raper, J. Goulding, & W. Howarth.
229. J. W. Evans.
241. J. Jones.
262. R. A. Brooman.

Patents on which the Stamp Duty of £100 has been Paid.

191. J. Alison.
239. W. E. Newton.
197. D. Edleston and H. Gledhill.

Journal of the Society of Arts.

FRIDAY, FEBRUARY 5, 1869.

Announcements by the Council.

Ordinary Meetings.

Wednesday Evenings at eight o'clock :—

February 10.—"On the Training and Education of Pauper Children." By G. C. T. Bartley, Esq.

February 17.—"On the Efficiency and Economy of a National Army in Connection with the Industry and Education of the People." By Henry Cole, Esq., C.B. On this evening the Right Hon. T. Milner Gibson will take the chair. If necessary, the discussion will be continued on the following Friday morning, the 19th instant, at 11 a.m.

February 24. — "On Ventilation." By Edward Smith, Esq., M.D., F.R.S.

March 3.— "On the Adaptation and Extension of Present Means for the Promotion of Scientific Instruction." By H. H. Sales, Esq.

Cantor Lectures.

A Course of Four Lectures, "On Painting," is now being delivered by S. A. Hart, Esq., R.A., late Professor of Painting at the Royal Academy, as follows :—

Lecture II.—Monday, February 8th.

On the Practice of Portrait Painting.

Lecture III.—Monday, February 15th.

On the Suggestions offered by surrounding circumstances to the Artist.

Lecture IV.—Monday, February 22nd.

On Landscape Painting.

Each lecture will begin at eight o'clock. These Lectures are open to Members, each of whom has the privilege of introducing two friends to each lecture. Tickets for this purpose have been forwarded to each member.

FINAL EXAMINATIONS, 1869.

In order to avoid holding these Examinations on the same evenings as those of the Department of Science and Art, it has been decided to hold them, in 1869, on the evenings of

TUESDAY, the 20th APRIL,
WEDNESDAY, the 21st ,,
THURSDAY, the 22nd ,,
FRIDAY, the 23rd ,,

From 7 p.m. to 10 p.m., instead of on the 27th, 28th, 29th, and 30th April, as announced in the Programme of Examinations for 1869.

In consequence of this alteration the Previous Examinations must be held earlier, and the Forms No. 2 and No. 4, referred to in par. 6 of the Programme, must of course be sent in a week earlier than the dates there fixed for receiving them.

It is very important that this alteration should be made as public as possible. For this purpose a number of small slips, to be inserted between pages 8 and 9 of every Programme sent out, have been forwarded to each Institution and Local Board. Large bills, to be suspended on the walls of the Institution reading-room, or in some other public place, will also be sent on application.

In reference to the subjects referred to in the notice at page 9 of the Programme, a sufficient number of applications from candidates in Conic Sections, Navigation and Nautical Astronomy, and Mining and Metallurgy, have already been received. Papers will therefore be set in these subjects.

Candidates desiring to be examined in Italian should communicate their wishes without delay.

Elementary Examinations, 1869.

Secretaries of District Unions and Local Boards desiring to adopt the Society's scheme of Elementary Examinations, are reminded that they must apply to the Secretary of the Society of Arts before the 10th of February, stating the number of male and female Candidates respectively desiring to be examined in each grade.

Committee on India.

The Council have resolved that a Committee be formed "to organize meetings for the discussion of subjects connected with the Arts, Manufactures, and Commerce of our Indian Empire."

The following gentlemen have been already invited to serve on this Committee:—

Archibald Campbell.
George Campbell.
Edwin Chadwick, C.B., Member of Council of Society of Arts.
Hyde Clarke, Member of Council of Society of Arts.
Sir Daniel Cooper, Bart., Member of Council of Society of Arts.
Sir William Denison.
Maj.-Gen. Sir Vincent Eyre, C.B., Member of Council of Society of Arts.
C. H. Fielder.
W. S. Fitzwilliam.
George Moffatt.
Sir Robert Montgomery, K.C.B., Vice-President of the Society of Arts.
Colonel Sykes, M.P.
Captain Edward Thackeray.
Sir Charles Trevelyan, K.C.B.
Dr. J. Forbes Watson.

In addition to these gentlemen, the East India Association has been requested to nominate three of its members to join the Committee.

The Secretary of the Society of Arts will be glad to receive the names of any members of the Society taking an interest in Indian questions, in order that they may be invited to attend the meetings above referred to.

Institutions.

The following Institution has been received into Union since the last announcement:—

Belfast, Union-place Science School.

Subscriptions.

The Christmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Food Committee.

A meeting of the Committee took place at the Society's House, on Wednesday afternoon, 13th January. Present—Mr. Benj. Shaw (in the chair), Mr. G. F. Wilson, F.R.S., Mr. H. Michael, Rev. J. E. Hall, and Mr. J. A. Youl.

Mr. Hardwicke, of 192, Piccadilly, attended for the purpose of informing the Committee as to the results of Professor Gamgee's process of preserving meat in accordance with the patents taken out by him before leaving this country for America. Professor Gamgee's process is thus described in his patents:—"The animals whose flesh is to be preserved are, when this is possible, killed by causing them to inhale carbonic oxide gas, which may be generated by the action of heat on a mixture of sulphuric and oxalic acids, or of sulphuric acid and ferrocyanide of potassium, or by any other method which yields carbonic oxide gas. The animals are then bled and dressed in the usual way, and the flesh may then be sold as human food, and even if it has travelled any distance it will retain a fresh and bright appearance longer than ordinary killed meat. The flesh of animals slaughtered with the aid of carbonic oxide gas or of animals slaughtered in the usual way may further be preserved as follows:—Firstly, by being placed in a closed chamber or vessel containing carbonic oxide gas alone, or a mixture of carbonic oxide and air or other gas or vapour for a period varying from two to twenty-four hours with a view to a complete action on the meat and its juices. Secondly, by simple fumigation of the entire carcase or portions of the carcase, after the action of carbonic oxide, by means of sulphurous acid gas alone or in combination with hydrochloric acid gas."

Previously to the meeting of the Committee, a piece of beef and some mutton chops, portions of the meat sent from America by Professor Gamgee, prepared by his process, having been cooked, were tasted by the members of the Committee present.

Mr. Hardwicke now informed the Committee that on the 4th December, 1868, Professor Gamgee, having had the animals killed in the manner described above, caused a large air-tight tank to be filled with two quarters of beef, two hams, eight sheep, and a large hog, when they were subjected to his process. This was done in New York. On the 12th the tank was opened, and the meat removed from it. On the 16th the carcases of four sheep (whole), a quarter of beef, and half a hog, were wrapped in cloth separately, put into one large, rough packing-case, and forwarded to England by the Royal Mail-ship *Cuba*. It arrived in Liverpool on 29th of December, whence it was despatched by the London and North Western Railway to Mrs. Gamgee, at Bayswater, arriving there on the 30th December. The meat exhibited before the Committee that day was part of that so sent, and was preserved in accordance with Professor Gamgee's patented process. Mr. Hardwicke added that a letter he had received from Professor Gamgee informed him that the cost of preserving the carcase of a bullock was from 2s. to 3s.; that two men could preserve as many carcases as fifty men could slaughter; and that the cost of apparatus to slaughter and preserve one hundred bullocks per day would not exceed £10,000. The cost of conveyance of the package of meat referred to, which weighed about 400lbs., was stated to be £2 7s. 6d., which was accounted for by its being brought by a mail steamer, the freight of which was much higher than that ordinarily charged by trading ships. Professor Gamgee believed, from inquiries he had made, that the cost of transit would be considerably under a halfpenny per lb. With reference to the prime cost of the meat, of the quality of that sent from New York, Mr. Hardwicke said it probably cost within a 1d. per lb. in that city of what it could be bought for in this country; but, he added, in the event of the process succeeding, the supply of meat would be obtained from much cheaper markets. He was informed, he said, that in Kansas a bullock in condition for killing could be purchased for £1, and to that had to be added the 3s. for curing and the cost of conveyance to this country. That would enable the meat to be sold at 3d. or 4d. per lb. here, and leave a good margin of profit to the adventurers.

Mr. Michael observed, that working out the £10,000 capital for setting up an establishment of the capacity stated, the cost would be 3s. 4d. for slaughtering and preserving a carcase of beef. That would leave 6 per cent. for interest and depreciation. On the general question as to the probability of the meat reaching this country in such a condition that people would eat it, and also on the commercial prospects of the matter, Mr. Hardwicke had expressed a favourable opinion, and a desire to see the experiment carried out on a sufficiently large scale to test the success of the process both scientifically and commercially.

The Committee recorded their opinion that the beef and mutton produced that day was untainted and well preserved. Some members detected an acid taste in the beef, and others noticed nothing peculiar. The mutton was pronounced to be slightly flat. It was, however, the opinion of the Committee, that the mutton exhibited was of inferior quality of meat.

Mr. Alexander F. Baillie attended, and gave information relative to a proposal to import live cattle from the River Plate.

Cantor Lectures.

The first lecture of the course by Mr. S. A. Hart, R.A., "On Painting," was delivered on Monday evening, the 1st inst., the subject being "The History of Portrait Painting." An outline of these lectures will appear in the *Journal* at an early opportunity.

Ninth Ordinary Meeting.

Wednesday, February 3rd, 1869; Charles Tomlinson, Esq., F.R.S., in the chair.

The following candidates were proposed for election as members of the Society:—

Anderson, John, 11, Carnmoney-street, Belfast.
Edwards, Henry Arthur, 132, Upper Thames-street, E.C.
Hunt, Charles, the London Gas Light Company, Nine Elms.

The following candidates were balloted for, and duly elected members of the Society :—

Alabone, Edwin George, Earlswood-house, Hackney, N.E.
Barrow, Captain Robert Knapp, Naval and Military Club, Piccadilly, W.
Clare, Walter Frederic, 16, Trafalgar-road, Old Kent-road, S.E.
Davison, William, 1, Lupton-villas, Tufnell-park-rd., N.
Dipnall, Mathias, S.S., Christ's Hospital, E.C.
Jones, Robert, Manor-house, St. John's.wood-pk., N.W.
Proctor, George James, Newport, Isle of Wight.
Smith, John Whittet, Elvet-house, Clapham-common, S.W.
Stone, John Benjamin, F.G.S., Union Glass Works, Dartmouth-street, Birmingham.
Walker, Lieut.-Col. W. L., 84, Inverness-terrace, W.
Wright, Henry Edward, St. Mary's National School, East Greenwich, S.E.

The Paper read was—

ON THE USEFUL APPLICATION OF WASTE PRODUCTS AND UNDEVELOPED SUBSTANCES.

By P. L. Simmonds, Esq., F.S.S., &c.

About fifteen years ago, in a paper read before the Society, I threw out various suggestions as to the useful applications of "Some Unappreciated and Unused Articles of Raw Produce from different parts of the World,"* for which the Council did me the honour to vote me their silver medal. Just ten years ago, I again called the attention of the members to the "Utilisation of Waste Substances."† These notes I afterwards amplified into a popular volume, published under the title of "Waste Products and Undeveloped Substances," which passed through a large edition, and is now out of print. From the very many interesting papers that have since been read before the Society on the utilisation of other waste substances, and knowing from personal experience, and a close investigation at the different International Exhibitions with which I have been officially connected, that many of these hints and suggestions have developed themselves into important industries, I have thought that a short notice of the application and progress made with some of these formerly waste products might not be without interest.

I am aware that there is a kind of contradiction of terms in the expression of the utilisation of waste, since by the utilisation of all residuary matters there will be no waste in any manufacturing operations. There are many natural products, however, yet lying waste or undeveloped, to which attention will one day be prominently turned, as new demands arise to be supplied. My desire is to press upon the attention of all persons engaged in the useful arts the importance of the prevention of waste, and I shall advert briefly to the utilisation of the refuse products of certain manufactures and processes of domestic economy, with the hope of suggesting to those engaged in other trades the profits which might accrue to themselves, and the benefits which would result to mankind, from the useful application of these hitherto worthless residues.

In our great textile industries all the residue and nominal waste is pretty generally utilised; the waste from the cotton, woollen, and silk manufactures is all fully appreciated. Thus we import some 25,000 to 30,000 cwts. of silk waste to be used up. There are at least 60,000 tons of cotton waste in the cotton manufacture, which, added to 20,000 tons of linen waste, and the same quantity from rope and canvas, gives a large total to be worked up again for various purposes.

The enormous increased production of wool in the last ten or fifteen years has somewhat lowered prices, but has not done away yet with the using up of shoddy or re-converted woollen rags. Besides the large quantity of shoddy and mungo produced at home, we import 22,000,000 pounds of woollen rags, torn up to be used as wool. The use of shoddy in the last fifteen years has assumed gigantic proportions.

It has been well observed that the combination of shoddy with wool, together with the use of cotton warps, is the most valuable adaptation of materials in the history of the woollen trade which the ingenuity of man has discovered. By it multitudes of the humbler classes are enabled to obtain useful and comfortable articles of clothing, which formerly were beyond their means. Nor does it stop here. An immense mass of material, once thought all but valueless, has been rescued from the manure-heap, and made subservient to the wealth, industry, and comfort of millions. A feeling of prejudice or a smile of ridicule may rise at the thought, but manufacturers and consumers owe more to it than they are ready to admit. The manufacturers of pure wool goods are deeply indebted to it, for it has allowed them a full supply, which they could not have had, except at ruinous prices.

It often happens that the value of a thing is only discovered after its loss. Stop the supply of shoddy, and you may reasonably expect to double the present price of wool, and deprive millions of their warm and cheap winter garments, and their light and useful summer ones. Stop the supply of shoddy, and you will close one-third of the woollen mills in the kingdom, and bring distress upon the West Riding of Yorkshire.

In all civilised and densely-populated countries, of the animals used for the food of man, it may be said that nothing is wasted, every part that is not eaten being turned to some useful purpose; the refuse fat is converted into tallow or soap, the greater portion of the skin is made into leather, and the scraps, with the hoofs, feet, and various membranes, converted into glue, the horns made into various useful articles, and the bones produce phosphorus and manure.

When, in 1854, I drew the attention of the Society to the large quantities of animal food wasted in Australia and the River Plate districts, the subject of increased animal food supplies for our home population had not reached the importance it now possesses. The inquiries set on foot by the Food Committee of the Society have resulted in the publication of much useful information. The British people eat more meat than any other nation; and with the progress of industry, and the larger accumulation of population in towns, we find our home supply is not sufficient, while prices continue to advance. Naturally, then, we turn to those great pastoral countries where meat is a drug, and numerous endeavours are being made, with more or less success, to place within the reach of the meat-consuming people here the good beef and mutton of Australia and the River Plate.

Take the great empire of Russia—what an enormous waste of good animal food is there met with, owing to the difficulty of bringing it to a profitable market—with 20 million horses, 30 million head of cattle, and 60 million sheep, besides 10 or 12 million head of swine, the 60 millions of population can not only be well fed, but have a large surplus available, which is only rendered into tallow. The production of tallow annually is stated to be about 200,000 tons, of which half is consumed locally. The average price of meat in Russia is four copecks, or a penny per pound. Not only the fat and the bones, but frequently the entire carcase, is thrown into the melting-pot for tallow.

It is certainly tantalising to many hungry mouths, who find meat an expensive necessary here, to know that the South American States have 70 millions of sheep and 22 millions of cattle, which they scarcely know what to do with, except for their skins and tallow; while there are in the Australian colonies four million cattle and nearly 40 million sheep. It is true that, failing in the transport of some of this surplus here, strong efforts are making to draw population to those productive regions,

* See *Journal*, vol. iii., p. 33.
† See *Journal*, vol. vii., p. 175.

where numerous advantages are held out to immigrants. Still, our home production of animal food is not likely to keep pace in the United Kingdom with the growth of population. Nine millions of cattle, and 35 millions of sheep, do not suffice for our 25 millions of people, and compare rather unfavourably with the enormous numbers in more extended but less densely populated pastoral districts.

Unfortunately, in this instance, distance does not lend enchantment to the view, and commercial and scientific men are striving what can best be done towards bringing the surplus food here alive or dead. The cooked meat does not find general favour, and the modes of preparing raw meat at present in use are scarcely less satisfactory. Whether the reward offered by the Argentine Republic will lead to the adoption of any new improved process remains to be seen. Several screw vessels are, I believe, being specially fitted out to bring over cattle alive from the River Plate; but those who have had experience in the cattle traffic, from much shorter distances, will, I think, agree with me that the profitable results for so long a voyage are very doubtful, looking at the difficulties of supplying water and fodder, even after the cattle have been driven from long distances to the port of embarkation.

Horned stock has increased of late in Australia in a more rapid ratio than the population, and the consequence is that the supply of beef being greater than the demand, a market has to be found for the surplus in other parts of the world. The price of cattle is already commonly quoted "at boiling rate," in other words, fat cattle will fetch no more from the butchers than can be realized from their hides, horns, hoofs, tallow, &c., for exportation. Under the old and slovenly system of sending cattle to the melting-pot, it is certain that from one-fourth to one-half of what ought to have been profitably turned to account was wasted. The value of cattle and sheep must in future be measured in the colonies not by the local demand for butchers' meat, but by the price which can be obtained for the various constituents of the carcase in the markets of the world. The utilisation of this waste animal food has received a large share of attention in the past two years from various Australian companies established to prepare animal food in different forms, whether as extract of meat, tinned provisions, or dried and smoked meat.

A new use for a formerly waste substance is the legalised employment of horse flesh for food in France. The Society has already drawn attention to this matter, but horse flesh as human food is not likely to find much favour in this meat consuming nation, where even the very poorest classes are the most dainty in their requirements.

The Prefect of Police of Paris, in June, 1866, issued an ordinance recognising and regulating the use of horseflesh for human food. Considering (says the document) that the flesh of the horse has been introduced into consumption in several countries without apparent harm, the sale of horse meat as food is permitted on the following conditions:—That special slaughterhouses be established; that no meat be sold by the ordinary horse slaughterers; that the animals whose flesh is to be eaten be killed in the presence of a veterinary inspector; that the pieces shall be stamped; all unhealthy horses are excluded; at every place where such meat is sold the fact must be indicated by a placard; all restaurateurs or others who make use of horseflesh shall be compelled, under penalties, to inform their customers of the fact. The consumption of horseflesh as food appears to be largely on the increase in Paris. An official return lately published shows that the consignment of salted horse to the capital from the department du Nord amounts to nearly 30,000 pounds weekly.

I pointed out in a former paper that more attention was being given to the waste products of the fisheries; but in this industry enormous progress has been made. Every description of fish is useful for some purpose or other, and very many, such as the dog fish and others, which were formerly thrown away, are now largely used as food on the Continent.

The shark fishery is carried on in many parts of the Indian Ocean and on the eastern coast of Africa, but lately it has been pursued on the coast of Norway. About Kurrachee, in India, as many as 40,000 sharks are taken in the year. The back fins are much esteemed as a food delicacy in China, from 7,000 to 10,000 cwt. of these being shipped annually from Bombay to China. There are two kinds, known as white and black fins, which appear to be chiefly obtained from *Rynocobatus pectinata*, *R. laevis*, and *Galiocorda tigrina*. White fins fetch 60s. the maund, black fins only 18s. When the fish are landed, the back fins, the only ones used, are cut off and dried in the sun on the sand; the flesh is cut off in long strips and salted for food; the liver is taken out and boiled down for oil; the head, bones, and intestines left on the shore to rot, or thrown into the sea. The rough skin of some sharks is used by the native workmen for polishing wood and ivory, and is also made into shagreen.

The shark fishery affords very lucrative employment to the inhabitants of the northern districts of Norway, where it is carried on on an extensive scale, the four following species being met with: the Greenland shark *(Scymnus borealis)*, the basking shark *(Selache maximus)*, the picked dog fish *(Squalus acanthias)*, and *Squalus spinax niger*. The fishery is carried on in boats of 25 to 35 tons, with a crew of six men, and, anchoring on the banks, they fish with seal blubber. The Greenland shark varies from 10 to 18 feet, and the liver yields from one half to two barrels of oil. After taking out the liver, and inflating and tying up the fish again, it is thrown back, and floated away. When the fish can be towed to shore, the flesh is converted into food for the cattle, should the dried fish heads, on which they are usually fed, be scarce. It is also occasionally used as human food, being cut into long strips and dried in the open air, or buried in the ground until partially decomposed, when it is taken up and prepared in a peculiar manner. It requires, however, an Arctic stomach to digest it.

The basking shark is harpooned; its size varies from 30 to 35 feet. This shark usually renders from five to seven barrels of liver; occasionally as much as from 10 to 16. When the liver is rich, six barrels will yield five of oil, 30 gallons to the barrel. No other part of the fish is utilised.

The fishing for the dog-fish affords lucrative employment to the fishermen during the whole of the summer, from the Naze to the North Cape. This fish is sometimes eaten fresh, but must be skinned before being cooked. It is, however, mostly smoked, and in this way it is considered rather a delicacy. It is also dried as split stock fish for consumption in the country, as well as for export to Sweden, where it is greatly appreciated. The yolk of the egg, which is about the size of a pigeon's egg, is used by the inhabitants as a substitute for other eggs in their domestic economy. The skin is employed by joiners and turners for polishing purposes. The liver is exceedingly rich, and makes a very fine oil. The other dog-fish *(Squalus spinax niger)* is the smallest of the shark tribe. It is not eaten, but sought after exclusively for the liver, which is unusually rich, and yields a very superior oil.

I cannot but conceive that we are much too dainty in our choice of edible fish, much being rejected by the fishermen that would be wholesome and nourishing. The French are more thrifty in this respect. Notwithstanding the attention lately given to fish culture, our sea fisheries require to be largely developed. It is said that nearly a tenth of the population of China derive their means of support from the fisheries; and yet, with our sea littoral, how small is the proportion of persons who follow fishing as a business. At the recent Maritime Congress, held during the Havre Exhibition, one of the questions propounded was whether attention might not profitably be given by the French to the seal, tunny,

and shark fishery, as pursued so profitably on the Norwegian coast.

There are many fish oils that might yet be brought into use for commercial and medicinal purposes. For several years M. Gobley, of the Paris School of Pharmacy, has prepared an oil from the liver of the skate, which is much less nauseous to the taste and smell than cod-liver oil. Professor Owen has also pointed out the services that might be rendered to medicine by the livers of various sharks and dog-fish which are met with on our coasts, and especially in the tropical seas, which are rejected by fishermen. In India shark-liver oil is prepared in the ports of Mangalore and Tellichery, and at Nellore and Gantour in the Madras Presidency.

M. Collas, principal naval surgeon and chief of the service of health in the establishments of French India, in the *Revue Coloniale* for 1856, pointed out that he had found shark-liver oil equally as efficacious as cod-liver oil, especially as an internal remedy in the case of certain ulcers in the inferior limbs, common in tropical countries, and for which he had previously found no remedy. I fancy, however, that the shark-liver oil has such an offensive odour and unpleasant taste that no mechanical or chemical process will remove it.

Our colliery produce cannot last for ever at the enormous rate at which we are working the mines, and as the quantity of small waste coal per annum in the United Kingdom has been estimated at 28,000,000 tons, the utilisation of this refuse is a matter of national importance in more senses than one. Various, not very successful, attempts at making patent fuel have been attempted in this country. The idea of utilising the dust and waste of coal is neither new nor recent, yet so enormous are the quantities of this refuse that there is room for very many ways of profitably treating it. Very effective and valuable fuels have been so prepared by means of admixtures of tar, pitch, silicates, and other substances. About three years ago the United Kingdom Patent Fuel Company proposed to do great things in making bricks of coal dust with farina and alkali, but the cost of the manufacture did not permit the condensed fuel to compete with ordinary coal.

On the Continent and in the United States the manufacturing efforts have been more successful. In the coal mines of Charleroi, Belgium, 800,000 tons of coal dust have accumulated, impairing the working of the mines, and M. Dehaynin, of Paris, and a company are working on this coal dust. After having it pulverized and freed from all strange matter, by machinery, this dust receives the forms and dimensions the best adapted for heating locomotives, by agglomerating eight parts of coal tar with ninety-two parts of coal dust. This mixture, heated to 300 or 350 degrees, with superheated steam, becomes a paste, which is mechanically and powerfully pressed into cylindrical or rectangular forms, and after having been cooled, solid, compact cylinders, of about five inches diameter, and weighing eighteen pounds, or prismatic blocks of about five and a half inches by seven and twelve high, weighing twenty pounds, are obtained. These blocks are very nearly the same density and weight as the solid coal, and they burn without giving obstacle to the circulation of air through the grate. This new combustible is warranted not to give more than six per cent of ashes, and is now in great demand by railway companies, on account of its greater heating power, and its being actually cheaper than ordinary coal. M. Dehaynin and the company now manufacture annually, 255,000 tons of this agglomerate. In economising the waste coal of the collieries, this manufacture supplies railways and steam-boats with fuel of good quality and easy of stowage, and also utilizes the enormous quantities of tar resulting from the manufacture of coal gas. Lastly, it gives rise to an industry which obtains from this same tar other products of immense value. From a black, oily, and almost fetid material science now obtains a series of dyes and colours of surpassing brilliancy and freshness. Phenic acid, now employed in medicine and surgery, and benzine, &c., which is used for removing stains from stuffs, to dissolve india-rubber, in the making of varnishes, and for the preservation of timber, are amongst the valuable applications of coal tar. All these applications of waste material have been so ably described recently before the members, that it is quite unnecessary for me to refer to them at greater length.

Great use is made in France of various waste substances for lighting fires, such as the cones of pine trees. The Société des Allumettes Landaises, of Paris, does a large trade in the sale of waste cobs of maize, or Indian corn. These are first steeped in hot water containing 2 per cent. of saltpetre, and after being dried at a high temperature, are saturated with 50 per cent. of resinous matter. These lighters, which are sold at from 10s. to 16s. the thousand, are employed with advantage and economy in private houses and for lighting furnaces.

In France, much attention has been profitably given to the utilisation of bran, gluten, and artificial gums, such as dextrine, leicomme, gommeline, and other starchy and gummy products. Among other uses for the refuse from potato-starch is that for flouring or dusting their kneading troughs, &c., by bakers.

Much has been done in developing new substances for starch, but the enumeration would be too long here.

Improvements in technical chemistry have added largely to the number and value of its products. This branch is susceptible of almost unlimited extension and application, in the creation of commercial and useful articles from the refuse of every other manufacture and the diversified products, vegetable, animal, and mineral, of our own and other lands. Many of the chemical branches, apart from the money value of their manufactures, are of the highest economical importance to the country, as auxiliaries to almost every other industry of the people. Chemistry has as yet revealed but a tithe of the vast wealth of its resources.

I was much struck, at the recent Exhibitions at Paris and Havre, with the illustrations of the utilisation of waste greases, shown by Messrs. Souffrice and Co., of St. Denis. This old house was the first to employ, on an extensive scale, steam and hydraulic pressure for the extraction of fatty substances. In 1860 they first turned their attention to the pickings and waste from the slaughter-houses, and a return of 120,000 francs per annum was the result of their efforts. In the early part of 1863 they created a new industry for utilising the skimmings of the Seine. The Préfect of the Seine, considering the benefit that would arise to health by freeing the river from dead animals, floating grease, and other unwholesome matters, granted this house the exclusive privilege on the Seine for a small rent. In December, 1864, Messrs. Souffrice and Co. proposed to the Prefect to undertake the removal of all greasy waters, and the waste and pickings of vegetables, in the twenty-five hospitals of Paris belonging to l'Assistance Publique, which was accepted, and a concession granted for six years. This led to the formation of an extensive piggery on their works, one of the largest in France, having continually feeding 600 to 700 head of swine. The firm was the first to utilise these pickings of vegetables, when cooked by steam, for the fattening of pigs, and more than 3,000 fat pigs are annually sold, raised from this collected waste. In December, 1867, Messrs. Souffrice and Co. fitted up two distilling apparatuses, to work another industry that had not been before attempted. The black residues after purifying colza oil, called fecal acids, after distillation are turned out white, pure, and fit for the manufacture of soap. About 500,000 pounds of this substance are annually produced. In 1868 they conceived the idea of utilising the distilled tar, by combining it with turpentine and forming an excellent varnish, calculated to be useful to machinists and for ships, not only from its good quality, but its low price. 100,000 francs are paid yearly by the above firm to various railway companies for the old grease, called "cambouis," which has served for greasing the axles of the wheels of

the carriages. The purified products obtained are sold partly to the manufacturers of stearine, for saponification or for distillation.

From the residue of the manufacture is furnished, to farmers and cultivators, an excellent manure. The water in which flesh has been cooked, saturated with sulphuric acid and mixed with the urine of the pigs, is delivered gratis, about 50 hectolitres a day, to the cultivators of the sandy plains in the neighbourhood. With the pressed animal residue an excellent manure is made, to the extent of one million pounds a year, sold at 10s. the cwt.

Dr. Hofmann, in his Chemical Report (Exhibition 1862), tells us that bisulphide of carbon has been found by M. E. Deiss to be especially useful for recovering the oils retained by the pressure residue of olives, or by the sawdust through which the oils have been filtered to purify them; also for extracting the fatty matter contained in the spongy parts of the joints of beef and mutton bones, &c. M. Deiss has already established several large works in which fatty substances are extracted from residual matters by means of bisulphide of carbon, one at Paris, another at Brussels, a third in London. In these works about 8,000 kilogrammes (16,500 lbs.) of residues are treated daily, and the quantity of fatty substances diurnally recovered amounts to more than 1,300 lbs. The fatty bodies extracted by means of bisulphide of carbon have all the properties of those obtained by mechanical pressure; in some cases, however, they are, according to M. Deiss, somewhat richer in stearine. Thus the oil remaining after repeated pressure in olive oil-cake and extracted by bisulphide of carbon is decidedly richer in stearine than ordinary olive oil, and on that account is particularly adapted for the manufacture of soap. M. Deiss has, as yet, met with some difficulty in disposing of the exhausted oil-cakes as manure, but experiments, made on a large scale, have satisfied him that the bisulphide extracted cakes are not less efficacious than ordinary oil-cakes. To show the importance of the extraction of residues of fatty substances, it may be mentioned that according to M. Deiss's estimate the quantity of oil annually lost at Marseilles amounts to nearly seven million pounds, while in the departments of Calvados and Nord the loss is at least doubly as great.

Some years ago the committee of the London Ragged School set on foot a rag-collecting brigade, with a few trucks, to collect waste materials in the metropolis. Its necessity was suggested by the evidence given before a select Parliamentary Committee, in 1861, when it was stated "that not more than four-tenths of the rags of this country were preserved, and that if the remaining six-tenths could be returned to be re-manufactured, there would be no necessity to go to foreign markets for some twenty-five per cent. of the rags now required for the paper manufacture of England." And if this is true of so comparatively valuable a commodity as rags, must it not be also true to a much greater extent of less valuable but still most important articles in our commercial economy, such as waste paper, grease, bones, broken glass, rope, carpet, &c.? For instance, what becomes of the envelopes of the million letters passing daily through our London post-office? all of which are worth preserving. Mr. Lloyd, of the Bow Paper Mills, tells me that he purchases from twenty to thirty tons a week of old paper, such as old account books, old letters, invoices, envelopes, cheques, insurance policies, &c., paying £12 a ton for them. Quantities are sent him from the extremities of the kingdom, even from Edinburgh and Cornwall. Nowhere is the class of waste collectors so developed as in Paris, where the chiffonier forms a peculiar type almost unknown elsewhere.

Various attempts, which have been made from time to time, to introduce new raw materials for paper, have been attended with but partial success. The failure, according to Dr. Playfair, generally results from one or more of three causes:—

1. Some fibres require so much cost to bring them to the state in which they are offered to paper makers, in the form of rags or cotton waste, that in point of economy they cannot enter into competition with the latter.

2. Certain fibres lose so much weight in bringing them to this state, that they cease to be economical.

3. Certain fibres, which are well adapted on account of their texture for the paper trade, present so many difficulties in bleaching them, as to render them unfit for white paper.

Only three or four new waste substances have as yet come largely into use for the supply of the paper maker—straw, esparto fibre, wood pulp, and the bamboo. Straw, although largely utilised now for paper, I need say nothing about.

The enormous trade which has sprung up in the wild grass, known under the name of esparto, for paper making is an instance of the utilisation of a waste or neglected vegetable fibre. This coarse strong grass, growing in tufts, resembling in the cylindrical form of the stalk, rushes — the *Stipa tenacissima* of Linnæus—has only come into general commercial use in the last ten years. In 1851, specimens of the fibre and of paper made from it were shown in the Algerian department of the Exhibition, but our paper makers ridiculed it, until a dearth of rags drove them to look for some material which might be utilised. On the 28th of November, 1856, the number of the Society's *Journal* containing Dr. Forbes Royle's paper on Indian fibres, was printed on paper made from esparto, by Mr. T. Routledge. What do we now find?—that our imports of this wild grass for paper-making reach from 55,000 to 70,000 tons per annum, against 18,000 to 20,000 tons of foreign rags; the price, too, of this raw material is low, whilst its utility is shown by the fact that its use is very general, even the *Times* condescending to use paper with a blend of esparto in it. From the south of Spain alone the export of esparto reaches 50,000 tons per annum, at an average of £4 per ton, whilst from Algeria the exports are equally large. This extensive use of esparto has furthered the cause of literature by cheapening the raw material for paper, and supplied a want of which our shipowners had long complained—return cargoes from Spain and Algeria. To Mr. E. Lloyd, of the Bow paper-mills, much credit is due for his persevering enterprise in seeking out in its native localities and utilising so largely for his extensively circulated cheap weekly periodical this important paper material, and other unused vegetable substances.

Wood pulp for paper is now very largely employed. The suggestion of the applicability of wood fibre to paper-making is by no means new.

Early in 1826, the brothers Cappucino, paper-makers of Turin, discovered the means of supplying the want of rags by the fabrication of paper from the thin bark of the poplar, willow, and other kinds of wood. The Academy of Sciences having examined the specimens of writing, printing, and wrapping paper thus produced, acknowledged their goodness, and praised the inventor. The King granted the inventors an exclusive privilege for ten years for the manufacture of paper from ligneous materials.

In 1838, James Vincent Desgrand took out a patent in this country for making paper and pasteboard with wood, reduced into a state of paste, and of the different sorts of wood that came under the denomination of white woods, he found poplar answer the best. In 1855 William Johnson was granted a patent for improvements in the application of various substances containing woody fibre to the manufacture of white paper pulp, as the inner bass of the lime-tree and other *Tiliaceæ*, the willow, birch, and elder.

Particularly facetious persons have more than once informed us that sawdust is a highly nutritious article of diet when properly cooked; but uses have been found for it other than gastronomical, one being as a fibre for

paper-making. Wood of any kind or age is equally well adapted for this process, which is being extensively worked in some of the Continental States. At the London International Exhibition of 1862, Wurtemberg contributed several samples of paper made from wood-pulp mixed with rags, the proportion of the former varying from 10 to 80 per cent.; and the paper was reported to be serviceable, although of a low quality. The wood was simply rubbed down into pulp against the periphery of a wheel prepared with a rough face, so utilising the enormous waste of the timber-producing forests of the north of Europe. A good rule, equally applicable to the manures of the farmer and to the supply of the paper-making material, I would give in a few words:—Use what others waste. If the thousands of tons of sawdust annually wasted at the different saw-mills in America and Europe could be collected, there would be no want of material for paper of a certain quality. But as this cannot be done, we may fairly suppose that, in some localities, an abundant supply may be maintained; if not, resort must be had, provided that the wood itself is cheap enough, to mechanical means of disintegration.

Three or four years ago, the Americans went into the manufacture of paper from wood, the Manyunk Wood Pulp Works, Pennsylvania, being established on a large scale, capable of boiling 30,000 lbs. of pulp (when dry) every twenty-four hours. It may appear to the uninitiated that the expense of the enormous consumption of alkali involved in this process would be fatal to its commercial success; but, fortunately, no less than 85 per cent. of the alkali is recovered after every boiling, to be used over again with 15 per cent. of alkali on a new supply of wood. To recover the alkali, the liquor drained from the pulp is collected in drains under the floor of the boiling-house, and thence conducted by underground pipes to the evaporating-house, whence it flows through evaporating furnaces subject to heat both above and below.

There are now more than thirty paper mills in Germany working up wood pulp, and there is not a journal published there which does not contain more or less of wood pulp in the paper used. At the Paris Exhibition in 1867, was to be seen in action one of the large machines of 50-horse power, constructed by Decker, Brothers, and Company, working the process of Mr. Henry Voelter, of Heidenheim, Wurtemberg, for making wood pulp for paper. The exhibitor, who was the first to carry on the manufacture, has developed it on a large scale, and greatly reduced the price of all kinds of paper by introducing from thirty to sixty per cent. of wood pulp into the fabric. He also exhibited a very large collection of various kinds of paper made from wood. All white woods are available for this purpose.

The bamboo has long been considered one of the most useful grasses in the East, but it is only of late years that we have begun to turn it extensively and profitably to those purposes to which the Chinese had long applied it. Besides its other numberless uses, it is much employed for making common paper in China, and their touch paper is made by beating the young shoots flat, steeping them for some time in a lime pit and then washing and drying them. The silicious exterior is slit into strips for weaving ropes, baskets, mats, sieves, &c., and for cabinet work. The bamboo has been for some years exported from Jamaica to the United States in bales and bundles for making paper. The great bulk of the article, however, was an objection, until the stems were first crushed between horizontal rollers so as to make it more portable. In the close of 1865 the *New York Daily Tribune* was printed upon bamboo paper made by the Fibre Disintegrating Company, working at New Jersey, under a patented process of Mr. A. S. Lyman. The bamboo is subjected to high pressure in steam cylinders, which disintegrates the fibre and dissolves the silex. It is then boiled in waste or spent alkali in an open vessel, and afterwards purified and bleached in the ordinary manner in paper-making. The Fibre Disintegrating Company have large works at Red Hook, South Brooklyn, a factory at Elizabeth Port, New Jersey, and works at Carondelet, near St. Louis, Missouri. The company also make paper pulp from a species of wild cane which abounds on the banks of the Mississippi, also from hemp stalks. Not less than 100 tons of cane are roughly broken down daily to be sent to the paper mills. The price of the material delivered undried is said to be only £1 per ton, and the cost of disintegrating but 5s. per ton, whilst the yield is one ton of paper pulp to five tons of the undried cane. A variety of other substances have been tried, but few drawn into use for the manufacture of even the coarser kinds of paper; still, even for these, the raw material is in demand, and substitutes for the finer flax and hemp rags have been for some time much in request for the better kinds of writing paper. Dr. Mueller, of Victoria, at the request of the Secretary for the Colonies, has devoted attention to an investigation of the local substances adapted to paper making. I have specimens here of twenty-eight kinds of paper made by him in Australia without any addition of rags. Eleven of these are from barks, principally of the *Eucalypti*, most of which make good packing and printing papers. The best appears to be that of the stringy bark (*E. obliqua*), which makes a paper suited for packing, printing, and even writing, and which can be employed for mill and paste boards. The pulp bleaches readily, and this is considered the most important material drawn into use. The bark is extremely thick and pithy; it moreover separates with the utmost facility, and is universally used for thatching rural dwellings in the colony. The supply is available by millions of tons. The area within Victoria alone, wooded almost exclusively with stringy bark, must extend over many thousand square miles, generally as yet without any habitations. Allied trees, with thick fibrous bark, occur in West Australia, Queensland, and North Australia, though not so extensively. The bark yields readily to mechanical appliances on account of its lax and loose texture, and is also easily acted on by caustic soda for conversion into pulp. No pains were taken purposely to prepare a superior paper, but merely to bring into some form the paper fibres available. The other papers made from foliage of trees, from grasses, rushes, and allied plants are curious, but do not call for any special notice. A quarter of a century ago New Zealand flax was shipped in the form of square solid lumps, prepared as a paper material; but, although making a very strong paper, no commercial progress has been made with this material.

When, so far back as 1824, Professor Olmsted drew attention in the *American Journal of Science* (vol. 8, p. 294) to the utilisation of the cotton seed, he little foresaw what an important commerce would arise in its products. He then suggested that on account of its cheapness it might be employed in the manufacture of gas, in preference to coal, which was then a scarce and expensive article. Nearly three-fourths of the entire cotton crop consists of seed, and there cannot, therefore, be less in all the cotton growing countries than 1½ million tons of seed available. Formerly the seed accumulated in offensive and noxious piles about the cotton gins; now, cotton seed for planting in various countries, for oil for burning and eating, and the cake for cattle, are all largely in demand.

In the last five years, the import of cotton seed into Great Britain has been from 80,000 to 100,000 tons annually, all, with the exception of an insignificant portion, from Alexandria. It yields, by crushing, about 19 per cent. of crude oil, almost black, the residuum being cake for cattle food, value £7 15s. per ton. This oil is refined at an expense of about £5 per ton; and the present value of the refined oil is £30 per ton. It is similar in appearance to refined colza oil. An immense quantity was shipped last season to the South of France, for eating purposes, that is to say, as a substitute for olive oil, which was then scarce. The residue of the

crude oil after refining is distilled, and, with care, produces a hard grease or stearine, which commands, when produced of good colour, within 3s. or 4s. per cwt., the price of St. Petersburg tallow. Even the foots or tarry substance remaining, is useful as a paint ingredient. Sometimes the seed is decorticated before being crushed; this process does not alter the nature of the crude oil expressed, although it produces a finer oil-cake, now selling at £9 15s. per ton, and it is quite worth the difference of price, being almost free from the black, tough, indigestible husk.

The beetroot sugar manufacture on the Continent has now made such enormous strides that nearly one million tons are made annually. In the manufacture, two refuse substances are obtained, the expressed grated root, or sugar cake, and the molasses. The first constitutes hard solid cakes possessing considerable nutritive properties; it is therefore used with much advantage, along with other food, in the feeding of cattle. The molasses was formerly given to pigs, or used for making a soluble colouring matter, its value not having been appreciated as it deserved. It is now, however, generally applied as the raw material for the distillation of alcohol. When mixed with water slightly acidulated with sulphuric acid, and submitted to fermentation, the molasses will yield about 24 to 30 per cent. of pure spirit. This beet spirit is, I believe, largely used, like potato spirit, to adulterate brandy. In the watery liquid remaining in the stills are found all the salts originally contained in the juice of beet-root. Experience has shown that it repays well the cost attending the evaporation of the water to obtain these salts (almost entirely composed of compounds of potassium) in a dry form.

The large quantity of dye-woods remaining after the colouring matter has been extracted has hitherto been almost useless. In 1867, we imported 40,000 tons, and France and other countries also import equally large quantities. In France, however, the residue is mixed with tar refuse, and formed into compressed cakes for fuel. I was much struck with the extent of this utilisation at the large factory of Messrs. E. Dubose and Co., of Havre. This firm now produces about 120 tons of agglomerated wood fuel per month. The product is distinguished by the relatively small quantity of coal-tar, 25 to 30 per cent., which they use, as well as by the low price at which they are able to sell it, as compared with other artificial wood fuel, namely, 4s. per cwt., at the works. The spent bark of our tanneries, submitted to a hydraulic press, might be applied with coal-dust as an economic fuel, and the derivatives by distillation usefully applied.

A new and curious application of a waste product is the utilisation of the acicular leaflets of pine trees. Near Breslau, in Silesia, are two establishments, one a factory where the pine leaves are converted into what is called "forest wool" or wadding; the other an establishment for invalids, where the waters used in the manufacture of this pine wool are employed as curative agents. The manufacture has extended, for there are now factories at Runda, in the Thuringer-wald, at Jonkoping, in Sweden, Wagenerger, in Holland, in parts of France, and other places. Two cases of these products were shown at the last Paris and Havre Exhibitions, which contained various illustrations in the shape of wool for stuffing mattresses and other articles of furniture instead of horse-hair, vegetable wadding, and hygienic flannel for medical application; essential oil for rheumatism and skin diseases, cloth made from the fibre, articles of dress, such as inner vests, drawers, hose, shirts, coverlets, chest preservers, &c., and other useful applications. In the preparation of the textile material an ethereal oil is produced, which is employed as a curative agent, for burning, and as a useful solvent. The liquid remaining from the decoction of the leaves is used for medical baths. The membranous substance and refuse are compressed into blocks and used as fuel; from the resinous matter they contain, they produce sufficient gas for illuminating the factory in which the manufacture is carried on.

It is asserted that articles made of this vegetable wool are not attacked by vermin; it maintains an even degree of heat, is a sure preventive against humidity, and is especially recommended for rheumatic patients.

Professor Betschler, of the Clinical Institution, and Professor Ebers, of Breslau, both strongly recommend these products; and they are extensively used in the Royal Hospital at Berlin. Whether they deserve or not all the high encomiums that have been passed upon them, it is nevertheless an important fact that a material, before considered useless, is now converted into articles of domestic utility and commercial importance.

The utilisation of waste leathers, such as leather scraps, &c., is rather a difficult process. Shortly after the publication of my work on Waste Products, I received a letter from a manufacturer at Leicester, who stated that he possessed 20 tons of leather scraps, which he wished to convert to some useful purpose. He had made many experiments to procure glue from them, but the difficulty of separating the tannic acid was so great, that he had been hitherto unsuccessful. My correspondent directed my attention to a patent, granted to Obadiah Rich in 1864, for separating tannic acid from leather, which, in practice, he had found unsuccessful. In Dr. Miller's "Chemistry" (vol. iii., p. 773) it is stated:—"Stenhouse finds that when threads of thin leather are digested, in a Papin's digester, with lime and a considerable quantity of water, the leather is almost entirely decomposed; the tannic acid combines with the lime, forming an insoluble compound, and a glue of good quality is obtained on evaporation; the solution amounting, on the average, to 25 per cent. of the leather employed. Thick sole leather does not yield glue or gelatine when similarly treated." Analysis did not indicate any considerable difference in the composition of these different leathers. The utilisation of leather scraps is a subject of much importance, even to the town of Leicester, where from five to six tons of leather scraps are made weekly, which are mostly burnt, or at best employed as manure. There is one use, however, to which they are applied largely in the United States and on the continent—the manufacture of "shoddy leather"—a manufacture from refuse scraps, which are reduced to a pulp by grinding and maceration, and converted into solid "sides" of leather by pressure. The article thus produced is used mainly for inner soles.

There is an American story told of a man who, upon being informed that a disciple of St. Crispin kept a "pancake shop," found himself at fault when he politely inquired for Mr. Jones, the pastry baker. Those unlearned in the singular nomenclature which attaches to every branch of the shoe business may be informed that "pancake" is a sort of nickname for a combination of paste and leather, which is used in the manufacture of heels for some qualities—not the best—of shoes. The more polite and proper term is "pasted stock." It consists of a number of layers of very thin leather, which are the odds and ends cut off by the tanners from whole sides; these are made quite compact by means of a layer of paste between each layer of leather, until the whole is about an inch thick, when it is placed between two iron rollers, and subjected to a tight squeeze, after which it is dried, and is then ready for use. The pancake, when finished, is in blocks or cakes, perhaps four inches wide by twelve long, and half an inch in thickness, and looks like a cross between a sheet of gingerbread and a huge cake of tobacco. Hence, I presume, its name.

There is a great "pasted stock" manufactory in the large shoemaking town of Lynn, in America, which employs between forty and fifty men and girls, who are occupied in cutting out the leather and pasting it together. The extent of the business may be inferred from the fact that they make up four barrels of flour into paste every week, and consume I don't know how

many tons of scrap-leather, which is made into pancakes, inner-soles, stiffenings, and the like. They have a powerful steam-engine, which runs a rolling-machine, and a large boiler furnishes steam for making paste and heat for the drying-room. In this room the blocks or cakes before spoken of are placed, and all the moisture taken from them. This firm does a large business, and their method is interesting to those who have any curiosity to know to what an extent economy is practised in the use of material for the manufacture of boots and shoes. Much material that was formerly considered valueless is now put to good use, thus reducing the cost of those necessaries of life, which are high enough, as everybody knows, even with the economy which is now practised.

For some years past numerous attempts have been made to utilise furnace slags. Dr. Paul drew attention to this subject a few years ago, and Dr. Finch has described the method adopted abroad to effect this object. The slag is run into pits eight or nine feet in diameter, and when cool it is cut in the form suited for paving, for which purpose it is used at Metz, Paris, and other places. In England it is not likely to compete with good paving-stone.

Cinders from fineries, puddling and reheating furnaces, and scale from rollers, squeezers and hammers, contain from 40 to 70 per cent. of iron in globules of various sizes dispersed through them. These cinders and scales are equal to 30 or 40 per cent. of the iron turned out. It thus appears that the iron wasted in the cinders is no less than from 12 to 28 per cent. as compared with the iron that is utilised.

The thought to give a more practical use to the many thousands of tons of cinders that are drawn from the puddling and heating furnaces, and which are by most of the rolling mills thrown away as useless, or, in the best case, used up as admixture to iron ores in blast furnaces, in order to increase the quantity (but certainly not to improve the quality) of the iron, has occupied attention for some years past. Mr. A. L. Fleury made numerous experiments on a practical working scale. Chemical analysis showed that these cinders contain invariably from 25 to 50 per cent. of metallic iron, combined and mixed with sulphur, silica, lime and alumina, forming a brittle compound of a very peculiar construction, defying the most ingenious devices of the ironmasters. Mr. Fleury states that at Troy, New York, near the Troy and Albany Iron Works, are many thousand tons of these puddling cinders spread over the streets, every hundred pounds of which contain from thirty to thirty-five pounds of good iron. After many unsuccessful attempts, he succeeded in extracting good cast, as well as wrought iron, and was even so fortunate as to produce from this refuse material a good quantity of cast steel. Two great difficulties had to be overcome; first, the oxides and metallic iron are in these cinders combined with silica and other substances in such a peculiar way, that, by remelting the same in the puddling, cupola, or other furnaces, very little of the metallic iron can be extracted, the combination withstands even the high heat in a steel crucible, no sufficient per-centage of iron can be extracted to make it pay; second, it was found that by re-working the cinders with lime alone, or with lime mixed with charcoal and clay, the product was invariably red-short, and many times red and cold-short (brittle at a bright red heat, as well as when hammered cold). The sulphur remained still combined with the iron, equally so the silica and phosphorus—the three devils or evil spirits of iron. All attempts to extract good neutral iron from the puddling cinders by dry admixture of lime were unsuccessful: there was no other way open but to destroy or loose the tenacious chemical combination of these substances before they were placed into the furnace. Unslacked burnt lime has the peculiar property to decompose silicates during the act of hydration, or slacking, as it is commonly called. This can be easily demonstrated by pouring water slowly into an intimate mixture of sand and fresh burnt lime; the outside of the sand grains will yield to the lime's gelatinous silica, and, when mixed, form with it a strong chemical combination, silicate of lime—the base of a good mortar. Taking advantage of this chemical fact, Mr. Fleury mixed a proper per-centage of powdered burnt lime with the fine ground cinder, and after wetting the whole with water, exposed the mixture to the drying influence of the atmosphere The dry compound was then heated in a common puddling furnace, and treated like pig iron. He obtained 50 per cent. of wrought iron, which, however, retained still some traces of sulphur, leaving the iron somewhat red-short. To extract these last traces of sulphur he dissolved in the water, which he used for slacking the lime, a small per-centage of a chlorine salt, and his expectations were thoroughly realised. The process is also applicable to the working of silicious ores, and can be performed in the puddling, cupola, or blast furnace; it can also be worked to advantage in Bessemer's, Nystrom's, Swett's, and other similar furnaces. The preparatian of the cinder, cost of lime, salt, &c., does not exceed two dollars per ton, and the result is, if properly worked, invariably a good quality of iron.

In one of my former papers I touched upon the subject of recovering the tin from the tinned iron which was wasted. This utilisation becomes the more important now that the price of tin is so much higher. The make of tin plates exceeds 600,000 tons per annum, and is annually increasing, and five or six per cent. of tin may be recovered. The difficulty is to entirely separate the iron. At the London Exhibition of 1862, Messrs. C. and E. Kühn, of Vienna, drew attention to their chemical process of procuring pure tin, good weldable iron, ammonia, Prussian blue, and some other minor articles, out of the worthless waste of tinned iron. Mr. Higgin, of Manchester, now utilises the tin from waste tinned-iron (scrap tin) in the manufacture of stannate of sodium.

A few years ago Mr. J. Webster, of Birmingham, took out a patent for utilising the waste flux from galvanising works. This waste or spent flux was formerly sold at a cheap rate, mainly for reconversion into metallic zinc, but by his process the precipitates find a ready market among refiners, and for making paint.

Few persons have any idea of the enormous quantity of steel hoop and wire manufactured for the millions of crinolines used, and as fashion gradually changes, the utilisation of these cast-off hoops becomes of consequence. Thousands of these are said to be thrown into the streets of New York and other large American cities, where they are a nuisance and a plague to passengers. The *chiffoniers* utterly reject them, as not worth picking up, and the dustmen do not like them, as they are not very portable. Some witty journalist suggests they might be used with a pole in the centre for a rosary or trellis work in gardens. At any rate some plan should be adopted to utilise this great waste of steel in cities, so that old crinolines may be gathered with as much avidity as old rags and papers are now.

There is another waste substance which is beginning to be utilised, to which I drew attention some years ago in a paper I read here on the gums, resins, &c., of commerce.* I allude to the abundant supplies from the semi-solid pitch lake of Trinidad, which covers about a hundred acres. In a new magazine for January there is a special article on this pitch lake, which concludes as follows:—"Considering the uses to which cheap asphalte might be applied in road-making as a substitute for stone, as a roofing material, as fuel, as an oil producer, and as a colour maker, and considering, too, that the so-called waste on purification is capable of being utilised and turned to profitable account—it is matter of surprise that energy and capital have not yet been found to undertake the utilisation of the pitch lake." Now, within the last

* See *Journal*, vol. iv., p. 13.

few years, commercial attention has been very prominently drawn to this article. In the report of the North American Commissioners, appointed to inquire into the commerce of the West Indian Islands, Central and South America, submitted to the Governor-General of Canada, in 1866, it was stated that two companies, one English and the other American, had been established to work this pitch lake, and to ship the product, in blocks of asphalte, or refined as petroleum oil, and this article bids fair to become one of the most important articles of commerce in the island. The distillation of oil has, however, been given up, merely owing to the insalubrity of the locality. One of the companies had contracted to supply a French firm with 1,500 tons of the pitch per annum, in the form of asphalte blocks, for paving, at nine dollars a ton free on board; and also to furnish a firm at Antwerp with 20,000 tons yearly, at 50s. a ton, to distil for oil. The pitch or asphalte is, however, rather an objectionable cargo with shipmasters and insurers, from its dead weight, &c. While in charge of the Trinidad products at the Paris Exhibition, I had many inquiries as to the prices of this asphalte.

It is a well-known fact that more than nine-tenths of the sulphur used in the manufacture of soda is retained in the material called "alkali waste," which is thrown away by the manufacturer. Thus is presented a problem, which, if it can be solved, would effect a large reduction in the cost of soda. Many chemists, both scientific and practical, have given a great amount of attention to this subject. The soda manufacture is estimated at upwards of two millions sterling in value, and as the main cost of production is some £5 per ton for sulphur from pyrites, any reduction on this would be an enormous gain to the manufacturer.

In the factories where albumenised photographic paper is made, a considerable quantity of paper is spoiled in the process, and it is then of but very little use. In Paris and Berlin this paper has always been washed as free as possible from the albumen, and then worked up into envelopes. Dr. Jacobson has found a new use for this paper. He proposes to stain it with aniline colours, and to employ it for labels, covers of boxes, and general decorative purposes, By being splashed with concentrated alcoholic solutions of the various aniline colours, the waste of these albumenized papers is now converted into marbled paper of a much more beautiful appearance than what is produced by the old process, from the green-gold lustre which the films of those substances possess. The papers obtained by this method retain the gloss, the bright "satin" surface, of the albumenised material, and are almost as brilliant by transmitted as by reflected light. They are said to be well adapted for shades, transparencies, paper lamps, and other means of decorative illumination.

In conclusion, I may state that I have only skimmed over the surface of this great subject; for, to have enumerated only the various useful applications of residues or waste which have been made in the last ten years would have occupied all the time at my disposal this evening. It may, however, be confidently asserted, that as man advances in scientific knowledge, he will discover means of utilising everything now considered as waste, and we shall realise the fact that the Great Creator has made nothing in vain. Certainly the thanks of the community at large are due to the long labours of the Society of Arts in collecting, publishing, and discussing every subject and suggested improvement calculated to benefit the wide domains of Art, Manufactures, and Commerce, on which not only so materially depends the progress of our commerce and our high status among European nations, but also the well-being, the intellectual advancement, and the artistic taste of our people.

DISCUSSION.

Mr. Yates said that he had been connected with the iron manufacture, and therefore knew the importance of utilizing the slag, and a friend of his, a clergyman at Brighton, had recently been making some experiments on the subject, the result of which he had hoped to lay before the meeting; at the last moment, however, his friend had informed him that his results were not so perfect as he could wish. He must therefore defer an account of these experiments until another opportunity. As connected with the subject of utilizing waste products, however, he had placed on the table a model of a machine for drying brewers' grains, which had been found very useful. Hitherto grains had been chiefly used for the feeding of cows, and in the wet state, but in this way they were sometimes injurious to the animal, and always so more or less to the milk. On being dried, however, they were perfectly wholesome, and a friend of his who had kept cows, told him that by giving 6 lbs. a day of the dry material, an additional five quarts of milk were obtained, and an increased quantity of butter. The subject was of some importance, since about seven millions of quarters of grain were annually used in brewing and distilling in the United Kingdom, of which one-third was recoverable. He had asked his friend Mr. Milburn, who was carrying on the process, to be present, and he would doubtless give further details.

Mr. Milburn said his attention had first been drawn to the subject at the time of the cattle plague, when brewers were paying to have their grains taken away. On trying several experiments it was found that there were considerable quantities of carbonaceous and albuminous products in the grains, and it was evident, therefore, that they would be useful for feeding if they could be properly dried, not only for cows, but also for horses, sheep, and pigs. After trying several processes his firm introduced, in conjunction with Mr. Norton, the patentee of the Abyssinian Tube Well, the machine of which a rough model was before the meeting. Heated air was driven by a fan into a revolving chamber, consisting of several floats or trays, in which the grains were placed, the whole being either partially or wholly surrounded by a steam-jacket, and the result was a product which resisted all fermentation, which would keep any length of time, and was readily transported. The same process was now being applied to spent hops, which, when dried, were found to make capital litter for horses, and so produce in this way manure more valuable than straw litter, inasmuch as it was more absorbent. He believed that Messrs. Allsop had introduced it and found the health of their horses was considerably improved in consequence. The same system was also applicable to the drying of corn. In reply to a question, Mr. Milburn said this was not the same system which had been tried at the brewery at Tottenham-court-road and had failed.

Mr. Hewett asked if Mr. Simmonds could inform him of the cost of the slabs of wood fibre as prepared for paper making, as compared with wood; for although evidently brittle, it might take the place of wood for many purposes where strength was not required, if sufficiently cheap.

Mr. Simmonds said he had not the figures by him, but the cost was comparatively small.

Mr. Warriner said allusion had been made in the paper to the chiffoniers of Paris, but nothing had been said of those of London, although connected with this was a most important question. It appeared that the refuse grease and kitchen stuff in Paris was utilised to a great extent, but in London there was an immense amount of waste. He had been studying this subject for the last three years, and could therefore speak with confidence upon it, and he was quite sure that as much material was wasted as would feed a million pigs. There were sanitary laws telling people to burn their potatoe peelings and cabbage leaves, simply because they lacked municipal regulations which would provide for the removal of these things every day. To show the loss which was thus sustained, he might mention that at Aldershot each regiment of about 500 men got about £4 per month for their refuse of this description, and of

course in their case the strictest economy was used, very different from the system in private families. He calculated that from every family of twelve individuals, living at the rate of £300 a-year, there was enough refuse to keep two pigs, and if all this could be utilised, there would be an immense saving to the country.

Mr. Botly said the subject of the paper was of the utmost importance, and he could only hope that we should take a lesson from the French in the utilisation of waste. He could confirm a good deal of what Mr. Warriner had said, for some years ago he was acquainted with a farmer at Aldershot, who kept eight or nine hundred pigs entirely on the refuse of the camp. Having been associated many years ago with Mr. Tomlinson in establishing a Mechanics' Institute in Salisbury, where that gentleman's zeal, energy, and ability were of the utmost service, he was much pleased to see him officiating as Chairman that evening.

Mr. F. Buckland (being called upon by the Chairman) was very glad that the subject of fish had been mentioned in the paper, for he did not believe there was any to spare in the shape of waste. They had not many tunny-fish or sharks on their shores, but there was no objection to fishermen catching as many dog-fish as they could, and he believed that even now many were captured and made to do duty as haddock. He hoped they would not become hippophagists, for although he had once been one himself, he had suffered so much for a week after the great dinner at the Langham Hotel, that he was now quite content to leave horseflesh to the dogs and cats. With reference to some of the waste products mentioned in the paper, he had no hesitation in saying that the high price of salmon was in a great measure owing to the enormous quantity of deleterious matters which were now thrown into rivers. The Tees was more often the colour of milk than of water on account of the refuse from the lead mines, and the same with the Weir. In some places catch-pits were now being made to intercept the poisonous ingredients, and he would recommend Mr. Simmonds, if he wanted to make his fortune, to devise some means of turning this refuse material to account, for one of the large proprietors in that part of the country had told him (Mr. Buckland) he might put up any apparatus he liked, and was welcome to all the lead he could catch. Near Chester was the Dee, which was polluted by petroleum being poured into it, and the consequence was that the salmon would not enter the river. There were hardly any fish in the Dovey, on account of the lead mines, while other Welsh rivers were almost choked up with the refuse from slate quarries. Coming further south they reached the Usk, near which there were very large tin-plate works, which sent large quantities of sulphuric acid into the river and poisoned the fish, notwithstanding that this substance was so valuable for other purposes. The Camel and the Fowey were spoiled from the quantities of mud thrown into them from the different clay works on their borders, for the fish could not spawn on mud. The Fowey had been nearly ruined, over 6 cwt. of fish having been killed in one hour by pumping into it the water from an old mine, in order to get at some iron at the bottom. The water was charged with arsenic and iron salts, and an enormous number of fish were killed. He was glad to say that the Duke of Bedford was now putting a clause into his leases, forbidding the pouring of pollutions into the rivers, and the Duke of Northumberland and other owners the same. In the Exe, and many other rivers and streams, the fish were destroyed by chloride of lime from the paper mills, so that there was not only the loss arising from the waste of such a valuable product, but also indirectly much greater loss by the country being deprived of a large and cheap supply of fish.

Captain J. Selwyn, R.N., said it would take a long time to go in detail into the numerous topics brought under their notice in the paper. He would, however, briefly touch upon two or three of them. First, with regard to the importation of meat from Australia, it was patent to all that a grievous error was committed when large quantities of meat were boiled down for the sake of products not fit for human food. The Society of Arts had very properly directed its attention to the question of the preservation of this meat, and the best method of bringing it over; but, in his opinion, the simplest and best process of preserving meat was that by which seamen had been fed for many centuries—salting. The only difficulty was that in warm climates the salting could not always be satisfactorily conducted, but this was obviated by the use of saccharine matter, instead of salt, particularly in countries where sugar was a natural product. In this way he believed the meat could be imported in a perfect condition for the use of English labourers, if only a certain amount of prejudice on their part could be overcome. The next question was that of condensed fuel. It was, perhaps, known to many that he was particularly interested in this question; but he attached great importance to the word *condensed*, and was of opinion that any substances or compounds which only professed to give about the same evaporative power as the fuel now in use, were not worthy of such investigation or such close experiment as those fuels which gave the power of carrying large calorific effect in small compass. One of the things which Mr. Buckland spoke of as being thrown into the river, he thought no one in his senses would now so dispose of any more than they would coal, for every ton of petroleum was capable of producing the same effect as three tons of coal, and it was much more portable. It had also the valuable property that it could be burnt with no more air or draught than was necessary to support combustion, so that, instead of wasting the heat up a chimney, they got the actual calorific value of the fuel, which never was, and never could be, the case with coal. Mr. Simmonds had given, in a few terse words, a receipt for making a fortune—"Use what others waste"—but he had not shown them how to overcome prejudice, or to impress on each individual in the community the importance of small economies. Manufacturers would still insist on throwing sulphate of copper, chloride of lime, and a thousand other matters, into rivers, which would be very valuable if only put in the right place. People even put up expensive works for the purpose of pumping sewage into the Thames. All these mistakes could only be remedied by the reading and discussion of such papers as that they had heard. Mr. Simmonds had shown them some most interesting specimens of different forms of vegetable fibre as applicable to the making of paper; but it was also true that they could make from these materials a kind of wood, or something very nearly approaching it, and something, too, which had greater powers of resistance than most descriptions of wood. This could be done with vegetable fibres, which had hitherto been thrown away, and with matters such as sawdust; and the product could at the same time be made to assume that particular form that was most useful. Not the least of the advantages was, that they could give a tensile strength to resist crushing which was measurable and under direct control. If it were desired to put an efficient backing behind an armour-plate, wood could not be used, because the exact resistance to impact which it would afford could not be regulated; but this end could be attained by a substance made for the purpose, which would give just that cone of dispersion which was required. With regard to the utilisation of liquid fuel, he might mention that having by accident some sheet iron covered with lead paint in front of a furnace burning this liquid fuel, and giving a temperature of about 4,000° as nearly as could be estimated (the temperature at which firebrick just began to melt), the extreme heat drove off the whole of the oxygen in the oxide of lead paint, and gave up the metallic lead in the shape of drops, which he collected as they fell. With regard to the saving of old crinolines, it might be mentioned that the textile strength of steel was increased

from about 36 tons per square inch to something like 50 tons by being drawn into wire, and, therefore, if the supply were at all constant, it would be worth some trouble to prevent the waste of such valuable material, but owing to the rapid changes of fashion he did not look upon the subject as of any practical importance. With regard to the recovery of waste alkali and other matters held in solution in water, it should be borne in mind that the cheapest process was that of evaporation. A very enthusiastic gentleman had given it as his opinion that all the motive power required in the world might be obtained from the sun, but without going quite so far as that, he was fully persuaded that if the system of simple evaporation were adopted, as in the manufacture of salt from sea water, many products now discarded might be turned to good account. Wherever there was a factory in England, there was always a stream of white vapour to be seen issuing from it, which was only an indication of waste heat, or waste of power. It was inexcusable in a great manufacturer, having a quantity of steam at his disposal, to employ it, as was often done, simply in boiling the fish in the nearest stream. The main difficulty with many of these products, such, for instance, as the pitch from the Trinidad lake, was in the condensation previous to transport, so that the cost of freight should not be too heavy. But wherever there was a calorific material, there was the means of effecting condensation; and he did not think there would be much solid foundation for the plea of unhealthiness, if the native labour available on the spot were employed. In conclusion, he remarked that he had no sympathy with the idea which Mr. Warriner seemed to put forward, of economy by Act of Parliament or municipal regulations, but he believed the true source of improvement in these matters would be private enterprise. He had no doubt that in electro-plating would be found a means of utilising the sulphate of copper which was now used to poison the rivers, by extracting the pure metal, while he had, to a certain extent, endeavoured to use the product in another way in some of the hop countries, by introducing it as a preservative for the hop poles. He hoped that before long scientific men would come forward and teach us how all these matters which were so desirable could be accomplished. The last observation he had to make was, that on all these subjects the appeal was constantly made to inventors to teach us how to economize. Could we then avoid the inference that the rights of inventors to protection and fair remuneration cannot be ignored, and ought to be of interest to every one who hopes to obtain economic results or to hasten the progress of applied science?

Dr. Ellis suggested that encouragement should be given to able and enterprising investigators in the wide field which had been spread before them by the offer of prizes for discoveries in the wished for direction. These discoveries were not made without great labour and perseverance, and when made they often entailed loss, disappointment, and litigation on the inventor who endeavoured to protect his rights; whereas, if a suitable reward were held out for useful discoveries, or if there were a proper tribunal for investigating such matters, there would be something on which a man could rest his hopes, and those who had enterprise and skill would be encouraged to work more for the public good when they had less likelihood of doing so to their own loss.

Mr. Campin said he had often remarked the large quantity of old boots and shoes and pieces of tin which lay about the unfinished roads in new districts, and he suggested, as these things were shown to be useful, that some of the destitute poor should be employed in collecting them. He also remarked that if something could be found which would serve as a substitute for flour in the making of paste, a large quantity of food material would be set free.

The Chairman did not wish to complain of the paper as being too full, but at the same time he thought they would not have had quite so discursive a discussion if fewer subjects had been taken up, and each more elaborately treated. He thought the first thing necessary was to define what was meant by a waste product. For instance, he did not think sharks in the sea were a waste product, and no doubt they had their uses in keeping down too rapid an increase of the smaller fish. There were some other things mentioned in the paper which he should not be disposed to consider waste products. The meaning, then, of the term being determined, the following questions suggested themselves:—Given a waste product, what could be recovered from it; what would be the cost of recovery, of collection, and, if at a distance, of carriage to the locality where it could be usefully treated. There were no doubt a large number of so-called waste products spread over the surface of the earth, which would cost more to collect and bring to market than they were worth, and so an apparently cheap article became in reality a dear one. He believed that was the reason why many of the grasses in different parts of the world had not been earlier introduced for the manufacture of paper. Many years ago he had prepared an article on this subject for the *Quarterly Review*, and he then arrived at the conclusion, that by the employment of straw and other vegetable fibres, paper of a very brittle texture was produced, and that was the reason why esparto and other fibres were not more extensively used, to say nothing of wood shavings. The cost of conversion was a very important element in the question of utilising waste materials; did time permit, he could give many examples of this, but one would suffice. Mention was made in the paper of alkali waste produced in the manufacture of carbonate of soda from common salt, and the quantity of this was so great that land had really to be bought on which to put it. Yet it was perfectly possible, and even easy, to recover the whole of the sulphur from this alkali waste, and the only reason why it was not more extensively done was, that sulphur could be imported at a cheaper rate than it could be made in this way. Some years ago, when the Government of Naples thought proper to set aside a treaty with England, and sell the whole of the sulphur in Sicily to a French company, the price rose immediately, and during the few months that elapsed before the trade was thrown open again, no less than fifteen patents were taken out for making sulphur from alkali waste. There was little doubt that had there not been a renewal of the supplies from Sicily, and had not other methods of procuring it, such as that from pyrites, been discovered, this would have become an important manufacture. At the last Exhibition, some beautiful specimens of sulphur were shown almost chemically pure, prepared from alkali waste, but the difficulty was that it could be imported more cheaply. These were the points on which discussion would be useful, and they were much indebted to Mr. Simmonds for the amount of labour and research he had brought to bear upon the subject. Such matters were well worthy the attention of the Society, and the subject was indeed of national importance. It might, he thought, be useful to offer premiums for discoveries in certain directions, but, until waste products could be utilised almost on the spot where they were produced, it was useless to abuse manufacturers for getting rid of them in the easiest way possible.

Mr. Simmonds, in replying to the observations which had been made, said he had endeavoured to save himself from such strictures as the opening one of the Chairman, by adding a sub-title to his paper of "Undeveloped Substances," and he still thought there was scope for enterprise in the direction he had pointed out, even amongst the sharks. He did not agree with Mr. Warriner's views as to the utilisation of domestic waste for the keeping of pigs, which he did not think very desirable on a large scale in the neighbourhood of great towns, and still less so on the Irish system of having a pig-stye at every back door. Mr. Buckland was quite right in saying that too much waste was thrown into rivers, but this matter was being cured by legislation. His object had

been, not so much to give detailed practical information how waste substances might be utilised, as to throw out hints and suggestions, which he hoped might be taken up by inventors, as to what might or might not be utilised. Some of the instances he had mentioned showed that he had been correct in the anticipations he had made in former papers on the same subject. It would have been impossible for him to go into all the topics which had been suggested, as almost any one of them, if treated at length, would have occupied an evening. Starch, for instance, was made to a considerable extent from horse chestnuts, and many other vegetable matters might be utilised for this purpose instead of wheat. He could not agree with Capt. Selwyn as to salting being the best method of preserving meat, nor did he think such provisions would find favour with the population, and unfortunately the countries where animal food was so abundant were not sugar-producing countries.

Captain Selwyn said sugar might easily be made from corn in Australia.

Mr. Simmonds believed that at present Australia had to import wheat for her own use, and although he knew the production was largely increasing, he doubted the economy of converting it into sugar. He was glad to find that his paper had elicited so much discussion, for the more such questions were debated and investigated, the better would it be for the community at large.

The Chairman, in proposing a vote of thanks to Mr. Simmonds, mentioned that Dr. Redwood, of the Pharmaceutical Society, had a process of bringing meat from Australia, in a perfectly fresh state, by dipping it into paraffin. The solid paraffin was melted, and the meat then dipped in and taken out, retaining a coating which was impervious to air, so that the meat could be preserved for almost any length of time. When the meat was to be cooked it was simply dipped into hot water, which melted the paraffin, and it was then ready for use.

The vote of thanks was then passed unanimously.

The paper was illustrated by numerous specimens from Mr. Simmonds' private collection, and by waste vegetable substances, and papers made therefrom, kindly lent by Mr. E. Lloyd, of Bow.

BARON LIEBIG "ON A NEW METHOD OF BREAD-MAKING."

The following is from the *British Medical Journal*:—

"Baron Liebig has just made some important researches on a new method of bread-making. He remarks on the stationary character of this art, which remains to the present day much in the state in which it was thousands of years ago. He dwells upon the sanitary importance of the mineral constituents of grain, and the necessity of a sufficiently abundant supply of them in bread. These are best found in certain kinds of black and brown bread, which are, therefore, more wholesome than the white bread that is nevertheless preferred by most people (especially by the lower orders) on account of its better appearance and superior palatableness. The problem has hence arisen, how to provide a beautiful white bread which shall contain all the essential mineral constituents of black bread. These mineral constituents (phosphate of potash, lime, magnesia, and iron) are introduced into the bread by the use of the baking-powder invented by Professor Horsford, of Cambridge, in North America. This baking-powder consists of two powders, the one acid, the other alkaline. The acid powder is phosphoric acid in combination with lime and magnesia; the alkaline powder is bicarbonate of soda. Two measures, made of tinned iron, the larger one for the acid powder, and the smaller one for the alkali, are employed. When bread is required to be made, every pound of flour is mixed with a measure of the acid powder and a measure of the alkali powder, and sufficient water added to make dough, which is presently made into loaves and baked. In one and a-half to two hours bread may be made by this process. The chemical change which takes place will be easily intelligible; carbonic acid is generated, and phosphate of the alkali is formed, at the same time. The essential feature in Horsford's invention is the economical getting of phosphrico acid in the shape of a dry white powder. This is done by taking bones, burning them, and then treating the well-burnt bone-earth (which consists of phosphate of lime and magnesia) with a certain quantity of sulphuric acid, so as to remove two-thirds of the lime, and leave a soluble superphosphate of lime. The sulphate of lime which results from the action of the sulphuric acid is separated from the rest by filtration and the solution subsequently concentrated by evaporation, and when it becomes very concentrated, mixed with a certain quantity of flour, and dried up. The mixture of flour with the superphosphate admits of being reduced to the finest powder, and constitutes the acid powder just referred to. It will be observed that the alkali-powder contains soda, whereas potash is required in order to furnish the right kind of mineral salts. Liebig proposes to rectify this defect by using a certain quantity of chloride of potassium along with the alkali. Chloride of potassium is now tolerably cheap, owing to the finding of immense quantities of it at Strassfurt. Baron Liebig, in order, as he says, to avoid being bothered, has appointed Herr Zimmer, of Mannheim, and Herr Marquart, of Bonn, his agents for his new baking-powder, and those interested may, if they like, get it from them."

Fine Arts.

Statue to Voltaire.—The subscription lists opened in Paris for the purpose of raising a statue to Voltaire have yielded the sum of £1,436, which is considered sufficient for the purpose. The model chosen is that of Houdon, which is being produced on an enlarged scale, by the house of Barbédienne. The monument is to be placed at the end of the Rue de Rennes, close to the Institut of France.

Monument in Commemoration of Dutch Independence.—One of the largest, if not the largest, public monument is to be inaugurated at the Hague in the course of the present year. It is to commemorate the revolution which gave independence to the states, and will be more than seventy feet high, and carry seven bronze figures of colossal dimensions. A circular flight of steps, surrounded with candelabra, will form an approach to the monument, the basement of which will be ornamented with bas-reliefs and inscriptions. On pedestals projecting from the basement will be placed the following statues: — In front, a statue of Guillaume I., four mètres in height; on the sides, two figures representing Religion and History, each three mètres high; and at the back, a group of three figures, representing the Counts Hoogendorp, Limburg, Stirum, and Van der Duyn Van Maasdam, the heroes of the War of Independence, and members of the Provisional Government. The upper portion of the monument will be decorated with the arms of Holland, and of the nine provinces, enriched in garlands; and on the summit is to be placed a female figure symbolical of Liberty and Independence; in one hand of the figure is to be the national flag, and in the other the attributes of the seven enfranchised provinces. At the foot of the figure will be the Dutch lion freed from his chains.

Rouen Art Exhibition,—The annual exhibition of works of art at Rouen has always been one of the most important of the provincial exhibitions of France, although the town is so near Paris. This year it promises to assume a much more important character than before; the Municipal Council has resolved to raise its grant towards the exhibition from £270 to £680, in order to enable the Commission to offer greater inducements

to able artists to send their works there. These are not the only funds devoted to the exhibition, the Society of the Friends of Art, which has the organization of these annual shows, has its own subscription list, and, in addition to these funds, there is to be added the amount taken at the doors for admission. After payment of expenses the whole of the proceeds will be devoted to the purchase of pictures and other works of art, and to the defrayimg of the cost of the gold medals to be awarded to the most approved works. The Emperor and the Minister of Fine Arts also subscribe to this latter object. The Rouen Exhibition has heretofore been held in the winter, but this year it is to take place earlier.

Manufactures.

Cheap Watches.—It will be recollected that some time since a notice was given in the *Journal* of a cheap keyless watch, manufactured in Switzerland, and it was stated, on the authority of a letter in *Les Mondes*, that such a watch could be sold for 25 francs. In consequence of further inquiry, however, this statement was, in a subsequent number, corrected to 35 francs. But, since that inquiry was made, cheap watches, manufactured by machinery, have been imported into this country, of Swiss make; and keyless watches are now to be bought retail in London at a price of 25s. each.

The Brazil Mint.—This large edifice at Rio Janeiro is under the direction of the Minister of Finance. The governor is called the provedor. The steam machinery and pipes for casting and coining, &c., are of the most perfect kind. In the assay of gold, 200 milligrammes are now employed. The refining is carried on in platinum vessels. From July, 1840, to July, 1864, there were struck 38,808,890 gold coins, and 13,765,553,500 silver, besides many medals of various kinds. There is in the mint a collection of the various coins struck in the former monetary establishments of the country, and 572 coins of other countries. It has also 83 dies of Brazilian medals, and 1,027 foreign medals. There is attached to the mint a school for painting, plaster-sculpture, and engraving, and each workshop has its own library.

Commerce.

Railways in Russia.—The length of the railways in Russia is, according to the latest returns, 10,556 versts, of which 5,739 versts are open for traffic, and 4,817 versts are in construction, and which will be opened in the course of the year. The lines in construction are—Sergniewsk to Yaroslaw, on the Moscow and Yaroslaw railway, 200 versts. Schonia to Twanowno, 82 versts; Moscow to Smolensk, 257 versts; Rybinsk to Ossetchensk, 278 versts; Roslawl to Orel, on the Orel and Witebsk line, 250 versts; Yelotz to Orel, 177 versts; Griaz to Berissoglebsk, 197 versts; Rostow to Tambow, 65 versts; Saratow to Tambow, 340 versts; Koursk to Sea of Azoff, 775 versts; Koursk to Kiew, 438 versts; Kiew to Balta, 622 versts; Krementchoug to Kharkow, 247 versts. Balta to Krementchoug, 150 versts; Tiraspol to Kischinero, 65 versts; Riga to Nitau, 40 versts; Finland line, 330 versts; Poti to Tiflis, 288 versts. Besides these, there are about twenty other lines in project, and the greater part will be shortly commenced, as being greatly needed. The most important of these projected lines will be the Oral line, which commences at the Port of Berezowk, on the Xama, and terminates at Tumena, on the Towra. Its total length will be 687 versts. This line will put into communication the eastern and western valleys of the Ural mountains. The total amount of merchandise exported from Europe into Siberia is estimated annually at 20,000,000 of Russian pounds in weight; and from Siberia into Europe at 2,300,000 pounds as the production of the mines in the Ural; 1,200,000 pounds of ores; 2,800,000 tallow, hides, oils; 6,000,000 pounds of provisions; and 1,000,000 Asiatic productions. The saving in transport by the construction of this railway is estimated at above 2,000,000 of roubles, and will no doubt have a most beneficial effect in developing the immense mineral resources of the Uural mountains.

Japan Silk.—In the report of the Japan Chamber of Commerce, for the half-year ending June 30th, allusion is made to a fraud discovered in Italy in the silk-worm-egg trade. Certain blank cards appear to have been shipped from Japanese ports by some dishonest persons, marked and stamped with the usual Japanese characters and custom-house certificates, to be covered with Italian seed and sold as produce of Japan. Such an abominable fraud, if successful, would of course imperil the whole of this increasingly valuable trade, and considerable sensation had been created there by the news of the attempt. The Chamber of Commerce has promptly taken up the matter, appointing a special committee to co-operate with his excellency the Italian Minister, in endeavouring to discover the authors of the fraud, and there is little doubt of their success. The eagerness with which the native silk-men have applied for copies of a circular just issued by the chamber, in which are set forth the faults found with Japan silk by European throwsters, encourages the hope that they, too, will gladly help to bring to justice the perpetrators of this silk-egg fraud.

The French Fisheries.—According to the statement published by the Minister of the Marine, the value of the production of the French fisheries in 1867 was 66,745,090 francs, and exceeded that of the previous year by 7,913,170 francs; this is due in a great measure to the unusual success of the sardine fishery. The value of the cod-fish taken in 1867 amounted to 14,665,208 francs; that of sardines to 15,635,816 francs; herrings, 7,737,004 francs; mackerel, 2,357,932 francs; anchovies, 286,867 francs; shell-fish, 3,565,458 francs, of which 970,975 francs are for oysters, and 1,279,631 francs for mussels; in the former amount are only included the value of oysters dredged from public oyster beds, and it does not include the value of oysters taken from private breeding grounds. The value of crabs, lobsters, crawfish, shrimps, prawns, &c., taken, amount to 1,821,718 francs. During 1867 the number of French vessels engaged in fishing on the coast of France, the eastern coasts of England and Scotland, and Newfoundland and Iceland, was 17,544, manned by 70,125 men.

Price of Gas in Italy.—The following are the prices per cubic metre of gas paid by private consumers in the principal towns in Italy, with their equivalents in shillings and pence per thousand cubic feet English:—

	Per cubic metre. Centimes.	Per 1,000 cubic feet s.	d.
Monza	50	11	4
Ravenna	47	11	7¾
Chieti	50	11	4
Ancona	50	11	4
Como	50	11	4
Lodi	47	10	7¾
Florence	50	11	4
Palermo	48	10	10¾
Naples	45	10	2½
Modena	50	11	4
Parma	47	10	7¾
Pavia	50	11	4
Milan	45	10	2½
" to large consumers to	40	9	3
	55	7	11¼
Novara	50	11	4
Casali	48	10	10¾
Venice	47	10	7¾
Alessandria	45	10	2½
Messina	45	10	2½
Genoa	37	8	5
Cuneo	54	12	3
Turin	26	5	10¾

Colonies.

The Public Debt of New South Wales.—The official statement up to 31st October, 1868, shows the amount of the various loans and the objects for which they have been raised:—

	Authorised.	Amount raised.
Loan to Sydney Railway Company	£216,571	£223,936
Sydney Sewerage	200,000	201,149
Sydney Water Supply	200,000	201,264
Public Works	178,750	136,890
Railways	666,800	630,105
Railways and Public Works	445,323	393,427
Do. do.	1,782,370	1,696,828
Public Works and Railways	161,832	..
Public Works	670,025	..
To pay of Land Immigration Debentures	73,776	70,300
Do. do.	130,400	130,311
Railways	300,000	300,895
Public Works	107,717	107,787
To pay off Debentures	14,500	145,007
Railways and Public Works	770,100	761,852
To pay off Debentures due in 1860, and Public Works	713,823	602,696
Voluntary and Assisted Immigration	55,000	54,945
To cover deficit of 1864, and to pay Debentures	850,000	765,596
Public Works and Immigration	1,043,300	252,694
To cover deficiency of 1863 and previous years of Treasury Bills	400,000	391,849
	£10,424,324	£7,486,748

There has been repaid £869,200, leaving a balance still due of £6,917,630.

Obituary.

William Ewart, the late member for the Dumfries Boroughs, died at his seat Broadleas, near Devizes, on the 23rd January, at the age of 70. The second son of the late Mr. William Ewart, merchant, of Liverpool, he was born at Liverpool, in the year 1798, and received his early education at Eton, where he numbered among his schoolfellows Dr. Pusey, Mr. Denison, Speaker of the House of Commons; the late Dr. Trower, Bishop of Gibraltar; the Marquis of Londonderry, and the late Marquis Camden, K.G. From Eton he passed to Christchurch, Oxford, where his poem gained him the Newdegate Prize, in 1819—the subject being "The Temple of Diana at Ephesus." He took his B.A. degree in Easter Term, 1821, obtaining a second class in classical honours. In 1827, he was called to the Bar at the Middle Temple, and in the following year entered Parliament on a casual vacancy for the since disfranchised borough of Bletchingley. At the general election of 1830 he was chosen for his native borough of Liverpool; he was again chosen in 1831, and he also sat for that constituency from the general election in December, 1832, till the dissolution consequent on the King's death, in July, 1837, when Lord Sandon and Sir Cresswell Cresswell were the successful candidates. On the death of Mr. R. Potter, towards the close of 1839, he again returned to the House of Commons as M.P. for Wigan; but at the general election of 1841 he did not solicit re-election by that constituency, but he was chosen, after a contest, for the Dumfries district of boroughs, which he continued to represent down to the dissolution of last year, being returned at every subsequent general election. In the earlier part of his career, Mr. Ewart's name appeared very frequently in the reports of the Parliamentary debates as a speaker, both on subjects of general politics, in which he was always an advanced Liberal, and also especially on commercial matters, with which his early education and associations rendered him particularly conversant. While Lord Melbourne's Ministry was in power he used to bring forward annually a motion for the equalization of the duties on East and West Indian sugar; he also strenuously and unremittingly urged, at a time when he stood almost alone, the mitigation of our criminal code by the abolition of capital punishment for horse and cattle stealing, &c.; and with a laudable zeal on behalf of the working classes and the population of our large and crowded cities, he advocated the opening of our public museums and galleries, and other repositories of works of art, as free from every restriction as possible. He was also among the first to propose, and certainly one of those who by steady perseverence carried, several important Bills for the establishment of Schools of Design. Mr. Ewart will be remembered as having introduced into Parliament the measure known as the "Prisoners' Counsel Act" and also the Free Public Libraries Act of 1850, which is in extensive and useful operation, especially in our great northern centres of commercial industry. He was elected a member of the Society in 1852, and was for many years one of its Vice-Presidents. He took an active interest in its educational proceedings, and at the instance of the Council, he brought in and carried through in the House of Commons the "Literary and Scientific Institutions Act, 1854," which had been prepared by a Committee of the Society.

Notes.

Velocipedes.—Velocipedes, known in England nearly half a century ago as dandy-hobbies, occupy a vast deal of attention now in France. Manufactories are established on a large scale in Paris and elsewhere, and the new carriages, without horses, are constructed on very scientific principles, light, elegant, and with all kinds of delicate appliances, at prices varying from ten to fifteen pounds. They are generally made with only two wheels, and the word velocipede being too long, it has been abreviated to *velox*, while those constructed with three wheels are called *tricycles*. The manufacturers—one in Paris, at least—have large places in which purchasers are instructed in the management of their carriages, and three or four lessons are said to be sufficient to form competent velocipedists. Many young men have adopted them, and in the country the velox may be seen awaiting its master at the railway-station. In one case, an economical application has been made of the tricycle, the rural postmen of the department of the Aube being provided with them, and considerable time is thereby saved in the delivery of letters in consequence. A box is attached to the machine, in which the postmen are allowed to carry parcels for customers, so that a regular parcels delivery is established in the district, and the charge for the parcels soon pays for the velocipede. The old dandy-hobbies went out of fashion on account of the numerous accidents to which they gave rise, but great improvements have been made in the machine, and its use is taught in a complete manner. The spider-like structure of the velocipede makes it very dangerous to pedestrians at night, and those in Paris are now provided with a small lantern, to prevent accidents.

Secondary Education in Paris.—There exists an important educational establishment in Paris, principally intended for the secondary education of youths for commercial employment, called the Ecole Turgot, and which has a well deserved reputation. A new school, which will form in fact a branch of the former, is now being constructed in the Rue Château Landon, to be

called the Ecole Municipal Colbert, which will form a worthy monument to the fame of a second great minister whose views on political economy were far in advance of the time in which he lived. In addition to these, other branches are to be established in the outlying quarters of the city to give secondary instruction to working men in evening classes. It is expected that Lyons, Rouen, Lille, and other towns will follow the example of the capital, in thus extending the means of secondary education for the middle and lower classes.

The Industrial Museum at Turin. — The programme of the studies at the Industrial Museum at Turin, for the scholastic year 1868-9, has recently been published by the Director, the Commendatore Devincenzi. These courses are principally intended for persons intending to become professors at technical, professional, and industrial schools, and for managers of industrial and agricultural undertakings. The following is the course of study for students who intend taking the diploma of the professor of agriculture:—

First year.

Physical Science, applied to industry.
Chemistry, applied to agriculture.
Rural Economy and Drawing.

Second year.

Chemistry, applied to agriculture.
Mechanics, applied to agriculture.
Rural Economy and Forestry.

Memorials of Public Men.—Twenty marble busts have been added within a short time to the sculpture gallery of Versailles. Amongst the notabilities represented are Arago, the astronomer, the poet Béranger, Archbishop Affre, the sculptor Rude, the painter Taunay, the composer Tesueur, the famous orientalist Champollion, the political economists Duquesnoy and Cobden, the chemists Gay-Lussac, and Pelletier, the philosopher Azaïs, the Duc de Larochefoucauld, and several admirals and generals. The council of the Order of Advocates at the Cour Imperiale decided the other day that a subscription should be opened, in the name of the bar of Paris, for the erection of a monument to the late Monsieur Berryer.

Population of Cuba.—According to the latest census, that of 1861, the number of white persons in Cuba was 793,484, including the creoles or descendants of Spanish or European settlers; the number of mulattoes and freed slaves was 234,493; and those of the black slaves, 370,553. The white population of Porto Rico in 1861 was 300,406. The freed persons of colour, 241,037; and the number of slaves amounted to 41,238.

Public Instruction in Greece.—In 1866 there were 140 superior educational establishments in Greece, including the Ionian Islands, composed of one university attended by 1,182 students, 16 lycées with 1,908 pupils, and 123 schools attended by 6,675 pupils. The elementary schools were 1,067 in number, of which 942 were for boys, and 125 for girls; the number of pupils in these schools was 52,583, making in all 1,207 public educational establishments, with 62,348 pupils. To this must be added 4 seminaries, 3 orphan schools, 45 private boys' schools, and 48 private girls' schools. Thus the total number of educational establishments in Greece amounts to 1,307, with 67,873 pupils, of which 11,323 are girls. The cost to the State for public instruction in 1866 amounted to 1,323,050 drachmas (£47,250). In Greece and the Ionian Islands, during the same period, there were 77 newspapers and 13 periodical reviews, of which only 19 were established more than 10 years ago. The number of printing establishments throughout the kingdom was 75.

Price of Land in Paris.—The demolitions now proceeding in order to form the two new streets which, with the Rue de la Paix, will give three splendid thoroughfares, diverging at different angles, but all terminating in a *place* opposite to the new opera-house, furnish examples as remarkable as any yet supplied of the enormous market-value of ground in Paris. Amongst the lots of land sold during the latter half of December are the following:—1,175 square metres in the Rues Réaumur, De Grammont, and Richelieu, at 1,200 francs (£48) per metre; 193 metres, at the corner of the Rue Choiseul, at 1,550 francs (£62) per metre; 404 metres in the Rue du Helder, at the corner of the new Boulevard Haussmann, at 1,200 francs; and 558 metres, close to the new opera-house and the same boulevard, at 1,060 francs (£42 8s.). In the same list are found, by way of contrast, 643 metres in the Rue Piat sold at 22 francs; 190 metres in the Boulevard Soult at the same price; and several other plots, at prices varying from 28 francs to 40 francs per metre. With the exception of the extraordinary cases given above, and of one plot in the Rue St. Lazare, which sold at the rate of 726 francs per metre, there is only one instance of ground fetching more than £20 per square metre, and very few over eight to ten pounds.

Newspapers in France.—The number of newspapers published in France now amounts to 1,668, of which 69 political and 710 not political are published in Paris.

Newspapers in Bavaria.—In Bavaria the number of newspapers is at present 392; last year the number was only 357. The number of newspapers published at Munich is 70.

Correspondence.

Food Supply.—Sir,—In his very interesting paper on the "Progress of the Society of Arts," under the head of "Food Supply," Mr. Davenport has hardly done justice to the exertions of the Australian Meat Company. I allude to the words (page 165) "attempts at importation." Our first shipments arrived in England in February, 1867, and up to the present date we have received and sold the produce of over 9,000 head of prime cattle; this shows that the Australian Meat Company have, at all events, got beyond the stage of "attempts at importation." The *Times* recently mentioned the matter in a similar manner, speaking of a few tins of beef having arrived. I write this letter with the object of placing the fact on record that, whatever may be done hereafter by others, "Ramorine" beef, preserved by the Australian Meat Company, was the first Australian meat brought to England in large quantities as a saleable and profitable article of commerce. Those concerned in the question should consider that although our process is not new, we have certainly opened out a new source of food supply. Whether this Australian beef is used among our poor, or on board ship, does not touch the merits of the question, as every pound of beef from a new source used on board ship, is a pound of beef added to the general stores of England. Who actually uses the particular pound of beef is of no importance.—I am, &c., C. G. Tindal.

Australian Meat Company, 52, Gracechurch-street.

Musical Pitch.—Sir,—In reference to the note signed "W. Pole, F.R.S.," on musical pitch, which was printed in last week's *Journal*, I would request permission to inquire if it is not a fact that the standard of musical pitch adopted in France corresponds with that generally accepted by Germany and Russia? There appears to be a diversity of opinion as to what is termed a "reasonable pitch." Eminent conductors of orchestras give a preference to a high pitch. Singers, and those whose practical experience shows them that the conductor's pitch is extravagantly high, advocate a lower pitch. Other circumstances, such as the detriment done to stringed instruments by the extra tension which tuning up to the present pitch involves, the impossibility of now executing certain musical passages in oratorios and operas written a hundred years back, all point to the necessity of a lower pitch. It being assumed, then, that the standards of musical pitch do agree generally on the Continent, surely the right step for England is the adoption of a similar pitch. The advantages of uni-

formity in pitch are many and palpable. As regards the letter on the same subject addressed to the editor of the *Journal*, in which it is stated "that the inquiries which the Society is instituting abroad will probably show that in Imperial France, where imperial gold and imperial will are omnipotent to issue an authoritative tuning-fork, the pitch is not the same at all institutions, even in Paris," is not this statement an unauthorised assumption that it is unnecessary to promote the reform of musical pitch? The differences in pitch which a highly-cultivated musical ear has detected at various concerts in Paris, may, probably, be due to the variations of temperature in such concert-rooms. The advantage, however, of possessing a standard for reference remains the same to the musical instrument manufacturers and musicians. As regards the letter which your correspondent quotes, it is but necessary to remark that that letter commences with the avowal of a battle existing between the voice and musical instruments. Can the writer of the letter quoted be one of the great musical authorities who give a higher rank and consideration to the musical instruments made by M. Antoine Courtois, Messrs. Metzler, Messrs. Rudall and Carte, Messrs. Hart, and others, than to the human voice, a natural musical instrument made by God? This writer further states, that "the progressive elevation of the diapason has, in all ages, been the standard complaint of singers who are approaching the natural termination of their musical career." This statement is an additional argument in favour of a lowered pitch, one more adapted to the human voice; and though the writer evidently does not wish to admit the necessity of lowering the present pitch, still every one must allow that the means within the reach of those who virtually lay down the law in musical matters in England should be taken to extend, if possible, the existence of good voices, rather than support, and persist in, a system which recent events show to be disadvantageous to the human voice.—I am, &c., A. S. C.

February 2, 1869.

Mr. Dean's Paper on Xylography.—Sir,—I have been much interested by reading Mr. Dean's paper on "Xylography." In my opinion there is plenty of room for improvements upon the old system of graining, and Mr. Dean's process seems to be a step in that direction. Without going so far as Mr. Ruskin in absolutely denouncing all imitations, I hold that where the actual material can be obtained it is always preferable, but when this cannot be effected, the nearer approach the copy has to the original so much the better, and this is more especially the case in nature; therefore the result of Mr. Dean's process must be to bring the work nearer to that of nature than the system of hand-graining. Besides this, there are difficulties which, I believe, have not yet been overcome in copying some of the choicest foreign and colonial woods. I may instance the Huon pine of Tasmania *(Dacrydium Franklinii)*, the knots of which correspond with those of the bird's-eye maple, but are exceedingly close together, and are surrounded by a singularly bright satiny lustre. It is this lustre, I believe, which the grainer has hitherto found difficult, if not impossible, to reproduce accurately. There are also the Tasmanian myrtle *(Fagus Cunninghami)*, the musk-wood *(Eurybia argophylla)*, and many other most beautiful woods, the produce of the Australian colonies, which, if they could be faithfully represented in this country, would be most valuable for panels of doors, or for large rooms, or even for cabinet work. The distance, and heavy charges for freight, are probably the only drawbacks to the importation of the woods themselves, as there is no lack of trees in the Australian forests. But setting aside the subject of imitating woods, is Mr. Dean aware that in America sheets of wood are cut so thin that the actual material itself is used in place of paper for walls. These sheets are nearly as thin as paper, and are cut in lengths of about ten feet, and the entire width of the trunk, and appear like the single shavings from a gigantic plane. They are said to be nearly as cheap as paper, and are affixed to the walls in a similar manner, after which they are either rubbed down with oil or varnished. By this process rooms can be papered, so to speak, with bird's-eye maple, curly maple, walnut, hornbeam, birch, and, in fact, with most, if not all, the North American woods, though I am not aware whether the machine by which they are cut is capable of treating in a similar way such hard woods as those of the Australian colonies I have already mentioned.—I am, &c., John R. Jackson, Curator of the Museum of Economic Botany, Royal Gardens, Kew.

February 3, 1869.

Recovery of Sulphur from Alkali Waste.—Sir,—The discussion on Mr. Simmonds' paper took such a discursive form that time would not allow me to offer a statement of some facts relating to this subject, by way of supplement to the reference made to it in the paper, and for the purpose of illustrating the general importance of studying the materials which are the refuse of manufacturing operations. As the quantity of common salt consumed in the British alkali trade amounts to no less than 400,000 tons a-year, and nine-tenths of the sulphur used in the manufacture of soda remains in the waste discharged from the lixiviating vats, the quantity of sulphur which thus becomes locked up as it were cannot be far short of 100,000 tons a-year. This sulphur is now being recovered with a very considerable degree of advantage to the alkali manufacturers, and with the further advantage of preventing that pollution of rivers by the slow decomposition of the soda waste heaps which has been such a fertile source of nuisance at alkali works. The method adopted, which is very simple and inexpensive, is the invention of Mr. Ludwig Mond. Its adoption is, in a great measure, due to the appreciative insight of the late John Tennent, manager of the St. Rollox Works, near Glasgow, where it has been worked some time. This method is also being worked at several other places. The recovery of the sulphur is effected to the extent of one-half of the amount in the soda waste, and at a cost of about £1 per ton. The sulphur thus obtained is very pure, and serves as a substitute for Sicilian sulphur, which has been imported into this country to the extent of about 50,000 tons a-year, at a cost of over £6 per ton, not for the manufacture of sulphuric acid—which is now almost entirely made from iron pyrites—but for the various other uses for which sulphur is required. If the application of this method of recovering sulphur from soda waste were carried out to its full extent at the alkali works of this country, they would, therefore, be able to furnish a quantity of sulphur equal to that now imported from Sicily, not only with profit to the manufacturers, but with the advantage of preventing one of the most obnoxious forms of pollution to which the rivers of manufacturing districts are subject, while the product of the operation would itself have a money value amounting to about £300,000 a-year. The fact that the recovery of sulphur from alkali waste has so long been an object unsuccessfully pursued, together with the results now obtained, should afford encouragement for the persevering prosecution of attempts to utilise other kinds of waste or refuse materials which hitherto have either been neglected or have refused to yield whatever they contain of value in such a manner, and at such a cost, as to be worth extraction.—I am, &c., Ben. H. Paul.

8, Gray's-inn-square, February 3rd, 1869.

MEETINGS FOR THE ENSUING WEEK.

Mon.....Society of Arts, 8. Cantor Lecture. Mr. S. A. Hart, R.A., "On Painting."
Social Science Assoc., 8. Mr. R. W. Cooke Taylor, "On a Project for opening the Civil Service to Women."
R. Geographical, 8½.
Medical, 8.
Victoria Inst., 8.
London Inst., 6.

Tues ...Royal Inst., 3. Mr. Westmacott, "On Fine Art."
Civil Engineers, 8. 1. Discussion, "The Mauritius Railways: Midland Line." 2. Professor Ansted, "On the Lagoons and Marshes of certain parts of the Shores of the Mediterranean."
Photographic, 8. Annual General Meeting.
Ethnological, 8. 1. "On Ceremonies accompanying Childbirth in Australia and New Zealand." Communicated by Dr. Hooker. 2. Mr. Hodder M. Westropp, "On Cromlechs and Megalithic Monuments."

Wed ...Society of Arts, 8. Mr. G. C. T. Bartley, "On the Training and Education of Pauper Children."
Geological, 8. 1. Mr. E. Hull, "On a Ridge of lower Carboniferous Rocks crossing the Plain of Cheshire." 2. Rev. T. Wiltshire, "On the Red Chalk of Hunstanton." 3. Mr. W. Boyd Dawkins, "On the British Postglacial Mammalia."
Graphic, 8.
Microscopical, 8. Annual Meeting.
R. Literary Fund, 3.
Archæological Assoc., 8.

Thur ...Royal, 8½.
Antiquaries, 8½.
Zoological, 8½.
London Inst., 6.
Royal Society Club, 6.
Mathematical, 8.
Royal Inst., 3. Dr. M. Foster, "On the Involuntary Movements of Animals."
Society of Fine Arts, 8. First Musical Evening—Haydn, Mozart, and Beethoven. Conductor, Mr. Alfred Gilbert.

Fri .....Astronomical, 3. Annual Meeting.
Royal Inst., 8. Col. Drummond Jervois, "On the Coast Defences of England."
Royal United Service Inst., 3. Major C. Adams, "The Italian Campaign of 1866.'

Sat .....Royal Inst., 3. Prof. Odling, "Hydrogen and its Analogues."
R. Botanic, 3¾.

Patents.

From Commissioners of Patents' Journal, January 29.

Grants of Provisional Protection.

Alum, production of sulphate of potash for the manufacture of—130—P. Spence.
Armour, defensive—2885—T. Berney.
Artificial busts—156—J. D. Thomas.
Bell and clock chimes, mechanism for—180—W. Gillett & C. Bland.
Boots and shoes—146—W. Thomas.
Boots and shoes, &c., machinery for cleaning—167—S. G. Archibald.
Brooches, &c.—3885—L. A. W. Lund and E. Axmann.
Carding machines, &c.—184—P. C. Evans and H. J. H. King.
Cartridge cases—166—W. T. Eley.
Casks, &c.—141—J. H. Johnson.
Casks, &c., cleansing—122—J. Steel.
Chronographs, &c., keyless and stop work employed in—109—R. Watson and B. Dangerfield.
Churns—108—W. McDonnell.
Closets and urinals—154—N. Voice.
Coal, &c., getting—127—W. Tijou and W. Whieldon.
Collars and comforters combined—3901—L. J. Paine.
Cooking apparatus—142—H. A. Silver.
Cotton machinery, &c., couplings of rollers for—145—W. and S. Bottomley.
Door and window fasteners—129—W. H. Brookes.
Fabrics, manufacturing looped—147—J. B. Whitehall.
Fabrics, &c., mosaic textile and tesselated—152—W. Pidding.
Fire-arms, breech-loading—119—T. Birkett and H. Scott.
Fire-arms, breech-loading—128—A. Sehet.
Floor dogs or flooring cramps—170—W. and J. Pain.
Furnaces, moveable grates for—116—J. H. Kitson and J. Kirby.
Gas, &c.—186—H. A. Bonneville.
Gas meters, &c.—162—G. Brown.
Grain-cleaning mills—190—D. Spooner.
Gun barrels, cleaning—125—H. Fowkes.
Guns, breech-loading—176—C. E. Brooman.
Hackling machines—169—G. Lowry.
Horse-shoe nails, &c.—160—J. W. Price.
Hydraulic lifts—3927—J. W. Wilson.
Iron and steel—3911—D. S. Price.
Iron and steel—139—J. Jeavons and W. Waplington.
Iron and steel, converting vessels used in manufacturing—124—J. T. Smith.
Life buoys, &c.—110—J. R. Hodgson.
Looms—153—W. H. Platt.
Looms—155—C. Catlow.
Lubricators—3877—T. R. Shaw.
Meal and flour, dressing—158—R. H. Clarke.
Meat, salting and preserving—98—C. J. Günther.
Metal articles, moulding—151—M. Henry.
Metals, &c., cutting—3879—R. Wilson.
Millstones, dressing, &c.—111—T. Mortlock.
Oil, manufacturing—134—A. H. A. Durant.
Oils, &c., presses for expressing—117—T. Cook and J. Watson.
Paper-making machinery—138—R. Craig.
Peat, drying, &c.—29—J. J. Hays.
Piles, apparatus for driving—171—H. W. Hammond.
Punches—132—E. Craddock.
Railway breaks—65—M. Wilkin and J. Clark.
Railway level crossing gates, &c.—121—C. H. Lea.
Railway reading lamps, pocket—112—E. P. North.
Railway switch apparatus, &c.—172—J. Armstrong.
Railways—113—H. Vavasseur and C. M. Wade.
Railways, connecting the ends of rails in constructing—136—J. T. Bintley.
Reaping and mowing machinery—114—A. V. Newton.
Reaping and mowing machines—131—T. Howcroft and A. McGregor.
Refrigerators—178—J. Siddeley and F. N. Mackay.
Rheumatism, &c., instrument to be used in the treatment of—173—C. Baunscheidt.
Sand distributors—182—E. Burton.
Saw-hardening furnaces, &c.—64—J. Rodgers.
Saws, sharpening and setting—3891—J. H. Johnson.
Scales and weighing machines—165—H. and J. Parnall.
Scarfs, &c., fastenings for—194—A. M. Clark.
Screw nuts, bolts, &c.—159—G. R. Postlethwaite.
Shawls, &c.—150—W. R. Lake.
Ships' skylights—168—M. Burke.
Signalling apparatus—140—J. G. Johnson.
Spoons—135—T. A. Warrington.
Steam pumps—115—W. E. Newton.
Step-ladders—123—A. P. Chance.
Sugar—164—A. M. Clark.
Sulphate of ammonia—148—F. Braby.
Surgical trusses—192—J. C. L. Camel.
Valves—107—G. D. Kittoe and P. Brotherhood.
Velocipedes—94—C. E. Brooman.
Velocipedes and manumotive carriages—137—S. Russell.
Vessels, propelling—143—J. Bourne.
Vessels, propelling—174—N. D. Spartali.
Water, purifying and storing—188—F. Lipscombe.
Whist, &c., apparatus for scoring at—133—M. Boyce.
Window blinds, rollers and furniture for—126—D. P. Wright.
Wood, reducing to fibres, &c.—3727—C. Farrar.
Wool, &c., preparing and combing—157—P. Oldfield.

Inventions with Complete Specifications Filed.

Artificial marble—198—F. Walton.
Centrifugal machines—235—H. W. and R. Lafferty.
Composition for the manufacture of various useful or ornamental articles—222—J. M. Merrick, jun.
Ensor net or lace—207—F. R. Ensor.

Patents Sealed.

2399. T. C. Fidler.
2400. C. D. Fox.
2401. W. T. Royle.
2402. F. A. Leigh.
2403. J. Ratcliffe.
2404. A. G. Day.
2405. J. F. Lackersteen.
2413. H. Moritz and J. Reinach.
2414. H. Moritz and J. Reinach.
2422. J. A. McKean.
2424. M. Wilkins and J. Clark.
2432. L. C. Bailey.
2458. M. Benson.
2501. J. Brown.
2502. A. M. Clark.
2543. C. Evotte.
2556. A. M. Clark.
2660. W. M. Jackson and R. Garsides.
3468. J. Howard and E. T. Bousfield.
3698. A. C. Sterry, F. Lambe, and J. Fordred.
3759. H. A. Bonneville.

From Commissioners of Patents' Journal, February 2.

Patents Sealed.

2343. L. Wray.
2439. W. Spence.
2444. B. J. B. Mills.
2450. C. G. Johnson.
2455. W. Millard.
2457. E. Edwards.
2464. W. and E. M. Hann.
2467. W. M. Moore.
2469. C. J. Curtis and A. Fiddes.
2473. N. Salamon.
2480. S. Gardner.
2489. F. Walton.
2503. J. Salmon.
2532. R. Saunders.
2570. C. J., W., A., & F. Simpson.
2659. T. Wrigley.
3033. B. E. R. Newlands.
3036. R. Heilmann and P. Hart.
3804. H. A. Bonneville.

Patents on which the Stamp Duty of £50 has been paid.

258. J. M. A. Montclar.
286. J. Robertson.
402. R. W. Armstrong.
430. J. Tomlinson.
301. C. Delafield.

Patents on which the Stamp Duty of £100 has been Paid.

293. J. L. Norton.
223. G. H. and E. Morgan.
283. D. Joy.

Registered Designs.

4994—Jan. 13—Nosing for stair-treads—F. Smith, Priory, Dudley.
4995—Jan. 21—Velocipede—Lloyd and Co., Birmingham.
4996—Jan. 25—Match-box—Bell and Black, Bow-lane, Cheapside.

Journal of the Society of Arts.

FRIDAY, FEBRUARY 12, 1869.

Announcements by the Council.

Ordinary Meetings.

Wednesday Evenings at eight o'clock :—

February 17.—"On the Efficiency and Economy of a National Army in Connection with the Industry and Education of the People." By Henry Cole, Esq., C.B. On this evening the Right Hon. T. Milner Gibson will take the chair. If necessary, the discussion will be continued on the following Friday morning, the 19th instant, at 11 a.m.

February 24.—"On Ventilation." By Edward Smith, Esq., M.D., F.R.S.

March 3.—"On the Adaptation and Extension of Present Means for the Promotion of Scientific Instruction." By H. H. Sales, Esq.

Cantor Lectures.

A Course of Four Lectures, "On Painting," is now being delivered by S. A. Hart, Esq., R.A., late Professor of Painting at the Royal Academy, as follows :—

Lecture III.—Monday, February 15th.

On the Suggestions offered by surrounding circumstances to the Artist.

Lecture IV.—Monday, February 22nd.

On Landscape Painting.

Each lecture will begin at eight o'clock. These Lectures are open to Members, each of whom has the privilege of introducing two friends to each lecture. Tickets for this purpose have been forwarded to each member.

FINAL EXAMINATIONS, 1869.

In order to avoid holding these Examinations on the same evenings as those of the Department of Science and Art, it has been decided to hold them, in 1869, on the evenings of

TUESDAY,	**the 20th**	**APRIL,**
WEDNESDAY,	**the 21st**	,,
THURSDAY,	**the 22nd**	,,
FRIDAY,	**the 23rd**	,,

From 7 p.m. to 10 p.m., instead of on the 27th, 28th, 29th, and 30th April, as announced in the Programme of Examinations for 1869.

In consequence of this alteration the Previous Examinations must be held earlier, and the Forms No. 2 and No. 4, referred to in par. 6 of the Programme, must of course be sent in a week earlier than the dates there fixed for receiving them.

It is very important that this alteration should be made as public as possible. For this purpose a number of small slips, to be inserted between pages 8 and 9 of every Programme sent out, have been forwarded to each Institution and Local Board. Large bills, to be suspended on the walls of the Institution reading-room, or in some other public place, will also be sent on application.

In reference to the subjects referred to in the notice at page 9 of the Programme, a sufficient number of applications from candidates in Conic Sections, Navigation and Nautical Astronomy, and Mining and Metallurgy, have already been received. Papers will therefore be set in these subjects.

No paper will be set in Italian.

Local Boards having candidates either in the "Theory of Music" or in "Elementary Musical Composition (Tonic Sol-fa System)," should communicate with the Secretary of the Society of Arts without delay.

Elementary Examinations, 1869.

Secretaries of District Unions and Local Boards desiring to adopt the Society's scheme of Elementary Examinations, are reminded that they must apply to the Secretary of the Society of Arts *without delay*, stating the number of male and female Candidates respectively desiring to be examined in each grade.

Free Libraries and Museums.

The Council have appointed a Committee to consider and report how the Society may aid in promoting the establishment of Free Libraries and Museums of Science and Art throughout the United Kingdom. The names of the members of the Committee will be published in a subsequent number of the *Journal.*

The Thames Embankment.

The Council have appointed a Committee to report upon the best way of dealing with the Thames Embankment, so that the opportunity may not be lost of making this noble site conducive to the embellishment and improvement of the metropolis. The names of the members of the Committee will be published in a subsequent number of the *Journal.*

Subscriptions.

The Christmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Cantor Lectures.

The second lecture of the course by Mr. S. A. Hart, R.A., "On Painting," was delivered on Monday evening, the 8th inst., the subject being "The Practice of Portrait Painting." An outline of these lectures will appear in the *Journal* at an early opportunity.

Tenth Ordinary Meeting.

Wednesday, February 10th, 1869; Edwin Chadwick, Esq., C.B., Member of Council, in the chair.

The following candidates were proposed for election as members of the Society :—

Birkett, Frederick Blow, Hampton-court, W.
Brandreth, Edward, 1, Elvaston-place, Queen's-gate, W.
Daubeney, Colonel, C.B., Osterley-lodge, Spring-grove, Isleworth, W.
Despard, Frederick, West-hill, Highgate, N.
Dyer, George, 90, Regent-street, W.
Hughes, Samuel, C.E., F.G.S., 14, Park-street, Westminster, S.W.
Lermitte, Edwin, Muswell-hill, N.
Lloyd, Edward, The Winns, Walthamstow, N.E.
Trevelyan, Sir Charles E., K.C.B., 8, Grosvenor-crescent, S.W.
Wright, Henry W., 3, Keith-terrace, Uxbridge-road, Shepherd's Bush, W.

The following candidates were balloted for, and duly elected members of the Society :—

Cow, Peter B., jun., Streatham-common, S.W.
Firbank, Ralph, 4, Rockhall-terrace, Cricklewood, N.W.

The Paper read was—

THE TRAINING AND EDUCATION OF PAUPER CHILDREN.

By G. C. T. Bartley, Esq.

On the 1st of July, 1867, in England and Wales, 331,235 pauper children, under the age of 16 years, exclusive of lunatics, received parish aid. This is nearly one in every 60 of the population. Of these about a seventh, or 48,002, were receiving indoor relief, and the remainder, 283,233, outdoor relief; some 13,700 were attending schools of a satisfactory character, and 22,500 more were attending schools of an unsatisfactory character; but, as regards the remainder, about 300,000 in number, it may be stated, without much exaggeration, that nearly all, if not quite all, were receiving no sort of instruction whatever, but are growing up without the least notion of the rudiments of those subjects and habits which are becoming daily more essential in enabling the poorer classes to obtain an honest livelihood.

The period of the year from which the number of pauper children just referred to is taken being about the most favourable season for obtaining employment, as shown by there being 50,000 more children on the pauper books on the 1st January, 1868, it is clear that those who are then dependent on the parish remain so pretty well all the year round. Nor is it likely that a part of their parish allowance is spent voluntarily, either by their parents or themselves, in education; the whole of the 300,000 must consequently form a large portion of that formidable regiment which, according to the statistics of the census of 1861, receives no education whatever.

There can be little doubt as to what becomes of these poor children—the boys and, in fact, many of the girls, are the pickpockets and street-thieves of the large towns; many of the girls, even at this tender age, are already hopelessly immersed in vice; and, practically, all prey on society in some shape or other as long as they are able, and end their days either in the gaol or the workhouse. This being the present state of the evil, which is yearly increasing, in spite of all the enactments on the subject, it may, perhaps, be interesting to investigate the working and history of the poor-law regulations for pauper children, ascertaining how they have arisen, and what steps may be taken to meet the increasing evil of neglected juvenile pauperism.

These children cannot be looked upon exactly in the same way as paupers proper, inasmuch as their unfortunate position is entirely due to circumstances over which they could have no control. They are either the offspring of felons, cripples, and idiots, or orphans, bastards, and deserted children, and claim the protection of the law, frequently from their tenderest years, from having been deprived of the care of their natural guardians without fault or crime of their own. Such being their condition, they must either steal or starve in the streets, or the State must take charge of them. It may further be affirmed that in a strictly commercial point of view it is more economical to devote a certain amount in education and systematic training, than by allowing them to grow up in the example of their parents and workhouse companions, to render their permanent support, either in a prison or a workhouse, a burden on the industrious classes. The State, in fact, acknowledges this; and, accordingly, provision is theoretically supplied for all pauper children, not only for their bodily wants, but, to a certain extent, for their mental improvement. At the same time it is also necessary that the other extreme should not be run into, viz., that of treating them so liberally as to hold out a premium to pauperism. In no case should their comfort be better than, or in fact so good as, an industrious labourer has within his reach. Nothing can be more unfair or more discouraging to honest labour than to see a great advantage given to what is in most cases the offspring of improvidence, crime, and often of vice; and the injustice becomes greater when by a forced imposition of law the industrious workman is compelled to subscribe heavily to give those advantages to his inferiors which in most cases he must deny his own children.

The subject will naturally divide itself into two heads, viz.:—1st, the plans which have already been tried and their success; and, 2nd, the work that remains to be done.

I.—The Plans which have already been tried, and their Success.

To Sir James Kay-Shuttleworth belongs the credit of reorganising the system of pauper children's instruction, and in a most able report to the Poor-law Commissioners, in 1838, he pointed out fully the great waste and inefficiency of the then existing system, and sketched out a plan which, if it had then been adopted almost to the letter, would have produced all that could have been desired, and at a reasonable charge to the ratepayer.

At that period even it would appear that most workhouses had a certain sort of provision for the education of the children permanently lodged in them. There was usually a paid master of very low qualification, but the remuneration was so trifling, and the duties so distasteful, as to preclude any teacher of experience from accepting the appointment.

As might be imagined, this education amounted to little or nothing, and the per-centage of children who could neither read nor write was very great. The teachers had a further disadvantage in the fact that the number of children who remained permanently in each union was so small as to render it impossible to have regular classes, and the daily intercourse of the young with the depraved and hopeless paupers most effectually eradicated

any good which a few hours' daily teaching might tend to produce. Again, the union was the child's home, and ever remained so; it knew no other; its earliest remembrances were of its walls, and thus the idea which of all others it was desired to eradicate from the child's mind was more carefully instilled into it, making it, in fact, a young pauper.

These and many other weighty reasons, as Sir James reports, clearly convinced him that the whole system was bad, and he pointed out that, by a mutual arrangement of unions in counties or districts, efficient schools might be formed, with better teachers and much less cost, more careful management and vastly superior moral benefit to the children. Sir James in this report proposed that schools of about 400 to 500 children should be formed, and suggested that some unused union-house or other available building should be adapted and used as the district school. He allowed one master or mistress, at £100, and maintenance 10s. a week, a second master or mistress at £60 and 10s. maintenance, a chaplain at £100, a tailor and shoemaker at 15s. a week, and a laundress at £15 per annum and 5s. maintenance per week. These latter to work for, and, to a certain extent, educate some of the children in their respective trades. This produces a total of £470 per annum, or, as nearly as possible, £1 per head for the total cost of a very superior educational staff, both religious and secular.

This was found to be less than half the aggregate cost of supplying the same number of children with most inferior instruction under the system of a schoolmaster to each union, a system which still exists in very nearly all parts of the country, though in the larger unions a separate building is appropriated for the children. The cost of the building, if an unused union house were to be had, would be trifling; and, even when premises had to be hired or built, the cost would be little, if any more, than the regular rental of the extra space in the union if the children were kept there; whilst the other items of cost, viz., food and clothing, would be much the same, or rather less, by keeping together so large a number.

Such was, broadly, the excellent system of Sir James Kay-Shuttleworth, and had it been carried out strictly in every district in England, the effect would have been most salutary both to the paupers and the ratepayers. Unfortunately, however, the farming system, which was then growing up, afforded greater attractions to the guardians, as being undoubtedly a more easy and less expensive method of getting rid of their troublesome charges. Theoretically, this plan consisted of very large district schools, where the children were sent, at a fixed charge, varying from 3s. to 4s. 6d. a-week, to be fed, clothed, and educated, but with this essential difference, that the schools were private commercial speculations, in the hands, usually, of one person. As a consequence, the sole aim of the proprietor was to make profit. At the sum charged he could only do this by stinting the children in every possible manner. The system grew to great proportions until the year 1848, when it culminated in the awful disclosures at the trial at the Old Bailey of Mr. Druet, for the murder of 150 children at Tooting. The horrible treatment the children received, the overcrowding, and almost starvation on bad food, caused a sudden outbreak of cholera, and the effect was so startling that, although Druet was acquitted of murder, his ill-treatment was but too apparent, and the farming system became doomed. This was forcibly stated in the conclusion of a leading article in the *Times* on the subject, on the 16th of April, 1849—"There is but one favourable point in the terrible tragedy, which is that the deaths of these 150 Tooting children must effectually break up the child-farming system—and for ever."

Since this period the education and maintenance of these children have depended much on the size and wealth of the unions to which they belonged; the different plans adopted for their improvement may be divided into four classes, viz.:—

1st. That in the district school.

2nd. That in a separate school building belonging to one union.

3rd. That in a national or other school in the neighbourhood of the union house.

4th. That in a school in the union house itself.

1. *As regards that in the district school.*—The distinctive feature of the district school is that it belongs to several unions, and is, therefore, managed by gentlemen with no other functions than the charge of the school; these are selected by each set of guardians from the unions or parishes which have amalgamated to form the district, expressly to look after the school; on the contrary, when a school belongs to one union, it is managed by the guardians of that parish, and is only a part of their general duty. Of the two systems, the district school has, undoubtedly, the advantage as a scholastic institution, but, in a financial point of view, it may be doubted whether it is, as at present managed, altogether so advantageous or economical as the union school. The obvious intention and limit of the school, viz., to enable the children to get their living honestly, and in the lowest station of life, are often forgotten, and the curriculum becomes immensely superior to that which the industrious labourer can hope by honesty to give his child. The board of guardians, it is true, often err in the opposite direction, and reduce their school to uselessness by false economy; but the district school managers, not being, as it were, actually responsible for the whole cost, are apt to be tempted, by the glory of a magnificent institution, into unnecessary expenses, all of which advantages are really an injustice to the ratepayers, and individually a premium to pauperism. For the buildings of these schools, palaces have been erected at a fabulous cost. Nothing seems too good or spacious for them; like many amateurs they have rushed into bricks and mortar, and one district seems to wish only to eclipse its neighbour in the splendour of its pauper children's mansion. For instance, the one at Leavesden, near Watford, under the St. Pancras guardians, now being constructed at a cost of £50,000, will contain 700 children; at 5 per cent. this is a rental of £2,500, or just £3 11s. 8½d. per head per annum for interest on building, to say nothing of repairs. It is true that this only amounts to about three farthings in the pound on the rateable value of the district, as is urged in justification of the expenditure, but, if it were but the fiftieth part of a farthing, it would still be excessive.

It appears that, as a temporary arrangement while the Watford school is building, 175 children are accommodated at Plaistow, under the same board of guardians, in three old houses, at a rental of £230. The houses do not seem to be full, but, even if they were, this is only a cost of £1 6s. per head per annum; and if the 700 children above mentioned were thus housed, no less than £1,600 per annum would be saved by this parish alone for rental. Many middle-class schools, with 50 pupils paying from £80 to £100 a-year each, are located in houses, the rentals of which do not exceed £100 per annum, being £2 per pupil, or a little over half the cost of the Marylebone pauper children's home. This case further exemplifies the wisdom of Sir James Kay-Shuttleworth's report in 1838, where he advocates the use of some disused union house, or other large building, which can generally be obtained in the least fashionable part of a town.

There appear to have been several legislative reasons which have prevented the rapid increase of the pauper district schools, and at present only six are in operation. They are in the following places:— The Central London at Hanwell, Farnham and Hartley-Wintney, North Surrey, Reading and Wokingham, South East Shropshire, South Metropolitan; and their costs and other points of interest may be gathered from the following table:—

	Cost of building.			No. of children at each school in 1867.	Payments from Parliamentary vote in aid of teachers' salaries in 1867.		
	£	s.	d.		£	s.	d.
Central London at Hanwell	84,000	0	0	1,056	1,097	8	11
Farnham & Hartley-Wintney ..	12,081	10	6	131	220	0	0
North Surrey....	48,614	0	0	724	808	6	6
Reading and Wokingham	200	0	0	124	282	0	6
South-East Shropshire	650	0	0	165	185	6	5
South Metropolitan.....	50,600	0	0	1,143	862	4	6
Total.....	*195,645	10	6	3,343	3,455	6	10

* The discrepancy of £500 must be caused by a misprint in one of the details.

In examining this table it must be remembered that the sum stated as paid from public money for teachers does not represent their whole cost. The Government grants only supplement the payments to industrial teachers, the other part of their salaries being paid from the rates. What addition this would make is not discoverable from the reports, as the proportion of industrial or trade teachers to ordinary teachers is not stated, but doubtless the addition would be considerable.

Leaving out the Reading and South-East Shropshire Unions, which are evidently converted buildings, the cost of the other four was £195,295 10s. 6d., and last year they accommodated 3,054 children, or each child's rental, at five per cent. on the outlay of the building, amounted to £3 3s.; the South Metropolitan being the lowest at £2 4s., and that at Farnham the highest, at £4 12s.

The cost of the teachers' payment for the instruction of these children also varies considerably, amounting at Reading to £2 5s. per head from the Government grant alone, whilst the average cost of the children of the artizan class, under the Educational Department of the Committee of Council, in 1867-8, was 14s. 8¾d., including cost of administration and inspection, which does not enter into the above sum of the district school. The working expenses of the schools are paid out of the rates, and consequently not published and presented to Parliament in the Poor-law Reports; they are therefore difficult to ascertain, except for those connected with the management. From a report recently published, it appears that last year each child at the Central London School cost the enormous amount of £40 10s. 7d., and this year it is stated in several newspapers that it will even reach £50. However this sum may be made up, and whether it includes the great cost of rental and tuition, with Government inspection and supervision, it is difficult to say, but a clear statement of the items in full detail should be published by each board of managers.

While asserting most clearly that the cost of these establishments is enormous, so much so as to render their universal adoption impossible, at the same time it must be fairly admitted that their action is beneficial; they undoubtedly do, to a certain extent, reform some of the pauper children, and a proportion of their inmates are converted into respectable citizens. It is impossible to over-estimate the importance of such results, and if half these children turn out well, no doubt the ultimate benefit to the State is worth the cost, yet in arranging a system for universal adoption, it is clearly necessary to make it practicable as much in cost as in anything else. Were all the pauper children treated as the favoured few in these district schools are, the cost to the country would be intolerable.

2. *As regards Schools in Separate Buildings in Connection with one Union.*—The second description of pauper schools is that which is in a building entirely separate from the parish union. These schools exist in about sixty places, more particularly in the larger unions. The exact cost of the schools it is almost impossible to ascertain with any certainty, though it may probably be considerably lower than that of the district schools. Mr. Tufnell, in his report last year (20th Report Poor-law Board, 1867-8, page 131), states that on the whole nothing can be more satisfactory than their general condition. They provide for about 10,500 children. In action they may be said to resemble the district schools on a smaller scale.

3. *As regards Pauper Children who attend the National or other Schools in their respective Parishes.*—This is a system of nominally providing for the education of the pauper. It is adopted in places where the union is too small to provide a teacher or schools, but in most cases the benefit to the children is very small indeed. Frequently no systematic order is enforced for sending them, and those who do attend are generally looked upon by the school as "merely paupers," and the amount of instruction they receive is about as much as their own unaided sharpness enables them to pick up. About 24 unions adopt this plan, and some 600 children are neglected by it accordingly.

4. *As regards Schools in the Workhouses.*—This class of schools is unfortunately the largest and, at the same time, necessarily least efficacious. About 480 unions out of the 655 either have no school at all or one under the same roof as the workhouse. The amount of training in this case to the children is indeed small, except as far as learning to follow in the steps of their companions in pauperism and often, alas, in vice. Any benefit they derive is soon eradicated by contact, and the good effected to these 21,000 children must be looked upon as very trifling. As a specimen, Mr. Tufnell reports (20th Report, 1867, p. 135), that in 1852 out of 23 young men and boys in the able-bodied wards of the workhouse no less than 14 had been in prison, 3 once, 4 twice, the rest from 3 to 20 times, and at the same time there were 19 young women in the able-bodied wards equally depraved; all these were brought up in the schools of the Brighton Workhouse.

Such is a brief outline of the existing regulations, but it will be remarked that they extend entirely to the children who belong to the in-door class, and that the large class of out-door pauper children are in no way provided for. Their education and training depend entirely upon accident, and, consequently, usually end in their learning nothing at all.

II.—What Remains to be Done.

From the preceding it appears (as asserted at the commencement) that of the 331,235 pauper children, which may almost be called the permanent establishment, 3,343 attend the district schools and are educated well, at an enormous cost; 13,500 attend the separate workhouse schools, and are also fairly educated at perhaps rather a less cost; 600 attend national schools with but little profit; and 21,000 attend only the school in the workhouse with almost no good at all. The total, therefore, provided for in some way is about 36,000, leaving the astounding number of nearly 300,000, for whom, as has been shown, hardly the slightest provision is made. By far the greater part of these are out-door paupers, and consequently under little or no control, though dependent on the parishes. What becomes of these? By far the largest part must be *habitual* and *permanent* paupers. They are all under 16, the sexes about equally divided. Can there be a doubt as to the history of this army of pauper ignorance? They are all totally ignorant; this is clear from the fact that they attend no sort of school; they therefore cannot hope to earn their living beyond the chance existence of a street life. They live on the parish to a certain extent; they form over a third of the pauper class, and may be said to cost

about that same proportion of the £6,959,841 spent on the poor, or little short of 2½ millions. It is evident that these wretched children recruit the armies of crime and villany, and can it be wondered at? They exist, of that there is no doubt, and some of them at times live extravagantly, but it is quite plain that the parish contribution which they receive does not supply the means for such depravity; the remainder must be robbed or forcibly taken from those who have failed to give them a chance of bettering their condition in their early days.

It would seem that the whole pauper question might fall into insignificance if by some miracle this class could be wiped out. Our prisons and workhouses would in a year or two be comparatively desolate if it were not for these poor creatures, who are born paupers, brought up paupers, live paupers, and are fortunate if they die paupers, without a deeper stain upon their foreheads. Their only object in life from their very first appearance seems to be to cause trouble and difficulty to all around them, and yet it honestly is in most cases not their own fault. The greater the difficulty, and the larger the dimensions of the evil, the more need there must be to make some rapid and radical change in the existing state of affairs, and it must undoubtedly behove the State to take some decided step to remove this curse to the country at large. For to these hundreds of thousands of children it may be said, without profanity, that it would be better for them that mill-stones were hanged about their necks and they were cast into the sea, than that they should grow up as they are doing, cankering the very core of the society which so neglects them.

It is quite clear, therefore, and no one will gainsay the assertion, that some means should and must be very soon taken to educate and train these children, and it is equally clear that no system of voluntary education can ever be of any use; whatever is done must be compulsory. Some plan must be invented to get hold of them by force, to restrain them when young from practising evil as their natural occupation, calling, or profession, and to teach them something better.

No poor law system can hope to be called perfect when the young are neglected. The number of adult paupers will fall to a minimum if its ranks are only recruited by the unsuccessful and unfortunate, but how can it fail to increase when we are always bringing up a permanent staff, of some three hundred thousand strong, in such complete ignorance and depravity?

The following scheme is accordingly submitted, after much consideration, not with feelings of over-confidence in its details, but more with a hope that it may lead to an energetic movement for beginning a reform of the Poor Laws, by properly providing for the training and education of the children.

The duty of a parent is accepted by law to be that of providing for his child until he or she is of age to work for himself. In the case of pauper children who have been deserted, or are orphans, or those who are habitually on the parish books from some cause or other, this parental duty has not been fulfilled, whether culpably or not does not affect the question. The state, or parish, or community, it matters not which, has stept in and given the child those necessaries which the parent should have given, and where it can, of course forcing the parent to pay the cost. Thus, whether pleasant or not, the community has, to a certain extent, taken these children on its hands, and it would seem that it has a right to demand some return for this in the same way that a parent habitually does. Would it, then, be unreasonable if every pauper child who regularly receives and lives on parish allowance were bound to enter a certain school? If the State were to say, not as it does now, "every pauper child we will feed," but "if we feed him he must earn his bread by learning what we think proper to teach, and living at this school for a certain number of years;" this would be interference with the liberty of the subject, it is true, but might it not be very beneficial interference, and really be the means of saving thousands?

Two objections will no doubt be raised to thus obliging all confirmed pauper children to enter the schools, viz., that by so doing a provision is being made for any unscrupulous parents to get rid of their offspring by casting them on to the State, and also that the parents would be deprived of whatever earnings these children might hope to make. No doubt the former of these, if encouraged, would be a very serious evil, but it would be no more difficult to prevent than the present desertion of children, and in all cases parents who were able should be made to pay, according to their means, towards their children's support in the schools, without, of course, the power of taking them out till they had passed the required standard of knowledge. Regarding the other objection, it must be remembered that these are children who in July receive parish aid; they cannot, therefore, earn much, or in any way assist their parents.

The schools for this purpose would, of course, have to be made expressly. In some cases old union houses might be used, or other buildings erected, though not in the style of the pauper palaces at Hanwell. Each might hold about 1,000 children, and should be placed in a healthy but economical district, with a few acres of land, and, when possible, near the sea. The staff might be much as Sir James Kay-Shuttleworth suggested, and, in fact, that gentleman's plan, as before sketched out, might be copied with advantage, adding any improvements which 30 years' experience might suggest. In all cases the children must, for the time, board at the schools; the strict unbroken discipline, and removal from the influence of their pauper associates, being equally important with, if not more important than, any branch of the education. This could not be attained by a day-school.

The objections which some persons have to this compulsory system are really not insuperable, and as the idea of compulsory education for all classes of society has been seriously mooted, surely in the case of paupers whom the community feed and often clothe, it is not asking too great a return to be allowed to force a further advantage upon them. Again, the idea of educating and training permanent pauper children is acknowledged to be a good thing by the community, as shown by the amount of money already expended for the purpose out of the rates and Parliamentary votes. If this be so, it must be better for all to have some training than for less than a tenth to get the benefit. If all willingly joined such schools instead of infesting our streets, no one would doubt as to the advantage to the community; surely, then, the fact of their being so ignorant as not even to know the good to be derived from the school, makes it not less, but very much more necessary to force them to qualify themselves for honest labour, not for their own good only, but for the benefit of the community.

The course of instruction at these proposed schools would necessarily vary; except that all the inmates would have to work, and work hard. They must be schools for work, if not workhouse schools. The boys should be taught reading, writing, and arithmetic, a sound idea of religion and morality, gymnastics and drilling. No attempt at teaching any trade would appear advisable. This is particularly stated in the 7th report of the Poor-Law Commissioners, page 47, in speaking of the training of workhouse schools. It says, "Some are taught tailoring, some shoemaking, some carpentering, and some are occupied in the garden; but still, the several employments in after life of the boys reared in the workhouse must, it is believed, in the great majority of instances, be of a description that does not admit of previous training or tuition within the workhouse, or at least in no material degree. The kind of skill requisite for such success in such employment must, in fact, be acquired by continued practice; and all that can be done in the way of preparation for the most part, is to send the youth forth imbued with habits of industry,

and with his frame braced and strengthened and inured to laborious exertion, and with his temper and mental faculties duly cultivated; and, above all, with a sense of religious duty deeply impressed upon his mind." For girls, the details of the instruction must be somewhat different. Needle-work and household servants' duties should be attended to; all the washing, mending, sock-making, &c., of the establishment, would give employment, together with a careful and strict course of training, not only as to book-work, but bodily and mental habits of regularity, discipline, and obedience, are even more important than the former. No abler advice could be had in this respect, both for girls and boys, than from Mr. Tufnell and his colleagues.

It might, probably, be advisable to divide these schools, not so much into districts as into ages and classes of boys and girls, drafting them from one to another as they grow older, and thus changing their associates. Any unusually bad specimens might be removed to separate establishments for stricter discipline. The necessary number of schools would render it easy thus to classify the children as might be thought best with only the slight extra cost of travelling.

The greatest responsibility to the state in thus taking charge of these children is the difficulty of getting rid of them again; and the more so in such large numbers. It is probable that the young applicants for parish relief might fall off if they knew they had to enter such a work-school, but it would not be safe to take less than 300,000 as the number of children. As a fundamental principle none should be allowed to leave the schools until they had passed satisfactorily a certain standard of knowledge and training. It may be said that this might tend to encourage them to be idle to stay, but by judicious treatment and by rendering the discipline severer to those who were thus refractory, not many would remain incorrigible. Besides, if some were so, and would not work in the school, it is certain they would not work honestly outside. They would be prevented by this self-imposed imprisonment from doing mischief, and at a known cost of much less than that unknown and incalculable amount of damage which they would probably cause by robbery and violence during their training as criminals.

Taking, then, 300,000 as the number of children of all ages in the schools, about twelve per cent., or say 40,000, would be eligible to leave each year, that is 20,000 of each sex. These divide themselves at once into two classes—the able-bodied and the sickly.

1st. The boys. The best of the able-bodied boys might all be allowed to enter the navy, both the Royal and mercantile services. Sailors are much wanted, and if entering the service were made the boys' ambition, they would look forward to it, and in time even work for it. The advantage of recruiting the navy from this source is very strongly urged by Mr. Tufnell in his report on Union Schools, published in the Twentieth Report of the Poor-law Board, p. 132-4. He says—"The opening for boys in the Royal and mercantile service is far greater," *i.e.*, than in the army bands, which he also recommends as a suitable opening for them. "The deficiency of sailors is well known; many ships go to sea half manned, supplied with Lascars and foreigners, who often do not understand English, and generally fail on an emergency. . . . . Now it is quite possible to train boys to be three-parts sailors by certain arrangements on dry land, as is proved by several instances. All that is necessary is to erect in a yard the deck of a 200 or 300 ton ship with appropriate sails, masts, and rigging; a well qualified seaman should be engaged to instruct the sailor boys daily in the names of the different parts of a ship, to mount aloft without fear, &c., to set and furl the sails, and, in fact, perform all the duties required of boys at first going to sea. Experience decisively proves the success of this method of training. Captains of ships prefer boys so trained to any others; and I have been informed by some they would rather have a boy so trained fourteen years of age, than a finer boy of sixteen untrained; the training advances the boy two years in the profession of a sailor. . . . . Captains eagerly engage these boys without premium." One might imagine the feasibility of converting one or two of our old men-of-war without much cost into such schools, and allowing the entry to be a sort of prize for the best boys at all local establishments. Mr. Tufnell continues—"Boys engaged in the Army or Navy are at once removed from the evil influences I have alluded to" (viz., pauper influence and idle associates). "They have a certain occupation from fourteen or fifteen years, are, during that time, kept under proper tutelage, which is especially desirable in the case of these friendless youths, earn good wages, and, as experience shows, almost invariably give the greatest satisfaction to their superiors. If I had my will, I would bring up every pauper boy either to be a musician for the army or navy bands, or to be a sailor for the Royal Navy or merchant service."

This would provide for all the cream of the boys, and at an early age. As regards the remainder, they must obtain employment after passing the standard of proficiency in the ordinary duties of agricultural and other labour. Their training at the school would have benefited them, and engrafted certain principles and habits tending at any rate to give them a better chance than as outcasts they would ever have had. If a half—nay, even a quarter—turned out well, how amply the State would be repaid!

2nd. As regards the girls. It does not seem so difficult to dispose of them. Mr. Tufnell says (20th Poor-law Board Report, page 132):—"There is no difficulty in settling the purpose for which girls are to be trained. They should be made household servants." From the general complaints of the public, there can be no doubt but that a large number of this class could be employed with great advantage.

Some, of course, of both sexes would still remain, viz., those who could not obtain employment, or, having obtained it, were dismissed, and so returned again to the parish relief, the incorrigibly idle, who could not pass the standard, and the very sickly and diseased. Something different would have to be done for these. The permanently sick must be placed in the workhouse or hospital, and remain on the hands of the community, as, in fact, they really do now. The unemployed and the idle, after having had a strict training till a certain age, if they returned again to the parish, would have to be got rid of, and the only plan that seems to suggest itself with the greatest advantage is emigration to the colonies.

This emigration should be absolutely imperative at a certain age, and in no way optional to these two classes of paupers. All would have been done for them, and either by their own want of appreciation of the advantage offered, or by their misfortune in not obtaining employment, nothing would seem to remain but to give them a final chance, with a free grant, perhaps, of a few acres to the young men in a land where labour can be utilised to any extent, and where their only chance of subsistence would be by labour, and that alone.

Could such a system be considered hard, would it not strike the vital parts of pauperism, by draining the spring of its ever-increasing stream? The state would, as it nominally does now, have taken charge of the children, brought them up, acted as their parents, and in return demanded two things:—1st. A sound and strict training. 2nd. A useful and honest means of livelihood, or, failing this, emigration.

Obtaining suitable buildings for these schools would, doubtless, for some little time, be a difficulty, though not at all an insuperable one. As already stated, possibly a few of our antiquated fleet might be turned to good account. No better plan could be adopted than that suggested by Sir James Kay-Shuttleworth, viz., of

utilising all unused workhouses, or renting large buildings in decayed parts of towns. Where necessary, and this would be in many places, schools would have to be erected, though not on such a scale as the one at Hanwell. The cost would undoubtedly be great, and the money could only be raised by the Government in a similar manner to that adopted by the district schools, viz., by a charge on the rates over a certain number of years. The number of children to be placed under one roof would be best known by those familiar with the working of the district schools, probably about 1,000, and all of one sex, as the number of schools would render the division of any one school unnecessary.

The greatest difficulty would undoubtedly be that of providing suitable and efficient teachers and rulers in each establishment. These duties would be arduous, and require patience and firmness in a larger proportion than great learning. In this, as in other matters probably, the want would produce the person sought for; but in all cases the greatest care would have to be exercised in the appointments.

The great point to be considered in such a scheme is the cost. If a plan be ever so feasible, it must be also reasonable in cost, that is to say, not necessarily economical, for in dealing with so great a subject, which has been so long neglected, a large outlay is imperative. If the indirect saving is taken into account, there can be no doubt that almost any efficient system would be profitable to the State.

In the first place, it may be remarked that if such a plan of work schools were in operation, they must necessarily be under the management of the government. Each school could not be managed by a separate union without very much reducing the efficacy of the system as a whole. Classification of the children, weeding out refractory characters to one place, and other detailed arrangements, could only be properly carried out by a central administration. The funds at the disposal of this department would be supplied from the Exchequer or local rates, as might be considered best. The union officers, being acquainted with the persons in their districts, would be the means of feeding the schools, the simple rule to guide them being, that children under a certain age, say 16, who systematically applied for parish relief should, as a matter of course and necessary consequence, be relieved by being sent to the school. This rule might require discretion in its action in some cases; a hard-working boy in temporary distress, who had been fairly educated, might, with advantage, be left at home, though for several years it is not likely that a tolerably strict carrying out of this regulation to the systematic applicants for relief would do much harm.

The amount of relief granted, in 1867, to the 931,546 paupers, was £6,959,841. At this rate the 331,000 children cannot cost much less than 2½ millions, or at the rate of £7 10s. per head per annum. This sum is spent, therefore, without any return beyond the support of so many helpless individuals, and the partial education of the favoured few who attend the district and other schools, as explained above.

What addition would some such plan as the proposed schools entail on the community? In the first place, taking Sir James Kay-Shuttleworth's estimate, in the year 1838, for the cost of a thorough educational staff at about £1 a head, the cost of provision and clothing at 4s. a-week, or £10 10s. a-year (the estimated cost of the children at the North Surrey district school), the cost of rent of each child, interest on building, &c., at £2 10s., and taking the cost of inspection, central administration, and miscellaneous charges as high as £3 10s., which should be an excessive estimate, a total of £17 10s. is made, or £10 more than the amount expended at present. For this extra sum of £10 per head, or three millions per annum, with a slight addition for emigration, a large part of the army of street arabs and idle youths, 300,000 strong, might be swept from the streets, and usefully trained to habits of industry.

Supposing, by way of example, they all turned out badly, would the money have been thrown away? Far from it; while at school they would have been kept at as low a charge as possible, free from mischief; had they been loose, by some means or other they must have consumed nearly as much as at school, and the chances are, nay, the certainty is, that many, if not most, of those over five or six years of age would cause ten or twenty times the amount of damage as pickpockets and thieves. Again, suppose that half of them turn out well, and this does not seem an absurd hypothesis, this surely requires no argument to prove the advantage and economy to the State as a return for its large outlay. It might further be hoped that as the system developed the number of such children, and consequently the expense, would sensibly decrease.

In concluding these remarks on the subject of the training and education of pauper children, it must be borne in mind that the present regulations and provisions only affect a few of the pauper children for which they are framed; nothing like a tenth receive any benefit at all. The two extremes of the system tend, first, to a too rigid economy and consequent hurtful neglect; and, second, to a too great extravagance and consequent injustice to the industrious. As a matter of economy and advantage to the community, it is universally acknowledged to be beneficial to do something for the children, but how much or how little requires great care to determine. By recognising the system of district schools, the country has agreed that the children should be fairly educated; but it has been shown that the system is so expensive as to render it impossible, without some risk of producing an insurrection of ratepayers, to adopt it at once all over the kingdom, its comparative smallness only now saving it from radical reform. Again, the advantages given to the children surpass by many degrees those of the industrious hard-working class; this is neither fair nor politic. On the other hand, the emergency is great; thousands, indeed hundreds of thousands, of children are growing up in vice and ignorance, and by some power they must be arrested in their downward path; little short of a miracle will do this—and it is certain that without some compulsory power they will never enter a school, or of themselves wish to be taught better; and, at the same time, the State does not wish, unnecessarily, to force any, or to interfere, without great caution, with the liberty of the subject; it does not want to be saddled with the offspring of all the poorer classes; the schools must not be looked on as provided by the State to take children off the hands of those who should provide for them, nor should the children prefer them, like the thief often, does the prison, to his free state, because he is fed well and worked little. To provide for the want, and yet to guard against these abuses, it is believed that some such scheme as the one proposed might be beneficial.

The compulsory entry into the school of all within a certain age, say 16, who receive regular parish aid, would at once reduce the claimants to a minimum, but generally secure the very young and helpless whom it would be most important and promising to get hold of.

The habits of the school being systematic, strict, and when necessary severe, would tend to discipline these rough spirits, and train them as human beings, and keep them away from evil influences at an age when their minds are susceptible of influences for good.

As they grew into youths, their nature would make them long to be free and in the world; but their freedom could only be bought by a certain proficiency which they would thus be glad to work for. When they left the schools after passing a certain standard, they would be fitted for employment by habits of honesty and industry, the best being allowed to enter the navy, others hired as labourers, servants, &c.; and as nearly all would enter the schools without the stain of crime, their start in life would indeed be different to what it is at present. The power of sending them to the colonies

at a certain age, if they could not or would not obtain employment, or if they returned to the parish relief, would give all an opportunity of earning their living if so disposed, and if not disposed, the consequences would fall on themselves.

These compulsory powers and consequences, while acting thus beneficially in the schools and to the public in this way, would also prevent the schools from being looked upon by the industrious poor as unfair to themselves. At present these may fairly compare the pauper at the district school to their own boy at the national or village school; but not so when they know the discipline of the work school, and the compulsory power which the community has over the children.

Concerning the cost, an attempt has been made to show that though adding a large sum directly to the expenditure of the country, there can be no doubt but that an absolute saving would at once be effected indirectly; the ultimate good could hardly be estimated even in money value, but a change might be produced in the moral aspect of the country greater than the most stringent criminal penalties.

If it be the case, and no one will be found to gainsay it, that the present state of matters requires great improvement, surely, even out of selfish motives, it is high time that something was done. By thus beginning at the right end, "prevention being better than cure," as has been said over and over again, many, if not a majority, of these wretched children, who so often are a curse to the community, might be rescued, and, with the divine blessing, converted into industrious, honourable, and honest, though humble, citizens.

DISCUSSION.

The Chairman said the author had done well in bringing this subject before the Society, for whilst it went to the seed plots of habitual criminality it went to the foundation of the Society's objects in the promotion of Arts, Manufactures, and Commerce, for which the extension of intelligent aptitudes amongst the wage classes was necessary. It distinguished the great class of the community for whom compulsory measures for education were chiefly in question. But, much from default, no doubt, in the available documentary information, Mr. Bartley had made some mistakes. One was in ascribing the plan of the separate treatment of pauper children in separate buildings to Sir J. Kay-Shuttleworth. It would be found to have been distinctly laid down in the report of the Commissioners of Inquiry, who pointed out that for the most part existing buildings might, at all events in the first instance, be appropriated to the purpose instead of building new ones. The Stepney school, an old building, for all classes of paupers, on the principle of the union-house, had been adapted to numbers of children equivalent to those aggregated in the district schools, and, by improved appliances for ventilation, notwithstanding the lower neighbourhood, competed with those new buildings in remarkably high sanitary results, and was an example justificatory of their recommendations that might most probably be extended, greatly to the relief of the ratepayers. The contract establishments spoken of, instead of having sprung up under the auspices of the first poor-law board, were in existence previously to its institution, and it took early steps for their removal. But the contractor of one of those separate pauper children's institutions, Mr. Aubin, displayed a desire to carry out faithfully whatsoever might be suggested to him, and Sir J. Kay-Shuttleworth, then an assistant commissioner, was instructed, together with Mr. Tufnell, to see what might be done with it, as an example of the treatment of destitute children in separate buildings. At his (the Chairman's) particular instance, it was based on the half-time principle, and was conducted on that principle in combination with industrial training, including naval and military drill, of which the Stepney school was now the chief example. Mr. Aubin's school ceased as a contract school, and the old buildings, which had well served their first purpose, being inadequate to the increasing numbers, the guardians were led to build the Central District School of London, which they did in their own way, with extravagant ornamental columns. But the statement that the expense was between forty and fifty pounds per head was an example of current exaggerations. The official return of the expense was £24 10s., but of this £6 10s. was for the repayment of principal and interest on the loan for the construction of the building. But the real normal expense of district schools, apart from the expense of building, was displayed at the Stepney Institute, where the weekly cost of food, which included meat rations, was 2s. 2d.; of clothing, sixpence; of school instruction, threepence; three farthings for the industrial master and mistress (the tailor and the needle mistress); teaching the naval and military drill, 1¼d.; superintendence, sixpence half-penny; altogether, 4s. 8d. per week, instead of double and treble that amount which had been put forth. The school instruction, which cost 4¼d. a week, including the naval and the military drill, or the physical training, was a great advance in the educational art, in economy, in time, in money, and in efficiency of result. It had yet to be made known and to be understood by the changing political chiefs, heads of departments and members of Parliament dealing with the education question, that the power of teaching in time, and very much as to expense, is as the numbers. A single master in a union, or in any single-chambered school, could not well teach more than about forty scholars of varying small classes, even with the aid of a pupil teacher, or get through the "three R's," as they were called, in less than six years, and as a good master could not be got for less than £80 per annum, the cost of teaching could not be set down at less than £2 per head per annum, or ninepence per week. But it had been demonstrated in these institutions that by teaching on a larger scale in schools of ten times that number, affording large classes for simultaneous teaching, and a division of educational labour by a trained staff of masters and pupil teachers, beginning with a head master at three times the salary of the single teacher and more, including the drill masters and a drawing master, the child could be got through the "three R's" far better in three years at an expense for teaching and training power of less than £1 per head per annum; demonstrating that by an application of neglected legislative and administrative arts in obtaining the proper aggregations, three or four pupils might be taught and physically trained well at the cost of the mere long-time scholastic teaching of one scholar comparatively ill. Ignorant and wasteful unpaid administrators, the guardians, objected to the training, that they did not want to make the children sailors and soldiers, but it was their duty to make them honest, productive, self-supporting labourers, and good subjects, and under their system they made bad and dependent ones, inapt for labour; for, as he had found it, two out of every three turned out ill, mendicants, paupers, delinquents, and spoilers. But in these district half-time schools, the failures to get productive employment and keep it did not amount to more than two per cent. instead of sixty. It was demonstrated that the drill and the physical training gave to three the efficiency of five for all purposes of ordinary labour, and this might be done for the entire labouring population. Guardians objected to teaching children elementary drawing, though, in imparting accuracy to the hand and eye, teaching elementary drawing was proved to be almost as important for handicrafts as teaching writing; and for less than a pound per head that qualification might be imparted to serve for life. The success of the mixed training was proved by the outcome wherever it was applied. Classes might, on this system, be taught in separate buildings, in the crowded urban districts where they were to be had, and the expense of new large

buildings avoided, though, for this purpose, the areas of administration would often require to be greatly extended. Such, however, as he had stated, were the demonstrated advances in teaching and administrative art, which had been overclouded by the incidents in the guardians' unchecked extravagance, in their unpaid and really irresponsible administration.

Dr. Stallard said all would agree that the subject of pauperism should bo dealt with at the root, but as yet he feared that they were at sea as to the mode in which the great work should be set about. He would first allude to the character of pauper children, and then call attention to the different modes in which they had been treated, and endeavour to show that it was impossible for any recommendation like that made in the paper to be efficiently or generally carried out. In the first place he believed the magnitude of the evil had been understated. There were probably 50,000 children in workhouses, and no doubt the greater part were under education of some sort; the exact number in districts and other schools being known, the remainder were probably those not old enough to receive systematic instruction. But with respect to the enormous number of 300,000 in receipt of out-door relief, he must take exception to the proposal to credit them with a proportional share of the money expended in the relief of the poor. The total expenditure included that of workhouses and all establishments connected with them, and of these very district schools, and in point of fact the poor children in receipt of out-door relief got but a very small fractional part of the amount indeed. He could not suppose for an instant that the State would undertake the charge of these children. He considered it a fault that it did not do so, but there were immense difficulties in the way of dealing with them in the way proposed. For instance, if a widow were left with four or five children, the youngest in arms, they would be reckoned amongst the 300,000, but if she endeavoured to support and bring them up as well as she could it would be impossible to take them away from her. The duty of the State was not to take them away from her, but to assist her in carrying out what was really her duty and no one else's. If they interfered between a parent and children under such circumstances they would at once destroy the sense of parental responsibility.

The Chairman said that in some places men were known to be at work while their children were in the streets begging, from which they easily progressed into stealing.

Dr. Stallard was aware of that, and, therefore, the principle of parental responsibility must not be carried out in all cases without exception. He knew a case of a woman in Southwark, who paraded her children about the streets as objects of pity, and though they had been taken up and sent to a workhouse, she had claimed them, asserting that she could and would bring them up herself. In such cases, no doubt, the children ought to be removed and the parent punished, but that was a different question entirely from that of a parent who honestly endeavoured to do his duty by his child, although he could only do it imperfectly. He had nothing to say against the efficacy of the district school system, but he believed it was utterly impossible to deal with a tenth part of the pauper children of the kingdom on such a dreadfully expensive system; and it would be an injustice to the children who were not in receipt of relief. He was so persuaded of the efficacy of it, that he had endeavoured to find a private school conducted on the same plan to which he might send his own children, but he did not think it could be largely adopted. If it were it would be the absolute duty of a widow, such as he had described, who desired to do the best for her children, to abandon them entirely, because they would then receive a much better education than she could hope to provide for them; and the more thoroughly destitute and desolate children were the longer they were kept in the school, and the better they were educated. He doubted the accuracy of the Chairman's opinion that buildings might be erected more economically, for the St. Pancras School, being built under an administration reputed to be very economical, was to cost about £54,000 for 700 children. It seemed to him that the children could all have been lodged, fed, and educated at home for such a sum. There was another very important point, which was generally omitted in such discussions, viz., the *physique* of children. No fact was more clearly established than this, that wherever a large number of children were assembled together, especially where they began with a poor condition of health, there there would be a great deal of sickness.

The Chairman remarked that the deaths in the London District School were not above 6 in 1,000.

Dr. Stallard was quite aware of that, but that proportion was far higher than it ought to be, and a short time ago it had been stated that 40 per cent. of the children were under medical treatment. It was well known that where a large number of children were congregated together they always got ophthalmia; and in the school alluded to they had lately gone to an enormous expense simply to try and get rid of this disease, but in vain. Children from large towns were always physically weak to begin with; and what was wanted was to send them back to the country to get such health as should enable them to earn an honest livelihood afterwards. Again, although there was much to be said for the successful results which had been attained, they were unfortunately much more noticeable in the case of boys than of girls. Moreover, in bringing so many children under one roof they became so many units, all independence of feeling arising from home ties was lost, and nothing was put in its place. One or two attractive children might be noticed or petted, but the majority were mere units, who had none of those individual or local feelings which were found to be the best mainspring to honest untiring industry. This was a very important consideration, and to it he believed it was owing that the district or separate school system had not been more successful. In Scotland, Ireland, Belgium, America, and France, the system adopted was to send back to the country those weakly town children who were deserted, orphans, or destitute, in order that they might grow up strong enough to compete with the labour constantly being imported into the great towns from the country. This was one of the great difficulties in the way of uprooting pauperism in large centres of population, which were constantly subject to the immigration of strong, healthy people from the country. After some years of town life, such a man degenerated, but his children and grandchildren far more so, and they, therefore, had no chance of competing with the fresh, strong newcomer, who could do two or three times as much work, and being, to a certain extent, squeezed out of the labour market, they had to make up the deficiency by their wits. He had lately received a communication from the secretary of the Board of Guardians in Edinburgh, which had about 700 children farmed out in the country. It was often said that this system had been tried and failed, and reference was made to the shocking occurrences at Tooting and elsewhere, but that was not the Scotch system at all; they rarely placed more than two, and never more than three, in the same family; and although the pay was extremely moderate it was sufficient, food being cheap, and being in the country the children did not require animal food. Oatmeal and milk formed a capital diet for children where they had plenty of fresh air, but if they were to try it in the central London school, they would have half the inmates down with sickness immediately. Attempts had been often made to introduce such a diet into workhouse schools, but they had always failed. He was no advocate for a meat diet under all circumstances, because fine strong Highlanders had been brought up without tasting meat until they were 25 or 26, but this would not answer in a large school. Another great

advantage was that the children acquired associations; they felt that they had a home and that they belonged to somebody. This plan was almost universal in France, and it was found that the children had great affection for their foster parents, and very rarely left them; and he believed the same was the case both in Ireland and Scotland. It had also been tried in England by the Eton union, and he believed with success. Another important advantage would accrue if the system could be generally introduced for persons of respectability to assume a species of guardianship over these children; and, after all, every attempt to wipe away pauperism from this country must start with the object of establishing a personal interest between the richer and poorer classes. He would recommend every one who wished to see the arguments in behalf of this system of providing for pauper children fully stated, to read the little book by Miss Florence Hill, entitled "The Children of the State;" and he believed that was the only system suitable for general adoption. He thought the industrial character of the English people had suffered considerably from the introduction of machinery, and therefore it was the more important that, as children, they should receive thorough industrial training. That ought to come before every other kind of instruction. In fact, he should like to see in every union or parish an industrial school, open, under certain restrictions, to all classes alike, for he believed the association of pauper children with those higher in the social scale would be of great mutual advantage, and with each school should be associated a gymnasium, for he heartily concurred in all that had been said with regard to physical education. He would also institute prizes in the shape of dinners for regularity of attendance, and those who made good progress in the lower schools should be entitled to admission to the present district schools.

Mr. E. C. Tufnell said there was evidently some mistake as to the expense of the district schools, for figures had been quoted in the paper taken from some newspaper, giving the cost per head at the Central London District School at £40; there must be a very great mistake somewhere, for, as had been said by the Chairman, the published reports gave the amount at £24, which appeared very large, but then £6 10s. of that was for interest on the building, and also in part payment of the principal, which would reduce the expense of maintenance and education to a moderate amount. The actual expense of feeding and clothing each child did not exceed about 4s. 6d. a week. It was true the building had cost a great deal, but he did not know that there was any thing superfluous, unless it was the columns in the central part which were put in to relieve the appearance. He had always been in favour of district schools, mainly from their good results. The Chairman had told them that only about 2 per cent. went to the bad instead of 60 per cent., and it must be borne in mind that they had pretty accurate means of judging, because it was one of the recognised duties of the chaplain, in all cases where distance did not prevent, to visit the boys for two years after they left school, and see how they got on. It was, unfortunately, but too true that some of the girls turned out badly, but he feared this could not be prevented while human nature remained as it was. With respect to the question of health, he thought Dr. Stallard had some erroneous views; he knew of no better means of testing the state of health than the proportion of mortality, and, having tested in this way all the district schools round London over and over again, he could safely say that the deaths were not more than two per cent. Some time ago, on the other hand, he had made a calculation how many would have died if they had not entered the schools, and he found that the majority of these children died at the rate of about 12 per cent; and it was well known that half of all the children born died before they were five years old. If, therefore, the mortality were reduced from 12 to 2 per cent., the state of health could not be very bad, and as to the number of sick, it was as small in proportion, generally, as in any family in the kingdom, even the richest. The children of the upper classes were often petted, and those of the lowest class starved, out of existence, but in these schools there was food enough given but not too much, and they had a combination of physical and mental training which was highly conducive to health. They were all half-time schools, which was a very important feature. It was remarked in the paper that it was unfair that pauper children should be better off than the children of the agricultural labourer, but it would be impossible to teach them at all without teaching them more than children who left school at 10 or 11. Children in pauper schools could not be got rid of until they were 14, and if they were turned out with no more education than a very imperfect knowledge of the "three r's," they would almost infallibly become confirmed paupers or thieves, and the effect of that on the rates would be enormous. Every pauper cost the country £100 or £200 before he died; and, therefore, it was of the highest importance that the children should receive such an amount of education as should prevent them falling into pauperism; and, in order to do this, they must be educated far beyond the children of an agricultural labourer, who left school at 10 or 11. During the last two years at school the advancement in general knowledge was very great, and if the amount of their education was to be restricted the sole object with which the schools were erected would be lost. With regard to putting children out to nurse, he had had opportunities of considering that subject, and was well acquainted with the valuable little book which had been referred to; and though, under certain conditions, which were not at all general, such a system might work well, it was, he was convinced, impossible to adopt it in such a place as London. In only one union in the home counties had it been adopted, viz., Eton, where there were not more than forty children; the union was small, and so was the workhouse, and there was no difficulty there in finding ladies and gentlemen who would look after the children, and see that they were well cared for. If the same agency could be secured in every part of the kingdom such a system might answer; but suppose they were to substitute it for the South Metropolitan District School, where were they to find a thousand people to take charge of the children? From the crowded state of labourers' cottages in almost all parts of the kingdom, it would be ruinous to the children to place them in such positions, even if cottagers could be found willing to take them. A plan somewhat similar was adopted under what was known as Sir Jonas Hanway's Act, the children being put out in different houses throughout London; but most of them died in about a year, the deaths in many parishes being about 80 per cent. per annum. The consequence was, the Act which led to such establishments as Mr. Druet's and Mr. Aubin's, which were followed eventually by the present district schools, and these he believed to be the best means ever devised for the proper education and training of pauper children.

Dr. Ellis said he was glad to see the Chairman in his present position on such an occasion, for many of the suggestions which he had thrown out had been adopted, the credit thereof sometimes going to other people. It appeared to him (Dr. Ellis), however, that the fountain head of all this stream of pauperism had been totally overlooked. It was admitted that these poor children were pauperised from no fault of their own, and that many of them began life under the heavy disadvantage of very sickly constitutions, but though this question had been agitated for years, no allusion was made to the great cause of all this evil, namely, intemperance. He had lately busied himself in investigating the condition of some of the worst neighbourhoods in the metropolis, of which, indeed, no one could have any adequate conception without personal inspection, and from

what he saw and what he heard (for he had no difficulty after a little time in gaining the ear of these poor people, and learning their history), he was convinced that drunkenness was the great cause of all the evil. The more complete the provision which was made for the training and education of the poor waifs and strays of humanity, so in great measure would be the supply of them; all feeling of restraint being thus removed from those who gave them birth. If drunkenness went on as it had done for the last century, the nation would become completely debased, both morally and physically, for it was the drunkard's children who had the weak and sickly *physique* which had been so much spoken of. They might attempt to confine the channels of pauperism, but while this great fountain-head existed all their efforts would be comparatively useless.

Mr. Campin said he had resided for some time in the neighbourhood of the South London District School, and, from personal inspection, he could bear witness to the generally healthy appearance of the children, and the excellence of all the arrangements. He was informed that the results also were most satisfactory, particularly in the case of the boys. They were taught gardening, and so on; and he might remark, in reference to the emigration of those who did not do well at home, that he did not think it would be of much use to send men to a colony unless they had some knowledge of agriculture, and also, if possible, of rough carpentering.

Mr. Bartley, in replying to the observations which had been made, said that he had not alluded to the education, but to the general treatment of pauper children, when comparing them with the children of the industrious class. He was afraid that it would be absolutely impossible to teach pauper children less than was learnt by the offspring of agricultural labourers, but great care should be taken not to afford them anything in the way of comforts beyond what was absolutely necessary; they should be made to feel that they really had to work. It was quite another question, and one not within the scope of his paper, whether the children of industrious labourers ought not to be better provided for; of course, they ought to have a better education even than the paupers. There was no doubt that drunkenness was the cause of the greater part of the crime and pauperism in the country; for instance, he was told once by a large manufacturer at St. Helen's, who paid several hundreds of pounds in wages every Friday, that three-fourths was in the hands of the publican by Monday morning. No doubt this was the cause of the whole difficulty, but if they waited until that was got rid of before doing anything for these wretched children, he feared they would never begin at all, at any rate not in the present century or the next. On the contrary, his hope lay in this, that by the better education and training of the children the next generation would be less inclined to fall into this evil habit. There was no doubt that pauperism was increasing, and he believed the only way of checking it would be to take the young pauper and bring him up in better habits than his father had been taught. He did not think there was any chance of redeeming a confirmed pauper at the age of 40, any more than a confirmed drunkard; they were so degraded in moral tone that no human power could restore them, but by getting hold of the children, there was a hope that the class would in time die out, or at any rate be reduced to a minimum.

The Chairman, in proposing a vote of thanks to Mr. Bartley, said he must differ from some of Dr. Stallard's conclusions, particularly with regard to the *enfants trouvés* in France. His information was very different from Dr. Stallard's. In the first place, the great test was the outcome of the system, and he learned that these children figured very largely in the criminal statistics. It was very probable that there was a great deal of affection between these children and their guardians, because it was a very prevalent practice for people to contrive to get their own children boarded with them at the expense of the State as *enfants trouvés*. With the present abuses in English cottage life, it seemed to him absurd to advocate the placing of pauper children in such homes, many of which were perfect nests of fever and other diseases. He believed also that Dr. Stallard was in error as to the health in the district schools. It was found that in the London schools they had almost banished children's diseases, with the exception of ophthalmia, and in some they had even banished that. Indeed, a friend of his had told him that if he had a sickly child he should like to send it to one of these schools, in the belief that it would get better treatment there than anywhere else. With reference to the question of emigration, it might be mentioned that at this very time, when the adult labour market was over-stocked, he believed Mr. Tufnell would corroborate his statement that there was no difficulty whatever in getting places here for the boys from these schools, even without apprenticeship fees.

The vote of thanks was then passed unanimously.

Proceedings of Institutions.

Marlborough Reading and Mutual Improvement Society.—Mr. George Grossmith recently gave a lecture at the Town-hall, in connection with the above Society. It was entitled "The World behind the Foot-lights," being a glance at life as pourtrayed by the heroes and heroines of the stage, and was intermixed with illustrations, consisting of recitations from "David Copperfield," "Brother Sam," "Artemus Ward," &c., concluding with the laughable narrative of "Mrs. Brown at the play."

THE PROPOSED VIADUCT ALONG THE THAMES EMBANKMENT.

On Thursday, the 4th inst., a deputation of gentlemen connected with the Strand district waited upon Mr. Layard, First Commissioner of Works, to urge him to aid them in opposing or delaying the construction by the Board of Works of the intended viaduct at the foot of Charing-cross-bridge to the entrance of Waterloo-bridge. The deputation was introduced by Lord Elcho, M.P., who, besides expressing his concurrence in the immediate object, contended that all projects like that in question ought to be under the control of the Government Board of Works, properly constituted.

The Rev. Henry White, chaplain of the Chapel Royal, Savoy, after stating as a reason for prompt action that 21 days' notice had been recently received by some of the inhabitants that their premises will be required, urged the following objections to the projected viaduct—that it is not necessary, especially as the present approaches from the embankment to the Strand might be made sufficient for a small outlay; that the concentration of the traffic at the corner of Lancaster-place, already inconvenient, would be greatly increased; that the scheme is improvident, involving as it does a needless sacrifice of the reclaimed land, the value of which is estimated at £300,000; that such a viaduct would condemn the present streets to obscurity, and render impossible the construction of public buildings between Somerset House and Charing-cross-bridge.

Mr. John Jones read a resolution passed by the district Board of Works on the previous evening, in favour of memorialising the Metropolitan Board against proceeding at present.

Mr. Clarke (Messrs. Farebrother, Clarke, and Lye) observed that such a viaduct would for all time cut off all communication between the Strand and the Thames Embankment.

Mr. Layard, in reply, said he had no power in the matter, as the Metropolitan Board of Works were acting under the authority of an Act of Parliament. A more improvident Act was never passed. It was passed, he supposed, in the small hours of the night, and it actually

gave Lord Salisbury complete control over Cecil-street and Salisbury-street, empowering him to erect gates there, and thus shut off communication with the Strand. As regarded the object of the deputation, although he had no control, he must say it appeared to him monstrous that two great streets or roads should run parallel to each other for hundreds of yards, and a piece of ground, which was no doubt one of the finest sites in the metropolis, be entirely sacrificed. As regarded the supposed necessity for this viaduct, the question was, whether the traffic between the embankment and the Strand would be so large after the embankment had been completed as to require additional means of access. That question it was impossible at present to decide; and he thought the inhabitants of the metropolis and the inhabitants of the country, who naturally took a pride in the metropolis, would wish to see that magnificent site utilised, and consider it unjustifiable to construct the projected road until it was ascertained whether the traffic absolutely required it. Even if the traffic did require it, there might, perhaps, be found some means of effecting the object without taking the very best part of the reclaimed land. If they got the law courts, of which there was some probability, he hoped, upon the embankment, and if between Somerset-house and Charing-cross Railway station, which he agreed with Lord Elcho it was desirable to screen, some great public buildings were erected, there would then be one of the finest series of edifices in the world along the side of the Thames. The immediate question, however, was whether the Metropolitan Board of Works could not be induced to hold its hand for the present. All he could say was, that he should have the greatest pleasure in communicating with that board and using what personal influence he could. He did trust that, in consideration of this being a great public question, it would hold its hand for a short time, that the work in question being one for which the ratepayers would have to pay, it would feel that it was advisable to wait a little while before entering into a scheme which would spoil at once and for ever one of the finest sites in the world.

Lord Elcho thanked the right hon. gentleman for the manner in which he had received the deputation, and the interview then terminated.

At a meeting of the Metropolitan Board of Works, held on Friday, the 5th instant,

Mr. Newton called attention to the above proceedings, and referred to the statements of the Rev. H. White, to the effect that the projected viaduct was not necessary, especially as the present approaches from the Embankment to the Strand might be made sufficient for a small outlay; that the concentration of the traffic at the corner of Lancaster-place, already inconvenient, would be greatly increased; that the scheme was improvident, involving as it did a needless sacrifice of the reclaimed land, the value of which was estimated at £300,000; that such a viaduct would condemn the present streets to obscurity, and render impossible the construction of public buildings between Somerset-house and Charing-cross-bridge. He (Mr. Newton) said there was no doubt that would be so, but this Board was not responsible for it. The Bill for its construction was prepared, and introduced by the Government, the Act was passed under the auspices of the Government, and it was given to this Board to carry it out, and to use the powers which that Act conferred upon them. Mr. Newton quoted the speech of Mr. Layard, given above, and said, that so far from the Act being passed in the small hours of the night, there was a very full discussion of it before a committee of the House of Commons, numerous clauses were introduced and fully discussed, and the Bill was only passed after very mature deliberation. One of those secured the rights of the Duke of Northumberland, and under that clause the Board could not do this or that without it met with his approbation. Other clauses gave great powers and reserved the rights of the Earl of Craven, the Duke of Norfolk, and the Marquis of Salisbury, and in the face of these clauses it was impossible for the Board to go on in any other way than the Act prescribed, and that very Act was passed by the Government of 1862, of which Mr. Layard was then a member. It was originally intended to commence this approach road at the corner of Wellington-street, and so carry it on diagonally to Hungerford-bridge; but on that occasion the Rev. Mr. White, who was one of a deputation that waited upon the Board, represented that if the plan was carried out in the way proposed it would take a portion of the burial-ground of the Savoy Chapel, and would approach the chapel too closely. From what was then stated the Board did alter their plan, and they proposed to commence the roadway at the western side of Somerset-house, and so carry it on through Lancaster-place to the Thames Embankment, and thus they endeavoured to meet the objection which Mr. White had brought before them. Such being the case, he (Mr. Newton) was much surprised to find that the Rev. Mr. White had felt it to be his duty to wait upon Mr. Layard to complain of this approach also, which had been adopted to meet his views. He also felt very much surprised that, as Mr. Layard was a member of the Government by which the Act was passed, he should have spoken so strongly on the matter. He (Mr. Newton) wanted to know what they were to do, or whether they were or were not to carry out the Act? Mr. Layard said, "It appeared to him to be monstrous that two great streets or roads should run parallel to each other for hundreds of yards, and a piece of ground which was one of the finest sites in the metropolis would be entirely sacrificed." Now, he wanted to know what the Board could do in the matter after the powers that were given to the Marquis of Salisbury, the Duke of Northumberland, and the Duke of Norfolk—powers expressly given by the Government of which Mr. Layard was a member. The Board, however, had battled against them, and endeavoured to break down restrictions given to great people that were not given to persons of less influence. The Board had been unsuccessful in their efforts, and they had been put to £300 costs in their resistance to these restrictions.

Mr. Phillips said, two years ago, when Mr. White attended the Board, he said the original plan would trench upon the premises of the Royal Chapel of the Savoy, and his representation did influence the Board in adopting his suggestion to remove the roadway to a greater distance from it. At the same time he was much surprised to find Mr. Layard deprecating the work to which he was a party.

The Chairman (Sir John Thwaites) said a short time ago the Government instructed an officer to report how Savoy Chapel would be affected by the roadway, and in consequence of strong remonstrances from the Government the Board were induced to reconsider the original scheme, and it was determined that it should pass through Wellington-street and Lancaster-place to the Thames Embankment, in the way the Board was about to carry out. He regretted that Mr. Layard was not better informed as to these proceedings, and he also regretted that the deputation that had waited upon him had not applied to this Board for information, and then they would have been made acquainted with the facts The Government had no control over this Board, although they always acted very harmoniously together; and it would have been fitting in the first instance that the deputation should have come to the Board to make their representations, and failing to obtain what they required, it would then have been time enough to have applied to the Government on the subject.

ÉCOLE PRATIQUE DES HAUTES ETUDES, PARIS.

The new school and the laboratories at the Sorbonne, which have been fully described in the Society's *Journal*,

were expected to be opened in the course of January. M. Milne Edwards, Dean of the Faculty of Sciences, has recently made a report, to the Academic Council of Paris, upon the progress, with one important change, made in the arrangements for the new high school and laboratories.

The faculty already is in possession of two physical laboratories, one for instruction under Professor Desains, in which candidates for the degree of Licentiate or Doctor may learn the management of instruments of precision, and exercise their faculties in the repetition of classical experiments relative to heat, light, electricity, magnetism, and acoustics. The rooms set apart for this purpose have been found in three old houses, close to the Sorbonne, and placed temporarily at the disposition of the faculty, and they will very shortly be opened four times a-week to the pupils. The second physical laboratory is for scientific investigation, and is installed in a new building erected by the municipal authorities expressly for the purpose; this is under the direction of Professor Jamin, and was opened in the middle of last summer. The large chemical laboratory, under the direction of M. Sainte Claire Deville, assisted by M. Schulzenberger, was to be opened early in the present year. The practical study of mineralogy is to be carried on in the study of M. Delafosse, once a-week at first, but afterwards twice, if necessary. There are provided two geological laboratories, both under the charge of Professor Hébert, and to be opened twice a-week. The study of botany is to be divided between the Sorbonne and the Museum of Natural History at the Jardin des Plantes; the laboratory of the faculty, directed by Professor Duchartre, to be devoted to dissection, microscopic examination and analysis.

A new arrangement has been made with respect to the study of comparative anatomy, which will be divided between the Jardin des Plantes, the Collége de France, and the Sorbonne, the dissection of animals being studied at the first of these establishments. With respect to experimental physiology, a laboratory is now being arranged by M. Claude Bernard, but on a scale much too small for the purpose, but which will doubtless soon be enlarged. Lastly, says M. Edwards, the faculty intends to complete its arrangements by the opening of a reading-room, in which the students of the new high school may consult the various scientific periodicals, and make use of the time that will necessarily elapse between the lessons; for this useful object the professors have given up their common room until a new one can be provided. It is quite evident that the Minister of Education and the learned Dean of Faculty are determined to carry out the intentions of the government with vigour, and it will be the fault of the young men themselves who are devoted to scientific pursuits if they do not make progress, not only in educational, but in original investigation. The professors are the most celebrated in France, and the means provided are such as no university in the world offers for high scientific study. It will be strange indeed if a field so well prepared, and in such good hands, should fail to be fruitful.

DIAMONDS AT THE CAPE COLONY.

As this subject has been recently several times referred to in the *Journal*,* the following correspondence, taken from the "City Article" of the *Times* of Saturday, the 30th January, will be of interest to the members:—

"18, King's Arms-yard, Moorgate-street, Jan. 29.

"Sir,—As considerable diversity of opinion seems to exist as to the finding of diamonds at the Cape of Good Hope, we beg to hand you the letter of Mr. W. Chalmers, Civil Commissioner and Residential Magistrate, dated Hope Town, December 11, 1868.—We are, Sir, your obedient servants, Joseph Mosenthal and Co.

"'No. 1.—Found on the farm De Kalk, division of Hope Town; weight, 21 3-16 carats. No. 2.—Found by a Boer in the boundary of the farms Paarde Kloof and Roode Kop, division of Hope Town; weight, 8 13-16 carats; first water; very regular in shape. No. 3.—Found by a native along the Vaal River; weight, 4 7-16 carats; first water, but of very eccentric shape. No. 4.—Found on the farm along the Orange River named Mark's Drift; weight, 1 8-16 carats; of a greenish colour, and broken. No. 5.—Found on a piece of Government ground along the Orange River; weight, 3 4-16 carats; regular in shape, very brilliant, and resembling No. 2 in shape and brilliancy. No. 6.—Found at the same place as No. 2; weight, 3 5-16 carats; valued at £30; of first water, regular in shape; found by a Hottentot. No. 7.—Found by a Griqua near the Vaal River; weight, 15½ carats; a beautiful gem. No. 8.—Found by a Griqua along the Vaal River, near Campbell, in July, 1868; weight, 12⅝ carats; valued at £47; defective in shape, and part of it bad colour. No. 9.—Found by a Griqua in Waterboers' country, August, 1868; weight, 2 carats; first water; regular shape; valued at £10. No. 10.—Found by a Griqua about the junction of the Vaal and Riet rivers, September, 1868; weight, 13 carats; triangular in shape; colour like polished steel. No. 11.—Found by a Bechuana beyond the Vaal River, October, 1868; weight, 9 carats; a very brilliant diamond; very perfect in shape. No. 12.—Found by a native along the Vaal River, October, 1868; weight, 6 carats; straw-coloured; defective in shape; valued at £12. No 13.—Found by a Griqua, October, 1868; weight, 3 carats; milky in colour; has a small hole in one of the facets, No. 14.—Brought in from the Vaal River by a trader, October, 1868; weight, 4 carats; very regular in shape; first water; has a small yellow spot on one of the facets, which gives the gem rather a yellow colour; particularly sharp pointed. No. 15.—Brought in by the same trader, October, 1868; weight, 2 carats. No. 16.—Found by a native along the Vaal River, November, 1868; weight, 2½ carats; defective in shape, discoloured, and chipped. No. 17.—Found by a Bechuana beyond the Vaal River, December, 1868; weight, 4 carats; not yet valued; a very beautiful diamond of first water; very regular in shape, and particularly clear and sharp pointed.

'"No. 1.—Purchased by his Excellency the Governor for £500. No. 2.—Purchased by his Excellency the Governor for £200. No. 3.—Purchased by Mr. Cruickshanks, and sent by him to his brother in London. No. 4.—In Mr. Chalmers' possession. No. 5.—In Mr. Martin Lilienfeld's possession; purchased by Mr. L. Lilienfeld from the finder; taken to England by Mr. M. Lilienfeld. No. 6.—Purchased by his Excellency the Governor for £25. No. 7.—Purchased by his Excellency the Governor for £400. No. 8.—Purchased by Mr. Chapman, and sent to England. No. 9.—Purchased by Mr. Chapman, and now in his possession. No. 10.—Purchased by Mr. Joseph, of Cape Town, for £100. No. 11.—Purchased by his Excellency the Governor, for £250. No. 12.—Returned to the finder, who refused £12 offered to him—the amount for which it was valued in Cape Town. No. 13.—Purchased by Mr. Hond. No 14.—Forwarded by Mr. Solomon to Fort Elizabeth for exhibition and sale. No. 15.—Forwarded by Mr. Solomon to Fort Elizabeth for exhibition and sale. No. 16.—Purchased by Mr. Hond from the finder for £2. No. 17.—At present in Mr. Chalmers' possession, for transmission to Cape Town.

"'This information can be relied upon as correct in every respect, as these diamonds (with only one or two exceptions) have been entrusted to me by the finders, and I have disposed of them for them, without the slightest benefit to myself. The one or two which have not been entrusted to me have, nevertheless, been seen and examined by me.

"'Several others have been reported as having been found, but as I have not seen them myself, and cannot, therefore, vouch for the correctness of the statements regarding them, I shall not refer to them.

* See last vol., pp. 849, 854, and present vol., pp. 41 and 46.

"'But these seventeen will, I think, be sufficient to show that this northern part of the colony contains immense wealth in diamonds; and that it only requires that a systematic search by competent persons be made to find valuable diamond beds. These seventeen diamonds have been found by the most ignorant persons (Boers and natives)—persons who never saw a diamond before. It is, therefore, impossible to say how many, in their search, of inferior quality or duller lustre they must have passed over. I am confident that a proper search by competent persons will repay any person who may invest his money in such an undertaking.

"'W. B. Chalmers, Civil Commissioner and Resident Magistrate.

"'Hope Town, December 11, 1868.

"'Note.—Those found along the Orange have been found in the Hope Town division. So many having been found along the Vaal River is, I think, owing to that county being populated by natives, to whom time is no object, and who have ample time to search; while along the Orange River there are no native locations.'"

THE AGRICULTURAL LABOURER.

Mr. James Sanderson, writing to the editor of the *Times*, says:—The condition of the agricultural labourer has recently been the subject of considerable discussion in your columns, and probably will attract increasing attention so long as pauperism increases.

Apart from the important questions of education, cottage accommodation, and wages, it must be admitted that the great distance between the cottage of a labourer and his work, and the prevailing mode of contract, especially in the southern counties of England, between farmers and employed married servants adversely influence the moral and social condition of the labourer.

Labourers' cottages, as a rule, are clustered together in villages in close proximity to the publichouse, and thus their occupiers are brought into contact with the temptation the beershop offers. They are, moreover, generally situated two or three miles from the labourer's work, and consequently involve the loss of much labour and time. Such a distance, indeed, between the labourer's dwelling and his work means, with respect to himself, one-fifth part of each day's work unrewarded, and with respect to his employer inadequate labour to the number of hands employed.

In the majority of the Scottish counties, as well as in the northern counties of England, there are attached to each farm, and placed near the homestead, cottages sufficient to accommodate as many labourers as the ordinary cultivation of the farm requires. The term of engagement is yearly. The wages average about £40, nearly the half of which is paid in money, and the remainder in bread food, potatoes, and either one cow's milk or the food of a cow. This system gives the farmer full command of labour, allows him to effect necessary operations at the proper time, obviates the difficulty of obtaining and the expense of paying extraneous labourers, and, whenever he requires it, irrespective of working hours, gives him the assistance of his labourers. On the part of the servant it secures constant employment, full and regular wages, notwithstanding sickness, and prevents the exhausting of physical energies by unnecessary and unrequited labour. This system, too, induces frugal habits, creates in the servant an interest in the employer's work, and tends to elevate the position of both by making one scrupulous as to the character of the other.

The labourers in the north are generally sober and industrious, regularly attend church in respectable clothing, educate their children in reading, writing, and the simple rules of arithmetic, rarely contract debts, and if one of them dies a pauper the case is exceptional.

This furnishes a striking contrast to the condition of the rural labourer in the south-western counties of England. Yet I am convinced that were the same system adopted in the south as in the north, the disparity would soon disappear.

As the erecting of cottages would involve considerable expenditure, the change I have indicated could not be prudently carried out at once; however, if farm cottages were erected as the village cottages decay, the system adopted in the north would be gradually introduced.

Wherever it is introduced, I believe that it will conduce to the mutual advantage of employer and employed, and diminish the poor-rate, which, as now levied in several districts, threatens to restrain the mainsprings of industry, and foster the evils it seeks to cure.

Fine Arts.

Art Exhibitions in France.—An exhibition is announced to open at Roubaix, on the 29th March, and to remain open till the end of May. The administration only accept the works of artists specially invited to contribute. The show will not be a merely local one for Roubaix; Lille and Tourcoing are close to each other, and include a wealthy population of more than three hundred thousand souls. It is proposed to hold some grand *fêtes* during the period of the exhibition, after the recent example of Lille. Large purchases will be made by the town of Roubaix for its museum as well as for lotteries in each of the three above-named towns, and the private purchases are expected to be considerable, this being the first time that such an exhibition has taken place at Roubaix. The Pau exhibition opened on the 18th January; the collection is more important than on any former occasion, the success increasing with every year. The list of well-known names in the catalogue is long, and includes many of the best artists in France, with those of fourteen ladies. The second exhibition of the Artistic Society of the Herault is announced to open on the 1st April, and to last about a month. It is proposed to transport the pictures after they have been shown at Montpellier to the neighbouring town of Béziers, so as to give the exhibition a departmental character. The town of Montpellier still maintains its literary and artistic character; the museum is remarkably fine, and the department boasts of many able landscape and portrait painters.

Excavations in Rome.—The Emperor has presented to the library of the Upper Normal School of Paris a series of fine photographs, representing the highly interesting discoveries made by excavations amidst the ruins of the palace of the Cæsars in Rome.

Academy of the Fine Arts, Paris.—The following list of artists for the election of a corresponding member of the Academy has been presented by the section of painting:—M. Podesti, of Rome; M. Rosalès, of Madrid; and Mr. Leighton, of London. The Academy has added the following names to the list:—M. Daeger of Dusseldorf; and Mr. Herbert, of London.

The Central Union of Applied Art, Paris.—The Union Centrale has just issued the prospectus of the free public courses of lectures to be held, as in former years, in the rooms of the society, in the old Place Royale. During the present month of February, M. J. Foucher will treat of "The Study of Shadows and of the effect of Light on Definite Surfaces;" Dr. Lintilhac, "On Anatomy and Physiology, as applied to Art;" M. P. Burty, "On Bernard Palissy and his Works;" M. F. Lenormand, "On the Asiatic Origin of Greek Art;" M. G. Lafenestre, "On Etruscan Art;" M. E. Chesneau, "On Japanese Art;" M. A. Rondelet, "On the Influence of Art on Consumption, and of Consumption on Art." The direction of the Union announces, in addition, that its art library and museum will be still open gratuitously to all, during the evening lectures as well as in the day time. This liberality on the part of a private association is especially praiseworthy. The Union is also seriously occupied with the arrangements

for its great exhibition of applied art and design, already announced to take place this year in the Exhibition building in the Champs Elysées.

Manufactures.

Smoke Prevention.—The attention called to the subject of smoke prevention by the late experiments conducted on this subject at Wigan by the South Lancashire and Cheshire coal owners, has led the Manchester Association for the Prevention of Steam Boiler Explosions to add to its staff the trained stoker who was engaged throughout the whole of the experiments just referred to, the object being that he might visit the works of the members, and assist their stokers in producing a more smokeless system of firing. He has now been engaged in this way for some months, and up to last December had visited 13 of the members' works, and operated upon 63 boilers, consuming per week 1,085 tons in the gross, and, on an average, 17¼ tons per boiler; while the mean rate of combustion per square foot of fire grate per hour has been 18¾ lb. Under these conditions the average result has been realised of about 12½ minutes of very light smoke, 2½ minutes of brown, and one-third of a minute of black per hour, which is certainly very much below the amount emitted from chimneys generally. The conditions under which the trials were made were not by any means the most favourable. In some cases the doors had no perforations, in many the area was too limited, while some of the fire grates were seven feet in length, which is too long. While no doubt more remains to be done to complete this movement, yet it has been seen that much can be accomplished by careful firing alone, coupled with the admission of a little air at the fire door, which shows the importance of having all fire doors fitted with suitable sliding grids on the outside, and perforated box baffle-plates on the inside.

Commerce.

Commerce between Italy and Great Britain.—In 1867, the total value of the imports into Italy from Great Britain amounted to £4,865,552, against £6,038,305 in 1861, being a decrease of £1,172,750. The following are the values of the imports during those two years, distributed according to the maritime divisions of Italy:—

	1861.		1867.
Northern provinces	£2,106,727	..	£1,053,245
Island of Sardinia	7,653	..	14,142
Tuscany	1,075,669	..	929,875
Southern provinces	1,624,855	..	1,660,722
Sicily	682,418	..	706,336
Ports of Romagna, on Adriatic	403,790	..	264,669
Venetia	137,193	..	236,663
	£6,038,305		£4,865,552

The values of the principal articles imported from England were as follows:—

Northern Provinces, including Island of Sardinia.

	1861.		1867.
Cottons	£307,832	....	£251,842
Iron	371,464	....	212,796
Cotton yarn	110,159	....	191,184
Woollen stuffs	255,515	....	138,103
Coal	121,271	....	126,096
Copper	117,975	....	70,446
Fire-arms and ammunition	29,377	....	52,021

Tuscany.

	1861.		1867.
Cottons	£333,342	....	£331,327
Iron	99,408	....	40,118
Cotton yarn	£111,882	....	£202,805
Woollen stuffs	175,317	....	132,234

Southern Provinces, including Sicily.

	1861.		1867.
Cottons	£597,410	....	£594,765
Cotton yarn	460,745	....	505,198
Iron	444,633	....	149,279
Woollen stuffs	224,706	....	151,604
Coal	71,155	....	88,451

Ports of Romagna, on the Adriatic.

	1861.		1867.
Cottons	£159,844	....	£119,373
Cotton yarn	48,295	....	69,697
Iron	62,559	....	16,075
Woollen stuffs	54,488	....	18,650

Venetia.

	1861.		1867.
Cottons	£13,495	....	£55,217
Seeds for oil	17,339	....	43,500
Coal	12,277	....	20,944
Shellac	35,114	....	18,278

The value of the exports from England of colonial produce during 1867, as compared with those during 1863:—

	1863.		1867.
Northern provinces, including Island of Sardinia	£902,672	..	£584,678
Tuscany	160,799	..	105,496
Southern provinces	280,209	..	181,104
Sicily	52,699	..	36,628
Ports of Romagna, on Adriatic	9,986	..	27,781
Venetia	127,242	..	77,683
Totals	£1,533,607		£1,013,370

The total value of the exports from Italy to Great Britain during 1867 was £3,101,552, being an increase of £318,999 on those of 1863, which amounted to £2,782,553. The value of the principal articles of export were as follows:—

Northern Provinces, including Island of Sardinia.

	1863.		1867.
Lead ore	£3,842	.....	£69,140
Copper ore	6,549	.....	27,024
Olive oil	10,556	.....	20,208
Maccaroni and vermicelli	12,740	.....	13,475
Marble	11,467	.....	23,295
Walnut wood	23,907	.....	11,707

Tuscany.

	1863.		1867.
Olive oil	£191,971	....	£120,024
Boracic acid	74,452	....	62,103
Marble	61,710	....	58,620
Marble (worked)	19,259	....	35,271
Hemp	47	....	28,982

Southern Provinces, including Sicily.

	1863.		1867.
Sulphur	£275,602	....	£375,217
Olive oil	316,044	....	335,285
Sumach	125,344	....	219,819
Oranges and lemons	117,105	....	125,171
Cream of tartar	96,253	....	133,830
Wine	60,974	....	72,134

Adriatic Ports.

	1863.		1867.
Grain	£9,450	....	£77,995

Venetia.

	1863.		1867.
Raw hemp	£175,518	....	£243,361
Beads and glass-ware	115,351	....	187,528
Grain (1864)	1,121	....	87,014
Hemp yarn	14,435	....	12,856
Sumach	6,256	....	12,094

Colonies.

Australian Tariffs.—The committee of the Melbourne Chamber of Commerce recently adopted a series of resolutions, to the effect that it is desirable to have one uniform tariff throughout the Australian colonies; that in order to effect this a commercial union should be established, the custom-houses at the various ports collecting on behalf of the union treasury, and that the net aggregate revenue should be distributed amongst the various colonies, on the basis of population. In short, they propose to establish at Melbourne a commercial union similar to the German Zollverein. The *Melbourne Argus* thinks this too sweeping a change for precipitate adoption, and goes on to say:—"Some parties prefer commencing with the establishment of a free interchange of colonial productions, leaving the question of absolute free trade to the future. To the principle of absolute free trade, we do not object, for it is the basis of our border treaty with New South Wales, but there are serious difficulties in the way of extending it so as to secure the just interests of all the colonies. There is no doubt that the views of the Melbourne Chamber of Commerce will find favour among similar bodies in the other colonial capitals, and this we shall regard as a symptom of the general desire to establish more harmonious intercolonial relations than have hitherto existed."

Subsidy to the Peninsular and Oriental Company.—The *Sydney Morning Herald* considers that New South Wales has gained this year (1868) at least fully the amount of the Panama subsidy in the diminished price of flour, and in this advantage all the colonies have participated, both those that have and those that have not contributed to the subsidy, except, perhaps, South Australia, which, as the great wheat exporting colony, has had the price of its staple article kept down.

Notes.

Aquariums.—M. Coste, the well-known oyster cultivator, made a report the other day to the Paris Academy of Sciences, on the aquariums and vivariums of Concarneau, in the Department of Finistère, in France. It is ten years since the establishment for the breeding and preservation of fish was commenced at Concarneau, and there is no other place where the inhabitants of the ocean may be studied in conditions so nearly resembling those of nature. There are six reservoirs in the open air with a surface equal to about 1,200 square-yards, and depths varying from two to four yards, and these are supplied twice a-day with fresh sea-water by means of grated flood-gates which prevent the escape of the fish. At one extremity of these reservoirs is a large building containing seventy aquariums or tanks supplied by a continual stream of sea-water containing a vast number of fish, crustacea, and mollusks, whose forms, colours, and habits may be studied without difficulty. This is truly an admirable establishment for the purpose intended, and M. Coste is justified in stating that nothing less than an arrangement of this kind is sufficient for the furtherance of abstract and practical science in connection with the creatures of the ocean.

Agricultural Education in Austria.—The course of studies in the institutions for agricultural instruction in Austria varies to from two to three years. Most of these establishments have model farms, so that the students are enabled to have practical as well as theoretical instruction. The principal institutions for the teaching of the higher branches of agriculture are those of Ungarish-Altenberg, which has a model farm of 350 acres, with orchard, gardens, cattle, and agricultural implements; at Duthany (Galicia), a model farm and chemical laboratory is attached to the institution; at Teuhen-Liebwerd there are a model farm, botanical garden, orchard, brickyard, chemical laboratory, workshops, brewery, and manufactory of spirits and liqueurs. At Tabor there is also an agricultural and industrial institution, with model farm, which cost 51,500 francs, and 28,000 more to arrange it with machinery, implements, &c. The agricultural institutions at Kolcawka, near Prague, has a library of 16,000 volumes, botanical museum, &c. These institutions cost annually 105,145 francs; are attended by 411 students and 59 masters. These institutions receive subsidies from the provinces. There are also 17 agricultural schools, and 4 more being established; these have 79 masters, and are attended by 411 students, and cost 192,678 francs per annum. The Academy of Forestry, at Mariabrunn, costs the State 30,000 francs per annum, and is attended by 75 students and 8 professors. The administration of the great forest of Weidlingen, 3,000 acres in extent, is confided to this institution; there is also a fine botanical garden, good library, and collection of forestry appliances. The students have practical instruction by excursions in the forests of the State. Besides this important institution, there are three other schools of forestry, at Eulenberg (Moravia), Weisswasser (Bohemia), and at Hinterbühl (Lower Austria); these schools have 10 professors, and are attended by 125 students, and cost 20,400 francs per annum. Another school of forestry is about to be established at Carniola. There are six schools for fruit-culture and wine-making, and two more being established. Three schools of sericulture and agriculture. For veterinary surgery there is the Royal Veterinary Institution at Vienna, for military veterinary surgeons; it has 7 professors and 290 students, and costs 65,000 francs per annum. There are also two other veterinary schools. All the above-mentioned institutes and schools receive subsidies from the provincial grants.

Agricultural Prizes.—The Minister of Agriculture, Commerce, and Public Works in France, has established a series of prizes for the encouragement of agriculture. In addition to a work of art, value £140, called the Cup of Honour, which has been given for some time, the following prizes are now offered:—1. An object of art of the value of £20, with £80 in money, to agriculturists farming their own land, either directly or through a bailiff, with a sum of £20 and medals of several kinds to the agents of such farmers. 2. An object of art of the same value as the preceding, and with a like sum of money in addition, for farmers holding more than fifty acres of land at a rental or under other arrangement, with a prize of £20 and medals for those in their employment. 3. An object of art, of the same value, for proprietors of several *metairies*, small farms worked by tenants, who, instead of rent, give the proprietor a certain portion of the produce, and £80 in money to be divided between the tenants. 4. An object of art of the value of £8, with £24 in money, to small farmers or proprietors of not more than fifty acres, and a sum of £8 and medals for those in their employ. When the cup of honour is awarded it will take the place of one or other of the works of art in the above list. These prizes will be offered in the various departments of France alternately; twelve departments are set down for the competition of the year 1870. These prizes are in addition to the medals and other recompenses given to the exhibitors at the concours regionals.

Technical Education at Florence.—A school for wood-carvers, cabinet-makers, and other workers in wood, was to be opened in Florence on the 4th January, in the ex-convent of the Annunciata, which has been given by the Municipio for this purpose. The lessons will be given on Sundays and fête days, from 8 to 10 in the morning, and will be gratuitous. The teaching will consist of geometrical drawing, elements of ornament, ornamental drawing, ornamental modelling, elements of mechanics applied to working in wood, resistance of materials, elements of chemistry applied to

the painting, varnishing, and preservation of wood, elements of natural history applied to wood-carving. The school will consist of three classes. 1st, wood-carving; 2nd, cabinet-making; 3rd, carpentry. For admission to the 2nd and 3rd classes the only requirements are that the students should be above 12 years of age and should be able to read and write. An examination in the elements of ornamental drawing, and a certificate from a drawing master as to the capabilities of the student, are required for admission into the 1st class.

Gas Works in Italy.—At the end of 1867, the number of towns in Italy lighted by gas was 86. The annual production of gas amounted to 30,189,941 cubic metres (upwards of 1,066,016,916 cubic feet). The quantity of coke produced was 67,668 tons, and 6,968 tons of tar. The total value of these products amounted to 14,188,598 francs. Upwards of 1,177 workmen are employed in this industry, and their wages amount annually to 885,925 francs. The price of gas in the north of Italy varies in different towns from 40 to 50 centimes per cubic metre (equal to from 9s. 1d. to 11s. 4d. per thousand cubic feet). At Milan the price of gas is 45 centimes per cubic metre (10s. 2½d. per thousand). The public lighting is, however, paid by the town at 28 centimes per cubic metre (6s. 4½d. per thousand), so that a street lamp consuming 120 litres per hour costs 0·0336 of a franc per hour.

Students' Reading-room at the Bibliothèque Imperiale, Paris.—This new room has now been open some time, and the experiment of establishing one room for general readers and another for serious study seems to be a success. The new reading-room, which is applied to the latter purpose, is a fine apartment, nearly square, and lighted from the roof, with seats, affording ample space for more than three hundred readers, forming, as it were, the internal court of the new library of printed books, which occupies three of its sides. The books in the library are arranged in three stories, each being provided with a balcony. The reading-room is separated from the library by means of dwarf book-cases, which contain a limited number of works of reference placed at the disposal of the readers. The librarians occupy a range of tables between the further end of the reading-room and the library, and the arrangement seems very convenient for the service. The method adopted is similar to that of the British Museum, each reader filling the particulars of the book he requires into a blank form; and, in addition to this, the attendants enter the names of the books consulted on another form, which the reader signs and delivers to an officer as he leaves the reading-room. The great want at present is that of a general catalogue; two portions of the new catalogue *raisonné* are placed in the room, containing a portion of the works on French history and medical books, but they do not go far to supply the want of the former. Classified catalogues have their special value, and are in some cases of inestimable service to students; but nothing can supply the place of an alphabetical catalogue arranged under the names of the authors. The attendance in the new room is large enough to justify the new arrangement, which is a boon to studious men.

Botanical Library.—The widow and daughters of the late M. François Delessert have offered to present to the Institute of France the magnificent botanical library formed by the brothers Benjamin and François Delessert, on condition that it is placed in a separate apartment, with the title of the Bibliothèque Delessert. This magnificent scientific library, the finest of its kind, perhaps, in France, comprises about eight thousand volumes, and the present possessors desire to carry out the views of the collectors, and preserve it entire in the interest of science, a wish which the Academy of Sciences will doubtless be eager to carry into effect.

Cattle Show at Paris.—It is officially announced that the Minister of Agriculture and Commerce has determined that various additions shall be made to the general show of animals already announced to be held at the new general cattle market of La Villette from the 20th to the 24th of March. This, says the *Journal del' Agriculture*, is a happy imitation of what is done at the Smithfield Club at Islington, in the month of December. The additional exhibitions will consist of live and dead poultry, grain, seeds and roots, instruments, and machines. This decision will add great interest to the competitive show.

Correspondence.

Xylography.—Sir,—Will you permit me to thank Mr. Jackson, of the Royal Gardens, Kew, for his letter which appeared in the *Journal* last week, on the paper I had the honour to read before the members of the Society of Arts, on the 27th ultimo, and to reply to the question put to me in that letter as to whether I am "aware that in America sheets of wood are cut so thin, that the actual material itself is used in place of paper for walls." For more than twelve months I have been aware that in America wood was cut almost as thin as paper, and about nine months ago I saw a specimen of oak so cut, but practically, there are one or two objections to its successful application commercially as it appears to me, and in directing attention to these points, I wish it to be distinctly understood that I have not the least desire to underrate the merits of the discovery. The first objection is that it cannot be applied to mouldings; these, it is admitted, must be put in in solid wood; this may not be so grave a matter for new work, although it must necessarily increase the cost, but it becomes a much more serious question when applied to work that is already fixed, and has been previously painted, for in that case the moulded work must either be removed and replaced with solid wood, or grained by hand, the part where Mr. Laing, a practical grainer—at the discussion which followed the reading of my paper—stated the hand grainer most failed, and where my process was so successful. The second objection is that most of the wood cut by the American process has a grain in it, such as the oak, the walnut and others, so that when held up to the light, you can see through the pores, and when applied, as I apprehend it must be, with glue to attach it firmly to the surface of the wood, to prevent curling at the edges and blistering, the glue shows through the veins of the wood, and detracts from the cleanness and smartness of its appearance. And further, unless the pores of the wood are effectually filled and covered over, either with French polish or several coats of varnish, there is an inevitable tendency to dust and dirt settling in the grain of the wood, which renders it not very sightly. It will at once be seen that the first objection refers mainly to wood work in the interior of dwellings, and to furniture; the second applies equally to its use for that purpose, as well as for walls.—I am, &c., Wm. Dean, Sen.

74, Park-walk, Brompton, Feb. 8.

P.S.—Following out the suggestion of Mr. Land, I have again visited the museum at Kew, and with your correspondent, Mr. Jackson, have re-examined the specimens there, and I am confirmed in my opinion that there are some six or seven of those beautiful foreign woods that are available for my process.

Velocipedes.—Sir,—After reading your notice on velocipedes in France, it appears to me that this useful invention may be employed with great advantage in this country by the postal authorities. There are many rural districts where the postman has to travel long distances on foot, frequently as much as twenty miles in the day. He would be able to perform this with much greater expedition and less fatigue to himself could he use one of the new description of velocipedes. But their great value would be found in the facility they would give for the expeditious delivery of telegrams. These,

as soon as the Government acquire possession of the telegraphs, and reduce the tariff to a uniform shilling, will be largely increased in country districts.—I am, &c., Alfred S. Churchill.

16, Rutland-gate, S.W.

MEETINGS FOR THE ENSUING WEEK.

Mon.....Society of Arts, 8. Cantor Lecture. Mr. S. A. Hart, R.A., "On Painting."
Society of Engineers, 7½. Mr. Thomas Buckham, "The Drainage and Water Supply of Fareham."
R. United Service Inst., 8½. Mr. J. M. Hyde, "Deflecting Armour-plated Ships for Coast Defence."
Entomological, 7.
British Architects, 8.
Medical, 8.
Asiatic, 3.
London Inst., 6.

Tues ...Civil Engineers, 8. 1. Renewed discussion on "The Mauritius Railways: Midland Line." 2. Prof. Ansted, "On the Lagoons and Marshes of certain parts of the Shores of the Mediterranean."
Statistical, 8. Mr. Horace Mann, "On the Cost and Organisation of the Civil Service."
Pathological, 8.
Anthropological, 8.
Royal Inst., 3. Mr. Westmacott, "On Fine Art."

Wed ...Society of Arts, 8. Mr. Henry Cole, C.B., "On the Efficiency and Economy of a National Army, in connection with the Industry and Education of the People."
R. Society of Literature, 4½.

Thur ...London Inst., 6.
Royal Inst., 3. Dr. M. Foster, "On Involuntary Movements."
Royal, 8½.
Antiquaries, 8½.
Linnæan, 8.
Zoological, 4.
Chemical, 8.
Numismatic, 7.
Royal Society Club, 6.

Fri .....Geological, 1. Annual Meeting.
Philological, 8¼.
Royal Inst., 8. Mr. Greville Williams, "On the Female Poisoners of the Sixteenth and Seventeenth Centuries."

Sat .....Royal Inst., 3. Prof. Odling, "Hydrogen and its Analogues."

Patents.

From Commissioners of Patents' Journal, February 5.

Grants of Provisional Protection.

Annealing cans, manufacture of—203—M. Tildesley.
Armour plates, rolling—238—J. D. Ellis.
Ballot-voting apparatus—63—T. B. Sydserff.
Boat and carriage combined—3933—W. R. Lake.
Boilers—144—J. Loader and W. H. Child.
Boilers—191—J. W. Wilson.
Boilers, &c.—179—F. A. Paget.
Boots and shoes—220—B. Mountain, T. Richmond, and G. Duffield.
Boots, &c., knives for cutting out the soles of—259—J. Silman.
Boring apparatus—195—C. J. Chubb.
Bricks, &c., burning—163—J. H. Johnson.
Chairs, cages, or hoists used in mines, &c.—3015—A. Thorpe.
China, &c., moulds for moulding—206—A. Maw.
Cocks or valves—227—C. E. Brooman.
Collar studs, &c.—233—R. J. Green.
Copper, smelting—219—H. Murdoch.
Diseases, apparatus for treating—3691—J. H. Johnson.
Drilling machines—177—G. A. Crow.
Earrings, &c.—224—C. Touchevieux.
Envelopes—240—J. Millar.
Envelopes, &c.—257—R. Girdwood.
Fabrics, finishing—226—R. G. Lowndes and M. M. Callum.
Fabrics, finishing, &c.—268—C. D. Abel.
Fabrics, looped and knitted—204—J. Wilkins.
Fabrics, singeing by gas flames—248—C. Mather.
Fire-arms, &c., breech-loading—118—A. M. Clark.
Fire bars—266—W. Brown and T. H. Garbutt.
Fire, liquid-discharging apparatus for extinguishing—255—T. Brown.
Furnaces—3945—E. Butterworth.
Gas—3009—J. F. G. Kromschrœder.
Grain and seeds, germinating—230—A. V. Newton.
Harmoniums—185—M. J. Matthews.
Ivory, compositions resembling—223—W. M. Welling.
Key-hole plates, &c.—197—C. G. Gumpel.
Letter boxes, &c.—211—W. Dennis.
Letter-copying presses—260—G. Tangye.
Life-boats, &c.—263—C. W. Petersen.
Locomotives, &c.—189—C. de Bergue and C. Faure.
Looms—200—R. Baxenden and J. Heald.
Looms—231—E. Hartley.
Millstones, dressing—217—W. Huggins and H. Horsnaill.
Mincing machines—212—W. Burgess.
Motive-power—3677—H. W. Grylls.
Motive-power—264—R. M. Marchant.
Motive-power, &c.—208—T. Cook and J. Watson.
Moulds for casting—234—J. and S. Roberts.
Oxide of zinc, obtaining—262—A. C. Pass.
Packing cases, &c.—120—H. L. Harris.
Pessaries—276—R. Blackbee.
Phosphatic manures—258—E. H. Prentice.
Pianofortes—187—H. A. Bonneville.
Pipes, connecting—245—H. Law.
Plate glass, grinding—236—C. L. Wood and J. Stockley.
Presses for stamping letters, &c.—272—L. P. Hébert & L. A. Moulin.
Railway carriages, buffers for—213—J. Beattie.
Railway signals—75—F. N. Gisborne and H. Allman.
Railway trains, communication in—202—B. Craig.
Railway trains, communication in—216—E. Simons.
Railway trains, intercommunication on—247—C. French.
Railways, wedges used on—256—J. H. Johnson.
Shearing apparatus, &c.—199—W. R. Lake.
Sheet-metal rollers—249—T. Reeder.
Sheet metal, stamping and forming articles of—228—W. E. Newton.
Ships, &c., propelling—251—J. Taylor.
Slate-cutting machines, &c.—210—W. E. Gedge.
Smoke and soot, treating—252—T. Vaughan and J. W. Smith.
Spinning and twisting machinery—221—J. Dinsdale.
Steam boilers—209—J. W. and J. W. Horsfield.
Steam engines—196—T. C. Lewis.
Steam engines—215—J. Ortton.
Stone, &c., quarrying and sawing—214—J. Millward.
Straw, machinery for shaking—241—J. Wilson.
Sugar—246—C. Gil.
Taps—183—E. Barcroft.
Tobacco—254—J. Porteous and H. Gibson.
Types and dyes—24—L. Hannart.
Varnish—3837—G. Hadfield.
Veneers, cutting—244—A. V. Newton.
Venetian blinds—229—J. Carr.
Ventilating apparatus—243—W. R. Lake.
Veterinary purposes, apparatus for throwing cattle for—201—A. B. Cunningham.
Wearing apparel—34—D. Nicoll.
Wheaten flour, manufacturing—232—H. D. Bowyer.
Window sashes, &c., fixing—237—E. D. Ruston and W. W. Mills.
Wool, &c., preparing, &c.—239—J. Wilson, J. Wilson, jun., and G. Cryer.
Wool, &c., spinning, &c.—205—J. Speight, J. E. Burton & E. Brooke.
Works of art, &c., obtaining in metals or alloys fac-similes of—149—L. B. Phillips.
Yarns, steaming printed—218—L. J. Crossley and R. Hanson.

Patents Sealed.

2333. B. G. George.
2460. W. Pearson, W. Spurr, and H. Bradbury.
2461. J. Hargreaves.
2465. W. R. Lake.
2472. J. Whitehead.
2474. H. Benjamin.
2481. J. Broadfoot.
2496. W. W. Hughes.
2507. A. Argamakoff.
2512. J. Winsborrow.
2517. C. D. J. Seitz.
2529. R. Sim.
2574. J. Briggs.
2626. A. F. Eckhardt.
2639. B. J. Cohen.
2656. S. R. Samuels and J. Birks.
2690. J. Wilkinson, jun.
2904. P. E. L. W. Stockmann.
3335. J. Vavasseur.
3681. J. Littler and J. H. Banks.
3732. J. Fitter.

From Commissioners of Patents' Journal, February 9.

Patents Sealed.

2510. E. P. G. Headly.
2511. D. Hill, J. Richardson, G. N. Duck, C. G. Johnson, and W. F. Masterman.
2516. H. H. Henson.
2518. J. Wilson.
2519. R. H. Southall and W. Hallam.
2525. W. Payne.
2533. J. Grant.
2539. T. R. Crampton.
2540. H. K. York.
2557. J. H. Dearle and T. Brown.
2569. W. Corbitt.
2743. W. E. Newton.
2747. J. Wood.
2755. A. V. Newton.
2815. W. R. Lake.
2859. W. R. Lake.
3001. J. Woollatt & W. B. Dodds.
3144. W. R. Lake.
3532. W. R. Lake.
3619. W. E. Newton.
3687. W. R. Lake.

Patents on which the Stamp Duty of £50 has been paid.

372. W. Richards.
376. J. A. Maxwell.
404. J. Rock, jun.
356. T. Spencer.
353. W. Renney.
369. U. Scott.
386. J. Townsend.
362. E. A. H. Beuther.

Patents on which the Stamp Duty of £100 has been Paid.

311. A. C. Bamlett.
330. W. H. Bartholomew.
463. W. Hamer.
509. J. Imray.

Journal of the Society of Arts.

FRIDAY, FEBRUARY 19, 1869.

Announcements by the Council.

Ordinary Meetings.

Wednesday Evenings at eight o'clock :—

Friday Morning, 19th February (this Day).—The adjourned discussion on Mr. Henry Cole's paper, "On the Efficiency and Economy of a National Army, in connection with the Industry and Education of the People," will be opened by Major-General Sir Wm. Denison. A. J. Mundella, Esq., M.P., will take the chair at 11 a.m.

February 24. — "On Ventilation." By Edward Smith, Esq., M.D., F.R.S. On this evening Thomas Bazley, Esq., M.P., will preside.

*** Persons having Models or Plans of Ventilators, or systems of Ventilation, desiring to show them on this occasion are requested to forward them to the Secretary not later than Tuesday next.

March 3.—"On the Adaptation and Extension of Present Means for the Promotion of Scientific Instruction." By H. H. Sales, Esq. On this evening Lord Frederick Cavendish, M.P., will preside.

March 10.—"On the Screw Propeller." By N. P. Burgh, Esq., C.E.

March 17.—"On the Trade and Commerce of Japan." By William Davison, Esq.

March 24.—*Passion Week.*—No Meeting.

March 31.—"On Technical Education, considered in relation to Female Schools." By Ellis A. Davidson, Esq., Lecturer on Science and Art in the City of London Middle Class Schools.

April 7.—"On the Theory of Boiling in connection with some processes in the Useful Arts." By Charles Tomlinson, Esq., F.R.S., F.C.S.

Cantor Lectures.

The concluding lecture of the Course of Four Lectures, "On Painting," will be delivered by S. A. Hart, Esq., R.A., late Professor of Painting at the Royal Academy, as follows :—

Lecture IV.—Monday, February 22nd.

On Landscape Painting.

The lecture will begin at eight o'clock. These Lectures are open to Members, each of whom has the privilege of introducing two friends to each lecture. Tickets for this purpose have been forwarded to each member.

FINAL EXAMINATIONS, 1869.

In order to avoid holding these Examinations on the same evenings as those of the Department of Science and Art, it has been decided to hold them, in 1869, on the evenings of

TUESDAY,	**the 20th**	**APRIL,**
WEDNESDAY,	**the 21st**	,,
THURSDAY,	**the 22nd**	,,
FRIDAY,	**the 23rd**	,,

From 7 p.m. to 10 p.m., instead of on the 27th, 28th, 29th, and 30th April, as announced in the Programme of Examinations for 1869.

In consequence of this alteration the Previous Examinations must be held earlier, and the Forms No. 2 and No. 4, referred to in par. 6 of the Programme, must of course be sent in a week earlier than the dates there fixed for receiving them.

It is very important that this alteration should be made as public as possible. For this purpose a number of small slips, to be inserted between pages 8 and 9 of every Programme sent out, have been forwarded to each Institution and Local Board. Large bills, to be suspended on the walls of the Institution reading-room, or in some other public place, will also be sent on application.

In reference to the subjects referred to in the notice at page 9 of the Programme, a sufficient number of applications from candidates in Conic Sections, Navigation and Nautical Astronomy, and Mining and Metallurgy, have already been received. Papers will therefore be set in these subjects.

No paper will be set in Italian.

Local Boards having candidates either in the "Theory of Music" or in "Elementary Musical Composition (Tonic Sol-fa System)," should communicate with the Secretary of the Society of Arts without delay.

Elementary Examinations, 1869.

Secretaries of District Unions and Local Boards desiring to adopt the Society's scheme of Elementary Examinations, are reminded that they must apply to the Secretary of the Society of Arts *without delay*, stating the number of male and female Candidates respectively desiring to be examined in each grade.

Free Libraries and Museums.

The Council have appointed a Committee to consider and report how the Society may aid in promoting the establishment of Free Libraries and Museums of Science and Art throughout the United Kingdom.

The Thames Embankment.

The Council have appointed a Committee to report upon the best way of dealing with the Thames Embankment, so that the opportunity may not be lost of making this noble site conducive to the embellishment and improvement of the metropolis.

Subscriptions.

The Christmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Institutions.

The following Institution has been received into Union since the last announcement:—

Keswick, Mechanics' Institution.

Proceedings of the Society.

Cantor Lectures.

The third lecture of the course by Mr. S. A. Hart, R.A., "On Painting," was delivered on Monday evening, the 15th inst., the subject being "The Suggestions offered by surrounding circumstances to the Artist." An outline of these lectures will appear in the *Journal* at an early opportunity.

Committee on India.

This Committee met on Tuesday, the 16th instant, at 4 o'clock. Present:—Major General Sir Vincent Eyre, K.C.S.I., in the chair, Sir Daniel Cooper, Bart., Major-General Sir Wm. Denison, Dr. Archibald Campbell, Messrs. Hyde Clarke, and C. H. Fielder.

The Committee resolved to recommend to the Council a list of other gentlemen interested in Indian matters who should be invited to join the Committee.

The Committee resolved that Six Conferences should be held during the present Session for the discussion of the following subjects, viz.:—

Tea Cultivation in India.
Hill Settlements and Sanitaria.
Waste Lands in India.
Trade with Central Asia, Thibet, and South-Western China.
Indian Fibres.
Silk Cultivation and Supply.

The following evenings were fixed for holding the conferences:—

Friday, March 12th.
" April 2nd.
" April 16th.
" April 30th.
" May 14th.
" May 28th.

At these Meetings the chair will be taken at 8 o'clock, and the discussion will be opened by a paper.

On the first evening, March the 12th, Mr. C. H. Fielder will open the discussion with a paper "On Tea Cultivation in India."

The subjects for each subsequent evening will be previously announced in the *Journal*.

Members of the Society interested in Indian questions are invited to attend.

Eleventh Ordinary Meeting.

Wednesday, February 17th, 1869; A. J. Mundella, Esq., M.P., in the chair.

The following candidates were proposed for election as members of the Society:—

Dermer, Edward C., 3, Barnes-villas, Barnes, S.W.
Fentiman, John W., Devonshire-cottage, Balham, S.W.
Gassiot, John P., jun., 6, Sussex-place, Regent's-park, N.W.
Harrison, Peter, Keswick.
Helme, Robert, The Forest, Walthamstow, N.E.
Hocombe, James B., 13, Bedford-row, W.C.
Hyam, Frederick, 109, Westbourne-terrace, W.
Leslie, Francis Simon, Ealing, W.
Lloyd, Frederick George, The Winns, Walthamstow, N.E.
Matthews, George Kelly, St. John's-lodge, Beckenham, Kent.
Maude, Colonel Francis Cornwallis, 75, Onslow-square, S.W., and Army and Navy Club.
Robertson, William Wybrow, 1, Whitehall, S.W.
Williams, Morgan B., 15, Hyde-park-gate, Kensington-gore, W.

The following candidates were balloted for, and duly elected members of the Society:—

Anderson, John, 11, Carnmoney-street, Belfast.
Edwards, Henry Arthur, 132, Upper Thames-street, E.C.
Hunt, Charles, the London Gas Light Company, Nine Elms, S.W.

The Paper read was—

ON THE EFFICIENCY AND ECONOMY OF A NATIONAL ARMY, IN CONNECTION WITH THE INDUSTRY AND EDUCATION OF THE PEOPLE.

By Henry Cole, Esq., C.B.

1. Notwithstanding the advancing civilisation throughout the world, the increasing communications of one country with one another, the extension of free-trade, and the spread of Christianity, it must be admitted that nations still require armies and navies to protect their Industry, their Arts, Manufactures, and Commerce. I am therefore desirous, at the outset of these observations, to guard myself against the imputation that I advocate the weakening, much less the abolition, of our country's defences. On the contrary, I desire to see greatly-increased efficiency in our military organisation, and I believe this is not only compatible with, but that it can only be secured through, greatly reduced expenditure. The adoption of a complete change in our present military system, which shall connect it—I may say re-connect it, as in old times, not the least glorious in the history of England—with the interests and occupations of the whole people, appears to me as necessary, for its own sake as for economy's and efficiency's sake. It is a common fallacy, urged by advocates of the present costly system, to argue that, considering the enormous value of our exports and imports—say, in round numbers, something like four hundred and fifty-five millions of pounds a year, which was the amount in 1867—the insurance is cheap at about $5\frac{3}{4}$ per cent., which is the proportionate cost of our annual military and naval expenditure. Last year it amounted to twenty-six millions, *i.e.*, about £15,000,000 for the army, and only £11,000,000 for the work at sea. Such a charge, even if necessary, is in itself wholly unproductive.

2. And it is said that it is good political economy to effect this insurance through the agency of a special class forming a large standing army, which employs rather than rejects the scum of our population. I deny that the amount of £15,000,000 a year is at all necessary. I assert that at least half is an unnecessary expenditure, and therefore a tax upon industry. I repudiate the idea, and it is only a modern one, not much more than a century old, that our soldiers should be a distinct caste, formed by hiring for the most part the outcasts and roughs of the people. On the contrary, I say our private soldiers ought to be able to read and write, as well as Prussian and Swiss soldiers, and, if you like it, to be as devout, going into battle with their Bibles, as our

ancestors did under Cromwell. In the progress of the times I am sure, if you don't have them educated and civilised soldiers, England will be distanced in its race with other nations wiser than ourselves.

3. I shall attempt to show that the country may have a more efficient army than at present at about half the present annual cost, leaving about seven millions either in the pockets of the taxpayer, or to be appropriated to national objects more productive than war, such as the education of the people, and the promotion of those things that advance Arts, Manufactures, and Commerce. I venture to say that even warlike training and expenditure may be usefully connected with the health and occupations of the people; may be a great assistance to the labour market and civil service of the country, rather than a drag upon them, and be made to elevate the national character. With this aim, I hope that the subject is worthy of serious investigation, especially at the present time, and by this Society, which, like the army itself, has nothing to do with party politics. But as a political question I agree with Blackstone, from whose "Commentaries" I have extracted a few passages, which will be found in the appendix. This old Conservative judge says, "The laws and constitution of these kingdoms know no such state as that of a perpetual standing soldier bred up to no other profession than that of war."

4. The subject of military organisation has almost fathomless details, but I do not propose to discuss them. My paper is intended to deal only with broad principles, and will avoid details except they may touch my argument. I do not propose to enter upon the numberless vexed questions connected with the army administration, which army reformers are discussing. For those who wish to go into this subject I refer them to the numerous pamphlets of the day. I will not stay to inquire why purchase of promotion should not be adopted in all the branches of the army, if in some, and those which require high scientific attainments like Engineers and Artillery, or various practical work, like the Marines, and why it is applied only to those branches of the cavalry and infantry which demand inferior attainments, and where the duties in the time of peace are so light, that they only employ a subaltern one hour in the day, leaving him the remaining twenty-three hours for dress, meals, sports, and pleasure. I do not stay to ask what is the reason why there should be purchase in the army and not in the navy; or to ask why the British army requires one officer to every twenty-eight men, such officer depending upon a serjeant virtually to do his duties, whilst the French army has only one officer to thirty-three men, and makes him do his work himself; and whilst Prussia requires only one officer to forty-nine men. I will not discuss the system of recruiting, as people generally now agree with the late Sidney Herbert, afterwards Lord Herbert, who said recruiting for men to defend the honour of the country was done "by every kind of cajoling and inducement we can devise, and in our necessity we descend to those means which men do not have recourse to till they think all others are exhausted;" or with Sir Charles Trevelyan, who truly writes that "Our pot-house system of recruiting, the soldier's long term of service, and the restrictions upon his marriage, act as a direct encouragement to drunkenness and debauchery in a great national establishment which might, under different arrangements, be converted into a popular training-school of the highest intellectual and moral value." I entreat the meeting to abstain from discussing these topics. I will not ask why half-pay for a whole life be necessary for the hard work which many officers undergo—that of only one hour a-day for a few years. I will not investigate the whimsical paradox by which railway engineers, untrained as soldiers, are made colonels, with military rank, whilst officers of Royal Engineers, thoroughly trained, are compelled to resign the army if employed in civil service for more than ten years. I will not say whether or not it is better to have one military school or many; whether or not an enormous centre for all military stores is cheaper and better than regimental management of them; whether or not there should be Government manufactories; whether or not military men alone ought to be sole judges of scientific and mechanical inventions; whether or not the progress of practical science, and its effect upon warfare, be sufficiently appreciated by our English military authorities; whether or not, in these days, when every year seems to add a mile to the range of great guns, it is good sense to spend millions upon enlarging the area of fortifications. Nor will I discuss what is called the "dual" system of government by Horse Guards and Pall-mall. All these are questions of administration, and there are many others of a like sort, any one of which is of sufficient importance to be discussed separately if the present system is to be maintained, but, as I advocate a thorough change of system, and would shut up the present one as soon as possible, I pass them by.

5. Let me say, once for all, that I consider the management of the army in India quite a distinct subject from the army for the United Kingdom and its other dependencies. Whether we employ too many soldiers there or not, whether or not the service in India should be connected with the whole army, whether or not India should be treated as a real military training school for the United Kingdom, are questions, too, which I pass by; but this I will venture to say, that the cost of the Indian army, be it little or much, ought not to be charged upon the taxpayer of this country, but should be supported by India, whatever that cost may be.

6. Putting, therefore, aside merely adminstrative details, and leaving the case of India out of consideration, then I come to our home army in its present state. We had last year a standing army of about 125,000 men, besides about 130,000 militia and yeomanry, and 150,000 volunteers; of this force, exclusive of militia, &c., I calculate that about 40,000 were distributed over the colonies. But the size of this great standing force is not to be defended on the ground of its efficiency; and many of the highest military authorities frankly admit that it is most imperfectly organised for immediate action when war arises. Our officers and men, I believe, are unrivalled for their enduring pluck, and make the noblest soldiers in the world; but at the beginning of a campaign they have to learn their work, and struggle into efficiency, with much suffering, through a long apprenticeship, and at enormous cost to the tax-payer. I need only allude for illustration to the latest instance, the Crimean war. On that occasion we left off in good fighting condition, but we began the work as badly as possible in respect of the administrative branches. Major Edwards, R.E., in his lecture on the organisation for the army of England, says:—"Any one who considers the present organisation of our army cannot but feel surprise and astonishment that the country should for so long a time have submitted to an enormous extra expenditure in time of war for want of organisation and a proper proportion between the services in time of peace. We know how the army suffered in the sieges during the Peninsular war for want of a sufficient engineer corps and siege train. If the infantry had been 3,000 or 4,000 less, and the engineers and artillery increased by that number of trained men, what a loss of life would have been saved! We need only go back to the army in the Crimea, with its inadequate force of engineers, and without any military train, to see how differently it would have been situated had only 1,500 of the infantry been trained sappers, and 2,000 employed as military train. It was well known before the Crimea that railroads would play an important part in future wars, and consequently the engineers of our army should have been trained in their construction and use. The 1,500 additional sappers might have been used as infantry if required, but employed in their legitimate occupation, they would have saved the great expense of the army

works corps, and have made a tramway or light railway from Balaclava almost to the front before the army began to die from starvation and exposure. What would not a military train 2,000 strong have done towards saving our army from destruction? Under these circumstances I think we may come to the conclusion that it would have been better to have had 3,500 less infantry in the Crimea, and to have employed this body of men in the above-mentioned manner, as they would have saved the remainder from destruction. We are now very little better off than we were during the Crimean war; we have a larger force of field artillery, and a small body of military train, but if we were to put 30,000 men into the field to-morrow, we could not undertake any operations a few marches away from our ships." I don't think even our late success in Abyssinia qualifies my assertion. That costly enterprise—for it cost nearer nine than five millions—and five only have been voted—was rather a scientific operation, fortunately confided to an able man of science, a military engineer, and, for the first time in our military annals, I believe, an engineer officer was entrusted with supreme military command. He was an Indian officer who had gained his position by hard work, rather than by purchasing promotion. On the contrary, I believe that instead of our present large costly standing army—not nearly large enough in case of war—imperfectly organised—our true policy to secure efficiency would be to have the smallest possible standing force, capable of indefinite and instantaneous extension when necessity arises. War, now, with science and railways, is a word and a blow, and the victory will be with those who are ready first with the greatest numbers and the best arms.

7. I am assured that the experience gained in the late Prussian war has proved that the best number for a *Corps d'Armée* is about 16,000 men properly organised, with its due proportions of engineers, artillery, commissariat, hospital staff, cavalry, and infantry. Instead of compact bodies of troops capable of acting together at an hour's call, we have to extemporise all the necessary organisation when war arises—and our professed military organisation I am afraid proves a sham and a delusion. I believe one such real *Corps d'Armée* of 16,000 men would suffice as a model for the United Kingdom, together with an ample reserve of efficient officers, engineers, artillerymen, marines, hospital staff, and all those divisions of an army which cannot be extemporised off-hand.

8. We do not want soldiers in the United Kingdom to act as policemen. Since the Duke of Wellington's campaigns we have substituted in the metropolis, for the old Charley watchmen and a few Bow-street runners, local armies of civil policemen, numbering about nine thousand trained men at the present time, and yet, as in the days of no police, we still keep large bodies of troops in the metropolis. Cavalry still remain in vile barracks at Hyde Park (where the officers' quarters have a pleasant look-out on the girls of the period in Hyde Park, and are certainly very handy for London evening parties), and we ignore the fact that special constables are easily made, and that the telegraphs and the railways could bring troops to London in half-an-hour, in case of any tumult which the police might be unable to suppress. Every county, too, has organized its own police, and Ireland has a police force of many thousands of loyal and effective men, better than soldiers for their purpose. But our home army has gone on increasing, whilst we have, at the same time, created civil armies of police by thousands.

9. But then it will be asked, if you reduce the standing army what is to become of our colonies? Our colonies are of different kinds. Some are communities having constitutional governments of their own, like Australia and Canada, which will rival us in population soon; others, like the Cape of Good Hope, Malta and Gibraltar, are military stations; others, like the West Indies, are places held in subjection, and require military forces to hold them. Australia and Canada, and the like, which regulate their own taxation, ought to be no charge on the tax-payer of this country; and I venture to submit that all imperial troops should be withdrawn from such colonies, except, perhaps, some few engineers and artillerymen. At military stations like Gibraltar, so long as it is considered to be policy to hold them, of course we must keep troops, but let them be as few as possible. Steam transports supersede the necessity for large depôts of men in time of peace, eating the bread of idleness.

10. At the present time, wars, although settled quickly, do not come on like a thief in the night, without previous notice. Thank God, the press keeps us all, even diplomacy itself, well informed if a nation is going to quarrel with us and threaten war. We have at least some time to make warlike preparations; and enthusiasts even dream of an international convention, to which all civilized nations may be parties, which shall agree that no nation shall make war upon another without giving due and ample notice for preparation.

11. Let us have at once perfect telegraphic communication with all our possessions and colonies, so that we may receive instantaneous notice of a call for the assistance of the mother country. I marvel at the blindness of governments which have not yet seen the imperative necessity for an electric telegraph under our own control to India. No cost of failures is worth estimating against the value of a means of hourly communication with India. Whatever be the cost, a British telegraph to India should be laid in the shortest possible period of time. Here, at least, is one subject where the military interests go hand in hand with those of Arts, Manufactures, and Commerce.

12. I now pass to the consideration of what our new military organisation might be, to enable us to defend the honour of the country efficiently and cheaply. It is common to say that England is not a military nation. I say she ought to be a military nation, and that she has the means of being so beyond all other nations; and I believe we shall be less pugnacious, when we are all soldiers, than when we have a caste whose special interest is fighting. Little Switzerland has an analogy with England. Switzerland is circumscribed with mountains, whilst England is bounded within fixed limits with water. Yet Switzerland, having the most military nations on all her frontiers, with only a population of some two millions, has always held her own against them. But then, Switzerland has every thirteenth soul of her population a soldier capable of bearing arms, an army of about 340,000 always ready for her defence in case of need. But Switzerland has no paupers, and every Swiss child is compelled to read and write. Odious compulsion! And the cost to the government of Switzerland of her military defence is stated to be a miserable sum of only about £150,000 a-year, or less than 10s. a man. I will not trouble the meeting with statistics from Prussia and Austria, which teach us a lesson, but I shall append to this paper some extracts from Mr. Martin's "Statesman's Year-book for 1869," to which I invite attention.

13. I have no hopes of having such an economical arrangement as the Swiss, but I do ask why England, at a reasonable cost, cannot have one in thirteen of her 30,000,000 population trained to bear arms in defence of her honour, her Arts, Manufactures, and Commerce in connection with them, and being no drag upon them? I trust my countrymen will seriously ask themselves this question. It may be said that except to guard the successor of St. Peter, the Pope, Switzerland only concerns herself with her own territory, whereas we have all the world to look after. That very fact all the more confirms me in the belief that we ought to have millions of men ready to come forward when required. No nation has such a field for military practice as England has in India. We ought to be able to supply India with British troops without difficulty, and without cost to the

home taxpayer, if the organisation, the pay, and the period of service were well arranged. We have difficulties with our present standing army of 130,000 men, but we should have much fewer and perhaps none with three millions of trained men. The proper training of three millions of men, which, according to the scale of Switzerland ought not to cost the state two millions a year, would be no weight upon the industry of the country. It might be even a benefit to it. This sounds paradoxical, but it is not so. The industry of little Switzerland is not damaged by its training of one in thirteen of its population, nor would be the industry of the United Kingdom. How, then, is it to be done?

14. I would begin by making drill part of national education in every boys' school in the country. At a very moderate cost, the military pensioners might be profitably employed to drill every school once in the week. No one will say that this drill would not improve the health and bearing of the boys, or assert that it would damage them as ploughboys or factory hands. It would also instil a military spirit into them.

15. When the lads leave school every inducement should be given to them to elect between becoming volunteers or joining the militia, not the present, but a reformed system of militia. Common cause should be made with all the great employers of labour, not only to allow, but to encourage their hands to keep up the drill and advance it. Call out the volunteers and militia once in the year for twenty days or so, and then return them to their occupations. Throughout the United Kingdom there should be drill from April to October, and your idle half-pay officers should be turned into full-pay, to command the men. Make another proportion of men of a certain age soldiers for twelve months at proper wages, and then return them to their occupations afterwards. I refer my hearers to an excellent article on this subject, published in the *Pall Mall Budget*, of December 4th. I quote only one short passage. "At the present time public opinion is, we trust, tending strongly towards the creation of a more national army—or, we should say, a more national military system—than that which exists at present. We want to obtain a better class of men, more of them, on better terms, and to pass them more rapidly through the military mill; to be thereafter engaged on their ordinary avocations, while available for some few years on an emergency for military service." I have consulted several large employers of labour in the North of England, and they all assure me that some such system would in no way interfere with the labour market and the operations of labour, but greatly benefit them both. Such a system is something quite different from taking a bad man for twelve years as a soldier, and then returning him to the labour market with a pension. Soldiers should thus be made in the midst of their industrial occupations. They should form part of the civil service of the country. Among the very best civil servants are officers and men of the Royal Engineers. Whether for officers or privates, you know with certainty that you can obtain a competent man for almost any kind of work in the Royal Engineers; and, this being so, why should not there be the same kind of certainty for obtaining civil servants in all other branches of the army? I am assured by high military authorities that twelve months is amply sufficient to make first-rate disciplined private soldiers, and that more time than this is thrown away. Of course, if you want men to march like machines, life is not long enough to accomplish it perfectly; but this old world dandyism is less cultivated by other nations, and is probably thrown aside on the field of battle.

16. I hope to see the military service thoroughly fused with the civil service of the country, and that one test of qualification for entering the civil service should be a certificate for having served well as a volunteer, militiaman, or soldier, retired from active service. The French even are adopting this principle. A report of Marshal Niel, dated the 23rd of January, 1869, has been addressed to the Emperor of the French, proposing that measures should be taken granting facilities to re-enlisted non-commissioned officers to pass from the military into the civil service of the State. The report concludes by saying that such measures would give to the lower military grades a greater attraction, and serve as a stimulant, which could not fail to produce an excellent effect throughout the army, and realize within a short time the benevolent intentions of the Emperor.

Again I quote old Judge Blackstone. "The military power should not be a body too distinct from the people. It should be wholly composed of natural subjects; it ought only to be enlisted for a short and limited time. The soldiers also should live intermixed with the people; no separate camp, no barracks, no inland fortresses should be allowed. And, perhaps, it might be still better if, by dismissing a stated number and enlisting others at every renewal of their term, a circulation should be kept up between the army and the people, and the citizen and the soldier be more intimately connected together."

Sir Charles Trevelyan, in his able pamphlet, "The British Army," says:—"The object to be aimed at is to make the army a true representation of the nation. It should be neither more aristocratic nor more democratic than the rest of English society. The upper, the middle and the lower classes cordially co-operate in every other public and private undertaking, and why should the army be the solitary exception? Since the beginning of the century the middle class has enormously developed; the present flourishing state of the country is chiefly owing to their exertions; and they have twice within the same period shown, by voluntarily organising for the national defence, that they do not yield to any portion of the community in military spirit and capacity. When this class, taken in its widest sense, shall be included, our army will come up to the full standard of the strength, the intelligence, and the moral qualities of our population; and, from being in its plan and design a purely aristocratic institution, the British army will become emphatically a popular army, and our recruiting difficulties will be at an end.

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"The rapidity with which militia regiments have improved after they have been embodied shows that the year's previous training, followed by a week or ten days' annual exercise, would give us the fruit of all our expenditure of time and money—an efficient, reliable militia—which cannot be obtained by any number of repetitions of the existing annual exercises. Our able-bodied youth would be economised and turned to the best account, because the year from eighteen to nineteen is the one which can best be spared in the life of a young man, standing, as he then does, on the edge of the labour market, without having taken up his place in it; and this year spent under discipline and instruction at the militia head-quarters would be well spent, even in reference to success in civil life. Those who have not completed their elementary education should be required to attend the regimental school until they come up to a prescribed standard; and the library and reading-room, and the lectures given by the military instructor and volunteer lecturers, should be open to all. Every militia head-quarters would become a military school, like those which have been established by the Government of Canada at several towns, under officers of the regular army, at which candidates for commissions in their militia are trained until they pass a certain examination, more or less strict according to their rank. Our provincial military schools, however, would be more efficient than those of Canada, because, being based upon a small but permanently embodied military force, they would combine practical with theoretical instruction; and once every year the entire regiment might be called out for brigade and division manœuvres with the other troops of the district. Instead of the holiday displays, which are not self-supporting, even for a single day, got

up by collecting volunteer regiments from distant parts of the country, the volunteers included in each military division would assemble for their annual exercise with the local line, militia, and yeomanry regiments, and they would all be supported by the local military and administrative staff, so that the troops which might have to serve together in war would acquire the habit of acting together under circumstances most resembling those of war; and as not merely the combatant ranks, but the entire military machine, would be periodically seen in actual operation, defects would be remedied without loss or discredit, which, in the face of an enemy, might involve untold sacrifices."

Many of these suggestions are well worked out by Col. Leahy, R.E., in his able paper on "Army Organization."

17. As respects engagement for longer terms—say seven years in India or more—that would be met by a special class, who would look to military service as the sole business of their lives, and the rate of payment would be regulated by the rate of wages and the necessities of the case. So in time of actual foreign war men would be engaged and paid liberally, and, if wounded, pensioned. If not wounded they would return to their occupations.

18. The Parliamentary votes for the army in 1868 were £15,455,000. This is exclusive of the cost of the army in India. This enormous sum was apportioned as follows:—

	£
No. 1. Regular forces	8,691,500
No. 2. Reserved forces	1,524,500
No. 3. Stores	1,491,400
No. 4. Works and buildings	968,400
No. 5. Military education, surveys, administration, &c.	655,200
Total effective service	13,331,000
No. 6. Non-effective services, pensions, &c.	2,124,400
Total of effective and non-effective	15,455,400

19. My conviction is, that about seven millions of pounds sterling would be saved annually by the adoption of principles such as those I have briefly glanced at, and the future apportionment of Parliamentary votes might, I submit, without pledging myself to precise details, which are far too many for public discussion, be somewhat as follows:—

	£
Standing army, 16,000 men at £65 a-piece	1,040,000
Scientific reserves of Engineers, Artillery, Marines, Hospital Corps, Staff officers, &c., say 30,390 men, being an increase on the present force, at £65 per man	1,950,000
Militia, and drilling of youths from 10 years old and upwards	2,000,000
Volunteers	1,000,000
Colonial corps	500,000
Stores	1,000,000
Works and buildings, excluding new fortifications	500,000
Pensions	600,000
Civil administration	150,000
	8,740,000

20. The feasibility of all this depends upon a real public desire to save annually seven or eight millions of unproductive expenditure, and, in return, to be willing to become home soldiers universally; foreign service being paid for at its proper value. Such a reform like this is not to be accomplished by a stroke of the pen. It could only be effected by slow degrees. But if the principles I advocate were adopted by the public, I think the new system might be fully introduced in the course of seven years, each year during the process witnessing a sensible reduction of expenditure, until the total cost reached the sum I have mentioned.

21. When war came we should be far readier for action than we have been hitherto. An unproductive annual expenditure of seven millions would have been economised, enabling us to bear the additional cost of the trumpets, drums, and fifes of actual war.

22. Allow me to glance at what a saving of seven millions a-year would accomplish for Arts, Manufactures, and Commerce. It would provide a national system of education. It would provide scientific and technical instruction, through colleges, schools, and museums, throughout the United Kingdom, wherever the wants of the country required them. It would establish complete electric telegraphs between the United Kingdom and the whole of our colonies and dependencies. It would enable us to abolish all taxes on locomotion. It would reduce the postage to all colonies and dependencies. It would relieve, if not abolish, many taxes on production, and help to give the people a free breakfast-table. It would help in abolishing pauperism.

23. And whilst these positive results to Arts, Manufactures, and Commerce could be predicted as certain, the better organization of military service would directly benefit them instead of being a wholly unproductive dead weight.

24. I hope to see all friends of peace assisting in this reform. It is the work rather of civil administration than for the heroes of warfare. The measure, I know, cannot be acceptable to military prejudices and to many of the military officers, who constitute a sixth part of the present House of Commons. But the press is discussing the subject most ably, and the pamphleteers on army reform are many. I venture to call particular attention to the masterly articles which from time to time appear in the *Pall Mall Gazette*, the *Saturday Review*, the *Times*, and other journals; and if the matter be as well discussed in Parliament as in the press, the national will, and the country at large, which pays for the defence of its honour and interests, will soon be the best judge of what is necessary for them. It may be a fight against narrow, short-sighted prejudices, to last as long as those against Catholic Emancipation, the Test and Corporation Acts, Parliamentary Reform, Municipal Reform, Railways, Corn-laws, and Free-trade. But these beneficial changes have become the creed of all men in my time, and I trust to live to see the honour of the country placed in the custody of a national army.

APPENDIX.—A.

Blackstone on Standing Armies.

In a land of liberty it is extremely dangerous to make a distinct order of the profession of arms. In absolute monarchies this is necessary for the safety of the prince, and arises from the main principle of their constitution, which is that of governing by fear; but in free states the profession of a soldier taken singly and merely as a profession, is justly an object of jealousy. In these no man should take up arms, but with a view to defend his country and its laws: he puts not off the citizen when he enters the camp; but it is because he is a citizen, and would wish to continue so, that he makes himself for a while a soldier. The laws therefore and constitution of these kingdoms know no such state as that of a perpetual standing soldier, bred up to no other profession than that of war: and it was not till the reign of Henry VII. that the kings of England had so much as a guard about their persons.

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It seems universally agreed by all historians, that King Alfred first settled a national militia in this kingdom, and by his prudent discipline made all the subjects of his dominion soldiers; but we are unfortunately left in the dark as to the particulars of this his so celebrated regulation.

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For every knight's fee a knight or soldier, *miles*, was bound to attend the king in his wars, for forty days in a

year; in which space of time, before war was reduced to a science, the campaign was generally finished, and a kingdom either conquered or victorious. By this means the king had, without any expense, an army of sixty thousand men always ready at his command. . . . This personal service in process of time degenerated into pecuniary commutations or aids, and at last the military part of the feodal system was abolished at the restoration, by statute 12 Car. II. c. 24.

In the mean time we are not to imagine that the kingdom was left wholly without defence in case of domestic insurrections, or the prospect of foreign invasions. Besides those who by their military tenures were bound to perform forty days' service in the field, first the assize of arms, enacted 27 Henry II., and after the statute of Winchester, under Edward I. obliged every man, according to his estate and degree, to provide a determinate quantity of such arms as were then in use, in order to keep the peace: and constables were appointed in all hundreds by the latter statute, to see that such arms were provided. These weapons were changed by the statute 4 & 5 Ph. & M. c. 2, into others of more modern service; but both this and the former provisions were repealed in the reign of James I. While these continued in force, it was usual from time to time for our princes to issue commissions of array, and send into every county officers in whom they could confide to muster and array (or set in military order) the inhabitants of every district; and the form of the commission of array was settled in parliament in the 5 Hen. IV., so as to prevent the insertion therein of any new penal clauses. But it was also provided, that no man should be compelled to go out of the kingdom at any rate, nor out of his shire but in cases of urgent necessity; nor should provide soldiers unless by consent of parliament. About the reign of King Henry VIII., or his children, lieutenants began to be introduced, as standing representatives of the crown, to keep the counties in military order, for we find them mentioned as known officers in the statute 4 & 5 Ph. & M. c. 3, though they had not been then long in use, for Camden speaks of them in the time of Queen Elizabeth, as extraordinary magistrates constituted only in times of difficulty and danger; but the introduction of these commissions of lieutenancy, which contained in substance the same powers as the old commissions of array, caused the latter to fall into disuse.

In this state things continued, till the repeal of the statute of armour in the reign of King James the first: after which, when King Charles the first had, during his northern expeditions, issued commissions of lieutenancy, and exerted some military powers which, having been long exercised, were thought to belong to the crown, it became a question in the long parliament, how far the power of the militia did inherently reside in the king; being now unsupported by any statute, and founded only upon immemorial usage. This question, long agitated with great heat and resentment on both sides, became at length the immediate cause of the fatal rupture between the king and his parliament: the two houses not only denying this prerogative of the crown, the legality of which perhaps might be somewhat doubtful: but also seizing into their own hands the entire power of the militia, the illegality of which step could never be any doubt at all.

Soon after the restoration of King Charles the second, when the military tenures were abolished, it was thought proper to ascertain the power of the militia, to recognise the sole right of the crown to govern and command them, and to put the whole into a more regular method of military subordination; and the order in which the militia now stands by law is principally built upon the statutes which were then enacted. It is true the two last of them are apparently repealed; but many of their provisions are re-enacted, with the addition of some new regulations, by the present militia laws; the general scheme of which is to discipline a certain number of the inhabitants of every county, chosen by lot for three years, and officered by the lord lieutenant, the deputy lieutenants, and other principal landholders, under a commission from the crown. They are not compellable to march out of their counties, unless in case of invasion or actual rebellion within the realm (or any of its dominions or territories), nor in any case compellable to march out of the kingdom. They are to be exercised at stated times: and their discipline in general is liberal and easy; but, when drawn out into actual service, they are subject to the rigours of martial law, as necessary to keep them in order. This is the constitutional security which our laws have provided for the public peace, and for protecting the realm against foreign or domestic violence.

When the nation was engaged in war, more veteran troops and more regular discipline were esteemed to be necessary, than could be expected from a mere militia. And therefore at such times more rigorous methods were put in use for the raising of armies, and the due regulation and discipline of the soldiery: which are to be looked upon only as temporary excrescences bred out of the distemper of the state, and not as any part of the permanent and perpetual laws of the kingdom. For martial law, which is built upon no settled principles, but is entirely arbitrary in its decisions, is, as Sir Matthew Hale observes, in truth and reality no law, but something indulged, rather than allowed as a law.

. . . . . .

But, as the fashion of keeping standing armies (which was first introduced by Charles VII. in France, A.D. 1445) has of late years universally prevailed over Europe (though some of its potentates, being unable themselves to maintain them, are obliged to have recourse to richer powers, and receive subsidiary pensions for that purpose), it has also for many years past been annually judged necessary by our legislature, for the safety of the kingdom, the defence of the possessions of the crown of Great Britain, and the preservation of the balance of power in Europe, to maintain even in time of peace a standing body of troops, under the command of the crown; who are however *ipso facto* disbanded at the expiration of every year, unless continued by parliament. And it was enacted by statute 10 W. III. c. 1, that not more than twelve thousand regular forces should be kept on foot in Ireland, though paid at the charge of that kingdom; which permission is extended by statute 8 Geo. III. c. 13, to 16,235 men in time of peace.

To prevent the executive power from being able to oppress, says Baron Montesquieu, it is requisite that the armies with which it is entrusted should consist of the people, and have the same spirit with the people; as was the case at Rome till Marius new-modelled the legions by enlisting the rabble of Italy, and laid the foundation of all the military tyranny that ensued. Nothing then, according to these principles, ought to be more guarded against in a free state, than making the military power, when such a one is necessary to be kept on foot, a body too distinct from the people. Like ours, it should wholly be composed of natural subjects; it ought only to be enlisted for a short and limited time; the soldiers also should live intermixed with the people; no separate camp, no barracks, no inland fortresses should be allowed. And perhaps it might be still better, if, by dismissing a stated number and enlisting others at every renewal of their term, a circulation should be kept up between the army and the people, and the citizen and the soldier be more intimately connected together.

APPENDIX.—B.

Extracts from Martin's "Statesman, for 1869."

The Prussian Army.

The military organisation of the kingdom, dating from the year 1814, is based on the principle that every man, capable of bearing arms, shall receive military instruction and enter the army for a certain number of years. There

are, practically, some exceptions from military service, though no substitution whatever is allowed. Every Prussian subject is enrolled as a soldier as soon as he has completed his twentieth year. He has to be in service during seven years, of which three years—from 20 to 23—must be spent in the regular army, and the remaining four years—from 23 to 27—in the army of reserve. At the end of this term the soldier enters the "Landwehr," or militia, for nine years, with liability to be called upon for annual practice, and to be incorporated in the regular army in time of war. Leaving the "Landwehr," the soldier is finally enrolled, till the age of fifty, in the "Landsturm," which body is only called upon for service, within the frontiers of the country, in case of invasion. There are various exemptions from this law of military service, in favour of the nobility, clergy, and some other classes of the population. A certain amount of education and fortune constitutes also a partial exemption, inasmuch as young men of twenty who pay for their own equipment and can pass a light examination, have to serve only one year in the regular army, instead of three. But in this case, the liability to service in the army of reserve—the "Landwehr" and the "Landsturm"—remains the same. Altogether, setting aside a few exceptions, the whole male population of Prussia may be said to be trained for arms—ready for offensive warfare, either in the army or the "Landwehr," from the age of 20 to 36; and for defensive warfare, within the country, till the age of 50.

The mass of soldiers thus raised is divided into companies, battalions, regiments, and corps d'armée. The strength of a Prussian battalion in peace is 518 men, raised in war to 1,002 by calling in part of the reserves: it is divided into four companies, each of which in war consists of 250 men. During peace each regiment of infantry consists of three battalions; each brigade of two regiments; each infantry division of two brigades, to which, under the command of the divisional general, four squadrons of cavalry, four batteries of artillery, each of six guns, and either a battalion of riflemen, or a battalion of pioneers are attached. The corps d'armée is considered a unit which is independent in itself, and includes not only troops of all three arms, but a portion of all the stores and appliances which are required by a whole army. Each corps d'armée consists of two divisions of infantry, a cavalry division of four regiments, with two horse artillery batteries attached, besides the two cavalry regiments attached to the infantry divisions, and a reserve of artilllery of four field batteries and two mounted batteries. The corps d'armée are locally distributed through the monarchy, with the exception of the first corps, that of the guards. Previous to the war of 1866, Prussia had, besides the guards, eight corps d'armée, distributed through and called after the eight provinces of the kingdom, as follows:—1, Prussia; 2, Pomerania; 3, Brandenburg; 4, Saxony; 5, Posen; 6, Silesia; 7, Westphalia; 8, Rhenish Provinces. By the annexation of new territories two more corps d'armée were formed, namely, 9, Hanover, and 10, Hesse.

The strength of an ordinary battalion on active service consists of one field officer, four captains, four first lieutenants, nine second lieutenants, one surgeon, one assistant-surgeon, one paymaster, one quartermaster, 1,002 non-commissioned officers and privates.

When a war is imminent, the Government decrees the mobilisation of the whole army, or of such a portion as may be deemed necessary. In preparing for the campaign in 1866, the whole field army and the first levy of Landwehr were mobilised in about two weeks. Every commanding general mobilises his own corps d'armée, and the commandants of those fortresses which are ordered to be placed in a state of defence take their own measures for strengthening the fortifications, and for obtaining from the artillery depôts the guns necessary for the armament of their parapets. All orders are sent by telegraph wherever there exists telegraphic communication. The process of the mobilisation may be classed under the following five heads:—1, The filling in of the field troops to their war strength; 2, the formation of depôt troops; 3, the formation of garrison troops and the arming of the fortresses; 4, the mobilisation of the field administration; 5, the formation of the head-quarter staffs, who are to remain in the different districts to supply the places of those who march to the seat of war. The completion of the rank and file of the field troops to war strength is effected by drawing in some of the reserve soldiers, who supply half the total war strength of the infantry, one-third of that of the artillery, and one-twenty-fifth of that of the cavalry:—

The organisation of the army was as follows in 1866:—

Field troops.

	No. of men on peace-footing.		No. of men on war-footing.
Guard-infantry, 9 regiments ..	16,991	..	27,054
Line-cavalry, 72 regiments....	116,208	..	216,432
Chasseurs and rifles, 10 battalions	5,340	..	10,020
Total of infantry	138,539		253,506
Guard-cavalry, 8 regiments ..	4,813	..	4,813
Line-cavalry, 40 regiments ..	24,000	..	24,000
Landwehr-cavalry, 12 reg.....	216	..	7,200
Total of cavalry	29,049		36,013
Artillery, 9 brigades	18,194	..	42,502
Guns	432	..	864
Pioneers, 9 battalions	5,400	..	9,018
Train, 9 battalions	2,097	..	29,034
Total of field-troops	193,259	..	370,073

Garrison Troops.

Infantry, 36 regiments	1,972	..	116,232
Cavalry	—	..	800
Artillery	4,995	..	16,200
Pioneers.....	350	..	1,950
Total.....	7,317		135,182
Total strength of the army	208,576		609,669

Reserve Troops.

	Men.
81 reserve battalions	8,162
10 companies Jäger reserves	1,692
60 reserve squadrons	12,000
9 companies pioneer service	2,225
Total reserves	104,414

Though Prussia has a large Roman Catholic population, the Protestant element preponderates in the army. The religious statistics of the year 1862 show that there are 11,298,276 Protestants, of whom 184,767 are in the army; 6,907,000 Roman Catholics, of whom 82,345 are in the army; 1,202 members of the Greek Church, of whom 6 are soldiers; 13,716 Anabaptists, of whom 8 are soldiers; 16,233 Dissenters, of whom 63 are soldiers; and 254,785 Jews, of whom 1,328 are in the army. This great preponderance of Protestants among the military is partly owing to the fact that out of nearly 8,000 officers in the active army, there are only a few hundred Catholics. In the military schools, out of 1,300 pupils, there are only from sixty to seventy Catholics.

There are 29 fortresses in the kingdom, of which five are of the first rank. They are garrisoned by 7,317 men in time of peace, and 135,182 during war, or preparation for war—"Kriegsbereitschaft." According to the statement of the Minister of War, laid before the second Chamber in the session of 1867, it is intended to strengthen and enlarge the whole of these fortifications.

[I am informed by Prussian officers that the principles here set forth are correct, but that modifications have been made in the details.—H. C.]

The Austrian Army.

According to official returns, Austria possessed, on the peace-footing, at the commencement of 1867, an army of 269,103 men, rank and file, with 42,201 horses. Official papers, furnished by the War Office, describe the troops of the empire as constituted in the following manner:—

	Peace-footing.	War-footing.
80 regiments of infantry of the line, each of 3 battalions, with 6 companies	124,590	330,430
1 regiment Kaiserjäger, of 8 battalions, with 4 companies	3,974	7,939
32 battalions of Feldjäger, of 6 companies each	23,200	41,761
14 regiments of frontier infantry	8,640	59,016
10 companies of "sanitary troops"	1,914	2,858
Total of infantry	162,318	442,003
12 regiments of cuirassiers, of 6 squadrons ... each	11,376	14,172
2 regiments of dragoons, of 6 squadrons ... each	3,120	5,680
24 regiments of hussars and uklars, of 6 squadrons ... each	23,400	27,210
3 regiments of volunteer hussars and uklars, 8 squadrons ... each	2,448	5,697
Total of cavalry	40,344	57,759
12 regiments of field artillery, of 10 batteries, with 4 companies; 1 regiment of coast artillery, of 3 batteries, with 4 companies; 1 regiment of raketeurs, of 12 batteries, with 3 companies	32,875	54,881
2 regiments of engineers, of 4 battalions	5,998	8,968
6 battalions of pioneers	3,797	6,416

The rest of the army of 269,103 men, on the peace footing, according to the Government tables, consists of the transport service, the *gendarmerie*, and various irregular troops in Transylvania and the border provinces.

By the terms of the "Compromise" come to between Austria and Hungary, the military forces of the whole empire are divided into the line, the Landwehr, or militia, and the Landsturm. The regiments of the line are under the control of the Minister of War of the Empire, and the Landwehr under the control of the Austrian and Hungarian Ministers of War. All the troops recruited in Hungary will be successively sent to Hungary, and all the troops stationed in the kingdom will be placed under the command of the Hungarian general-in-chief, who is to reside at Buda. The orders relating to great concentrating movements of troops will emanate from the King-Emperor.

The Austro-Hungarian army is formed by conscription, to which every man is liable who has reached his 20th year. In times of peace, the Government undertakes to furnish substitutes, at the average price of 1,200 fiorins, or £123 each. The term of service is eight years, after which the soldier is liable to serve two years longer in the army of reserve. During peace, a large proportion of the troops are sent home regularly on furlough. It is part of the military policy of the Government to encourage, by all possible means, the re-enlistment of old soldiers, for which purpose the fund contributed by those who seek substitutes is distributed in the shape of bounties. The pay of the troops, privates as well as officers, is smaller in the Austrian army than that of any other country in Europe, except Russia. A large proportion of the officers are noblemen. In 1861, there were 103 princes, 590 counts, 898 barons, 570 knights, and 2,826 untitled nobles in the army; the largest number proportionately in the cavalry, and the smallest in the artillery and the engineers. The upper ranks consisted, in 1866, of 3 field-marshals, 14 Feldzeug-meister and generals of cavalry, 77 field-marshal-lieutenants, and 125 general-majors, in active service, besides 337 field-marshal-lieutenants and generals on half-pay.

Austria has 24 fortresses of the first and second rank, namely, Comorn, Carlsburg, Temesvar, Peterwardein, Eszek, Brod, Carlstadt, Canove, Arrat, Munkacz, Cracow, Gradisca, Olmütz, Leopoldstadt, Prague, Brixen, Theresienstadt, Kufstein, Linz, Salsburg, Buda, Ragusa, Zara, and Pola. The last-named is the chief naval fortress of the empire.

The Swiss Army.

The thirteenth article of the Constitution of September 13th, 1848, forbids the maintenance of a standing army within the limits of the Confederation. To provide for the defence of the country, every citizen has to bear arms, in the management of which the children are instructed at school, from the age of eight, and they pass through regular exercises and public reviews. Such military instruction is voluntary on the part of the children, but is participated by the greater number of pupils at the upper and middle-class schools. They not only go through the infantry exercises, but practice gunnery, the necessary rifles and cannon—the latter 2 and 4 pounders—being furnished by the Federal Government.

The troops of the republic are divided into four classes, namely:—

1. The "Bundesauszug," or Federal army, consisting of all men able to bear arms, from the age of 20 to 34. All cantons are obliged, by the terms of the Constitution, to furnish at least 3 per cent. of their population to the "Bundesauszug."
2. The army of reserve, consisting of all men who have served in the first-class, from the age of 35 to 40. The numbers are calculated to amount to 1½ per cent. of the population.
3. The "Landwehr," or militia, comprising all men from the 41st to the 45th year.
4. The "Landsturm," or army of defence, including all men above 45, till the term when they are disabled by age from military service.

The numbers of the various classes, in actual readiness to take the field, are given as follows in an official return of July, 1862:—

1. Bundesauszug	82,747 men
2. Army of reserve	42,292 ,,
3. Landwehr	64,887 ,,
4. Landsturm	150,000 ,,
Total	339,926 men

The two first classes are organised in 80 battalions of infantry, numbering 80,000 men, and 120 companies of "sharpshooters," comprising 8,712 picked riflemen. The cavalry comprises 2,911 men, divided into 35 companies, and the artillery, 12,400 men, with four "mountain batteries," of 10 guns each, and eight "rocket batteries," besides twelve companies of sappers and miners.

The whole of the military expenses for the year 1863 were as follows:—

	Francs.	Cents.
Salaries of employés in the magazines and offices	52,707	90
Central military school	179,313	90
Annual manœuvres	211,646	71
Staff of instructors of all arms	128,580	30
Instruction of recruits	1,295,890	49
Trigonometrical studies	38,000	0
Acquisition of guns, muskets, and munitions of war	1,595,370	99
Fortifications of Aarberg, Luziensteig, St. Maurice, Bellinzona, Eglisau, and Basle	153,001	3
Military armament and various other items	115,678	6
Total	3,770,189	38
	or £134,807	

During the short civil war—the "Sonderbundkrieg"—of 1847, an army of 138,441 men, with 246 guns, was placed in the field, after less than three weeks' preparation. The troops were—

	Men.	Guns.
From the 14 federal cantons.....	98,861	172
„ 8 seceded	39,580	74
Total.....	138,441	246

The enlistment of citizens of the republic into foreign military service is forbidden by the terms of the Constitution of 1848, under the penalty of loss of all civil rights.

DISCUSSION.

Mr. Hyde Clarke said that as an old military student he felt great interest in the subject which had been brought before them, especially as he had formerly taken part in the discussion of questions of military administration. He thought the subject was one which might be advantageously discussed by civilians as well as by military men, and he regretted that any attempt should have been made to put a limit on the subjects for discussion, particularly as several statements had been made to the prejudice of the existing system which a little discussion might tend to modify. For instance, the proportion of officers to men being larger in the English army than abroad, was explained by the fact that there were a greater number of companies in a battalion. There was a great advantage in introducing this subject for public discussion, because the public would have an opportunity of learning what were the real difficulties of the question, and he hoped they would not be altogether led away by Mr. Cole's eloquence. There were many proposals which, when stated in a general way, looked very attractive, but which, when they came to be discussed, would be found to be utterly impracticable. He said this with the strongest possible adhesion to those principles of military reform which had been brought forward on the authority of many military men. He also thought it would be a great advantage to military men to have these matters discussed in public, in order to assist them in their endeavours to effect improvements in the service. In support of the principles brought forward by Mr. Cole, he might say that the army depended to a great extent upon the civil element. It would be found always that the real military qualities were not those which were vulgarly regarded as such, but were the same which led men to advance in civil life. It would be seen in the correspondence of the Duke of Wellington that the qualities even of the banker and financier were prominently required, and that the great military qualities were purely mental. Having said this much, he must make a considerable reservation with regard to two principles on which Mr. Cole had founded great part of his reforms. He had said, as many military men had said before, that future wars would be short and sharp, but it would be found in the history of the past that this expectation had always been held out as the result of improvements which were being made. Notwithstanding the Austrian and Prussian war, he did not believe that the period of long wars was over, and therefore it was, he believed, necessary that preparation for long wars should be made. Again, with regard to the peculiar circumstances of the present day, and the certainty of having notice of war beforehand, he did not think that this could be depended upon. They never knew what might be done by a single military ruler, or by a military cabal. Under all these circumstances he did not think they ought to lose sight of the dangers to which they might at any moment be exposed.

Sir Charles Trevelyan, K.C.B., said the great difficulty of this subject consisted in its extent. Several portions of it, taken separately, would require a long discussion before the real merits were arrived at; as, for instance, military education, the rules of promotion, the conditions of retirement, and the purchase system. He considered, therefore, that Mr. Cole had acted wisely in passing by all these hackneyed details, and going straight to the mainspring of the whole subject—aiming rather at cutting the knot than at untying it. The operation which he proposed might be compared to the pulling down of an old country manor house, and the utilisation of all the sound materials in the erection of a nobler and more commodious edifice; or to the growth of underwood under the shade of older trees, which themselves gradually yielded to time and to the woodman's axe. They had, in fact, to choose between two alternatives, the existing system of a standing army, and a new system of a popular army founded on instruction and morality. As briefly as possible he desired to refer to the main points of difference between the two, taking first the existing system. First, with regard to its sufficiency. Continental nations had adopted the system of popular armies, the French having lately reduced the term of service from seven to five years, which, in time of peace, practically amounted to less than four, and one result was a vast number of available men in case of need. The Emperor of the French could count at least 1,200,000 men excellently armed, and was able to put at any time 800,000 men into the field, and it was a balance to this immense force which we ought to provide. After an expenditure, however, of fifteen millions and a-half, the number of men whom we could put into the field was only stated at 40,000, which he believed was an outside estimate. We also boasted of our veteran soldiers, and a great expenditure had recently been incurred for the purpose of inducing men who had served for twelve years to continue nine years longer; but there was a considerable diversity of opinion as to which were best, old soldiers or new. The military art was studied quite as much on the Continent as in England, and of late years they had been going in the direction of having young soldiers. Prussia set the example of having her soldiers serve for three years. France had lately reduced the term from seven to five years, and Austria had followed the example of Prussia. He did not give his own opinion on this matter, but that of higher authorities. The Duke of Wellington's Peninsular army was composed of men who had seen some five years' service, and a man who had served two campaigns was considered an old soldier. The Duke of Cambridge stated before the Recruiting Commission that the best soldier was a man after three years' service. Colonel Fitz-Wygram said he should like to see every man leave after twelve years, and that they could get no good work out of their men after fourteen years, as the men got nervous about riding after that time. Again, with regard to economy, the effect of a standing army was to withdraw from the ranks of productive industry a large number of men in the very prime of their capacity, and add them to the ranks of unproductive expenditure. An army was not what it used to be. The general rise of wages, the higher standard of living and of comfort, and the spread of philanthropy, had all tended to make the army more expensive. Formerly anything was considered good enough for soldiers and sailors, but now they had to be treated like human beings and Christians. Then, again, scientific men were answerable for a large amount of expenditure in connection with the army; for science advanced so rapidly that immense sums had to be constantly spent in experiments. As an illustration of the great change which had taken place of late in this respect, he might mention that the late Lord Hardinge, the Commander-in-Chief, many years ago introduced him to Mr. Whitworth, who, he said, had made some important improvements in guns, and he was anxious to get the sanction of the Treasury to an expenditure of £3,000 or, at the utmost, £4,000, for experiments thereupon. Why, in the present day, such a sum would hardly suffice for a fortnight's experiments at Shoeburyness. He came to the conclusion, therefore, upon the whole, that it would be

totally impossible to support a standing army adequate to the requirements of England, for when France had 800,000 men at command, notwithstanding her undoubted peaceful intentions, we could not be considered prepared for all the eventualities without a much larger army than we had at present. Prussia spent about seven millions, and was able to put 300,000 men into the field against Austria. France spent from ten to twelve millions, and could command 800,000, while England, with an expenditure of 15½ millions, could only muster about 40,000. At this rate, if a large army were required, the expenditure would amount up to thirty or forty millions at once. He considered, therefore, that the argument on that head against a standing army was conclusive. As to the question of morality, it was of great importance when they took away a large number of the youth of the country that some consideration should be given to the question whether these young men were being trained for good or for evil. Lord Herbert's opinion as to the method of recruiting had already been quoted by Mr. Cole; Lord Dalhousie, Lord Eversley and Lord William Paulet said that under the present system, young men were inveigled into the army rather than induced to enter by fair representations of the advantages of the service, and H.R.H. the Duke of Cambridge freely admitted the evils of the existing system, although he did not see any way to avoid them. A common argument in support of the present system was that it exercised a good influence in training an inferior and rough class of the youth of the community, and to a certain extent this was true, but he was for extending the benefit to all classes. No doubt there was a large class of what were called in English confirmed reprobates, or, in French, *mauvais sujets*, and many of these found their way to the army, where they passed their time between the military prisons, the regimental cells, and the drill-yards, and where they were not worth their salt. They were only retained because the army would be in great part dissolved if they were dismissed; but they were retained, to the corruption, disgrace, and discredit of the army. Upon this point he might quote the testimony of Colonel Henderson, R.E., formerly Inspector-General of Military Prisons, as given in his report for 1865. It appeared that the number of prisoners had increased from 5,470 to 6,340, the main increase being amongst soldiers who had served from seven to fourteen years; amongst this class the number of commitments had gone on from 355 in 1859 to 2,166 in 1865. This was a remarkable fact, and showed, in his opinion, that while the community at large had been improving, the dregs of society had gone into the army, and made it worse than it was before. The death rate was a test of morality as well as of other things, and it appeared that although amongst men under 25 the mortality was less than among the civil population—this arising from the fact that the young men all underwent a rigorous medical examination before they were admitted—at more advanced ages the mortality was much heavier than amongst civilians. In concluding this part of the subject the evils of celibacy were remarked upon, and the figures quoted from the return of the Registrar-General for Scotland, showing that after a certain age married men had a prospect of 19½ years longer life than bachelors. The army was a society of enforced bachelors, the evil being thus intensified, and it must ever remain so to a very great extent, because military service was practically incompatible with married life, and the wife and children of a soldier were exposed to numerous and most grave evils. Turning to the question of a popular army, he considered that all these conditions were reversed; it was founded on morality and instruction. It might be said to have been invented in the following way:—Frederick the Great's standing army was for years the model for all Europe, but it was completely broken up by Napoleon at the battle of Jena, when the condition was imposed upon Prussia of limiting her standing army to 40,000 men. This limit was agreed to, but instead of allowing the men to grow old in the service they were passed in constant succession through the army, so that when the reaction against Napoleon took place in 1813, Prussia was able to contribute something like 100,000, instead of 40,000, and the good results of the system had been abundantly shown in the last Prussian and Austrian war.

Major-General Sir William Denison said he should, if possible, attend the adjourned discussion on Friday morning, but in the name of the army he desired now to protest against many statements which had been made, tending to throw the odium which rightly attached to a few upon the whole mass. He denied *in toto* that the men in the army were of that demoralised character which Sir Charles Trevelyan had stated. There were black sheep amongst them undoubtedly, but so there were in all classes. They never could get angels of light to serve in the army, nor were they very plentiful in our factories or our workshops. They could not expect the morality of the army to be above the average in the lower working classes, and that standard was certainly not high. He left England in 1846 and returned in 1866, after 20 years' absence in India and the Colonies, and having been since, as chairman of the Rivers Commission, in the manufacturing districts, particularly in Lancashire, he was sorry to find that there had been during the interval a marked change for the worse in the relations between the employer and employed. He at first doubted his own impressions, but they were confirmed both by masters and workmen, and the fact was admitted by Mr. Gladstone and also by Mr. Henley. Of course, when he began to inquire into the cause of this, every man gave a different answer, according to his particular views. To return, however, to the subject under discussion, he complained that it had been treated in the loosest manner possible, and that, while Mr. Cole had deprecated discussion upon what he chose to term the details of army management, the whole of the discussion must necessarily turn on those details. Everyone admitted that there were evils in the present organisation of the different parts of the army, but the only suggestion in the shape of a general principle of reform was that one in every thirteen persons should be trained to arms; this would include every male between 16 and 26, and, although it might be true that people in the manufacturing districts had assented to the general proposition as put by Mr. Cole, he thought they would have very serious objections to it when the real effect of it was brought to their attention. He spoke as a military man, having some knowledge of organisation, and being one of the corps of engineers so highly complimented by the reader of the paper; and he doubted the capability of civilians, who knew nothing of the details, which really formed the whole science of the army system, to discuss the matter at all. He remembered when he was Governor-General of New South Wales that a question arose as to the defence of the harbour of Sydney, and a person introduced himself to him for the purpose of laying before him certain plans of his own on the subject. When asked, he said he was a tailor, and after listening to his plans, he (Sir Wm. Denison) asked him if he would not consider him a great ass if he were to go and attempt to teach him to make a coat. He did not like the idea of calling the Governor-General an ass, but at length, putting titles aside, he agreed that such would be his opinion, but he could not be got to admit what was pressed upon him, that he was equally an ass to attempt to teach a soldier his own business. When he was in India, he had to protest against the system by which the native army had been ruined. Lord Canning's proposition was that a portion of the army should be made irregular, the principle being to pick out an active, intelligent young officer, with a good knowledge of the language and habits of the natives, and tell him to raise a thousand men, giving him full power to act as

he thought fit, only prescribing that the number should be brought up to muster by a specified time. It was then supposed by the wiseacres at home that if it was much cheaper to have half the army irregular, the saving would be doubled by putting the whole in the same position, and the consequence was the whole army was made irregular, the principle of selection was destroyed, and there were six European officers to a regiment instead of 26; and whereas, at the time of the last mutiny, there was not a single native who had been trained to command, there now were plenty. He put this forward by way of illustration, to show the folly of people pronouncing upon matters of which they admitted that they knew nothing. These matters of detail which Mr. Cole professed to pass over, in reality involved the whole system. As to the drilling of boys at school, he recollected, fifty years ago, when he was at school, an old pensioner coming every Saturday to drill them, but, so far as he remembered, instead of awakening any great military ardour, they considered it rather a bore. The whole thing was a fallacy. He did not maintain that the army was as efficient as it ought to be or might be, but he deprecated such an entire change as was involved in this proposal. If a coat pinched a man under the arms, one way certainly was to go and order a new one, but the general practice was to go to a tailor and ask him to ease it in the particular spot where it was too tight. The best way was to remedy each specific evil as it was discovered, and by that means they would in time arrive at a more perfect organization. After having knocked about the world for some twenty years he had come to one conclusion more positively almost than any other, which was that nothing was so indelible as race. In Canada the Frenchman and Englishman were set down side by side, but they preserved their national peculiarities. It was the same thing at home with Irish, Scotch, Welsh, Jews, and Gipsies, and it was the same in India. Yet, notwithstanding this fact, it was a very common error that what suited one country must suit another; this was particularly an English fallacy, but it was a very mischievous one. We fancied that what was good for us must be good for other people, and we tried to cram down their throats, whether they liked it or not, our own system of religion, politics, and everything else. A short time ago, for instance, it was stated that they were going to try responsible government in India. In his opinion there could hardly be more flagrant folly. England was a peculiar nation, which had undergone a peculiar training, and after working at it for some 800 years, had brought her system of government to its present state; but the same system would not suit Frenchmen, and if it were forced upon them they would repudiate it. It had been tried with Spaniards in South America, and had set them to cutting one another's throats for the last 30 years, and the same process seemed likely to continue. The same experiment was going on in Italy at present, and he did not think it would be successful. The conclusion, therefore, which he came to was that a system which suited Austrians, Prussians, and the French, was, *a priori*, most likely *not* to suit the English, whose habits of thought and action were so totally different. He believed, therefore, that it would be better to let military organization alone, or only subject it to such judicious reforms as might fairly be discussed amongst men acquainted with the subject, and not by men who knew nothing whatever about it. If permitted to re-open the discussion on Friday morning, he would make some further observations.

The discussion was then adjourned to Friday morning (this day), at 11 a.m.

COMMERCIAL SCHOOL OF THE CHAMBER OF COMMERCE OF PARIS.

This useful school, which was noticed in the *Journal* in the month of November, 1867, seems to progress in a highly satisfactory manner, and we have now before us the report of the session ending in the autumn of last year. The establishment is but five years old, and the entire course of study occupies four years, so that the first round of study was finished last year.

The charge for each pupil in this school is sixteen shillings per month, and the cost to the Chamber of Commerce is about £1,200 per annum, which the President has declared publicly the Chamber is quite prepared to meet, for the school has met with the complete sympathy of the body of merchants and manufacturers, who eagerly give employment to the youths leaving the schools with full diplomas or certificates of capacity. At the end of the last session eight outgoing pupils, who had remained the full time in the school, received diplomas, and nine were awarded certificates at the end of the three years' study. The long list of prizes shows that in future years the number of young men thus prepared for commercial pursuits will be greatly increased; the progress of the school is, in fact, clearly indicated by the increased number of prizes awarded annually.

In addition to the ordinary class prizes, there are prizes of honour in each class; these are given by the Minister of Public Instruction, the Chamber of Commerce of Paris, the Cercle de la Librairie of Paris, and by a society formed of the earliest pupils of the school. The programme of the studies of this school may be useful, either as a guide or by way of comparison for those interested in commercial education. The course for the preparatory class, which is not a necessary portion of the curriculum, and only for boys under twelve years of age, consists of moral and religious instruction, writing, orthography, arithmetic, the English and German languages, the elements of history and geography, and drawing—that of the first scholastic year of the same, together with French grammar, book-keeping, the Spanish language, and commercial geography. During the second year are added commercial arithmetic and the elements of technology; and in the third, international commercial law, literature, and political economy. During the fourth year are added to the preceding courses on moral philosophy and rhetoric. In October last evening classes were opened at the school for elementary studies, the three languages already named, book-keeping, and commercial law. These classes are quite distinct from the school.

RECENT EXPERIMENTS WITH SCHULTZE'S NEW GRANULATED WOOD GUNPOWDER.

Communicated by Major-General Sir Vincent Eyre, C.B., K.C.S.I., Member of the Council.

1. These experiments took place on Wednesday, the 27th January, about a mile from Wandsworth, on the banks of the river Wandle, for the satisfaction of the local authorities, and under the direction of Professor Miller, of King's College, in consequence of an application made by Mr. James D. Dougal, gunmaker, of St. James's-street, for a license, enabling him to establish a manufactory for the above-named powder in that locality. As they were of a novel and interesting nature, the following brief account of them may prove acceptable to the readers of the *Journal of the Society of Arts*.

2. The main object of the authorities was, of course, to obtain satisfactory proof that the safety of the neighbourhood would not be imperilled by the establishment of the works in question; the spot selected being bounded on one side by a carriage-road, and on the other by a railway, though tolerably clear from habitations, and with abundance of water close at hand in the river Wandle.

3. At 2½, p.m., Captain Schultze himself appeared, accompanied by Mr. Dougal and other scientific gentlemen interested in the invention; and among the spectators were Generals Sir George Pollock and Sir George Lawrence; Mr. Hudson; Colonels Smith and Gompertz,

Royal Engineers; and several ladies. The experiments were then commenced, under Professor Miller's orders, as follows:—

4. Firstly, an open deal box, of about 14 inches in cubic dimensions, was placed on the ground, and received the contents of 25 canisters of 2lbs. each of the powder in a loose condition. The latter, being fired by a slow match, exploded upwards in a white cloud without noise, and without any damage to the box, which, indeed, was scarcely moved out of its position. It was explained that 50lbs. of Schultze's powder is equal in force and in bulk to 100lbs. of ordinary gunpowder.

5. Secondly, five of the aforesaid 2lb-canisters, filled and fastened, were placed upright in the same box, and on the central one being ignited only two out of the five exploded; the box still escaping almost uninjured. The noise was also trifling.

6. Thirdly, the first experiment was repeated, only with ordinary powder, for the sake of comparison, and a loud explosion followed, whereby the box was violently rent asunder, and its pieces sent flying several yards distant.

7. Fourthly.—One of the empty tin canisters, having both ends open, being stuck upright on the ground, was partially filled with one pound of Schultze's powder, and was neither upset nor injured by the explosion of the latter; while, on the contrary, two ounces of common powder, similarly placed, sent the canister flying to a distance of three feet.

8. Thus far nothing could be more satisfactory than the results in favour of the comparative harmlessness of Schultze's powder, notwithstanding that its propelling force is double that of the ordinary powder. This was pretty clearly evidenced by some subsequent experiments with one of Dougal's breech-loading fowling pieces.

9. In March, 1868, Mr. Dougal delivered a lecture at the Royal United Service Institution, wherein he clearly explained the peculiar characteristics of this new explosive, and its adaptability to military purposes. The following summary may interest those to whom the subject is new. The component parts are saltpetre and uncharred alder wood, without sulphur. The wood being reduced to a granular state, consisting of minute cubes and oblongs, by means of fine saws and other implements, is subjected to certain chemical processes for the removal of acids and other soluble substances. It is then impregnated with concentrated nitric acid in combination with sulphuric acid, the latter being used solely for the purpose of driving the nitric acid into the wood, which being effected, the sulphuric acid is entirely withdrawn to be again utilised. The wood having been thus impregnated, undergoes some cleansing processes, and is either dried for immediate conversion into finished powder, or stored in a damp state for safety until required. The final and most important process consists in its incorporation with the saltpetre; and, unfortunately, Mr. Dougal's paper furnishes no particulars as to the method employed. But it is understood that there is no grinding, therefore that source of danger is absent. Indeed the original forms of the wood in grain seem to be preserved in the complete powder, which is finally dried for a space of twelve to eighteen hours, and is then ready for use.

10. Mr. Dougal claims the following advantages for this new invention:—

1st. Safety and rapidity of manufacture, and consequent reduction of cost.

2nd. Safety in transport and storage.

3rd. Less injury by absorption of damp, inasmuch as the imbibed humidity, up to three per cent., is not injurious to its propelling powers; and even if ten per cent. be added no mischief accrues if the powder be redried.

4th. Diminution of recoil.

5th. Ample driving force.

6th. The power of regulating its rending force so as to adapt it to various requirements.

7th. Absence of fouling.

11. This powder seems undoubtedly destined sooner or later to supplant all rivals in public favour for use in small arms, provided that, on adequate trial, it be found possessed of the numerous advantages involved in such virtues as "absence of fouling;" "absence or diminution of smoke;" "diminution of recoil;" "reduction of heat in prolonged shooting;" "greater initial velocity and regularity of shooting;" in addition to the other tests already undergone with so much success.

It is a sufficiently significant fact that a military committee of officers, appointed by the French Minister of War to investigate its properties at Vincennes, have unanimously recommended its adoption in the French army for use with the Chassepot rifles.

12. In some respects it seems peculiarly worthy of a fair trial in India, where powder is subject to constant deterioration from exposure to damp in the rainy season. The assertion, too, that the Schultze powder is capable of being stored and shipped in a moist, and therefore unexplosive state, is too important to be overlooked. The total absence of sulphur is another item in its favour, as regards India, where that ingredient can only be obtained in a pure state from Sicily, at a heavy cost. The very impure specimens supplied from the Persian Gulf, Burmah, Sumatra, and elsewhere, require to be fuzed before use.

The subject is one well worthy of deliberate investigation in regard to economy, safety, and efficiency.

REPORT ON THE MALT LIQUORS SOLD IN THE UNITED KINGDOM, WITH ANALYSES AND COMMENTS.

(From the *British Medical Journal.*)

Although the recent introduction of the cheaper kinds of wine into this country has led to their being used much more largely than was the case before the alteration of import duty, it appears to have had little influence on the habits of the chief beer-consuming class, and our national beverage is still, for a large portion of the community, as important an article of diet as ever; while its manufacture, employing a large amount of capital and labour, and constituting a gigantic industry, is a great source of trade, of individual profit, and of revenue to the State.

The following statistics* will furnish an idea of the extent of the business of beer brewing in this country:—

	Malt.		Sugar.		Total quantity of malt equivalent to the malt and sugar used in brewing.
	Charged with duty.	Used in brewing.	Used in brewing.	Equivalent in malt, 200 lbs. sugar to 8 bus. malt.	
	bushels.	bushels.	lbs.	bushels.	bushels.
1865...	48,538,412	45,093,778	3,698,180	140,883	45,234,661
1866...	50,163,487	50,777,200	7,628,206	290,598	51,067,798
1867...	50,915,828	49,392,856	26,532,403	1,010,758	50,403,614

At the rate of $2\frac{1}{2}$ bushels per barrel, these quantities would represent about 20 million barrels of beer brewed annually in the kingdom.

The general excellence of British beer, in its various modifications, has long been recognised; and, although beer is largely consumed in other countries, it has been customary to consider both the method and system of manufacture adopted in this country, as well as the product itself, as being in most respects far superior to any other. But, as in other branches of industry, the pre-eminence we have held in regard to foreign countries has, during late years, been lessened or done away with by their more rapid progress in manufacturing arts, so in the production of malt liquor, we are now threatened with a foreign competition which would probably have been regarded as ridiculous a few years ago.

* For these data we are indebted to the knowledge of Mr. G. Phillips, Chemist to the Inland Revenue Department.

Of other countries than this, where beer is consumed and produced, Germany has long been famous, both for the capacity of its beer-drinkers, and for certain peculiarities of the beer made there; especially that kind known as Bavarian beer, which is brewed in a manner somewhat different from that generally practised in this country. During the last thirty years, great attention has been paid in Germany to the brewing of malt liquors by some of the most eminent chemists and scientific men, among whom the name of Liebig stands prominent. The various governments have also given great assistance in promoting and improving the manufacture; so that while very great progress has been made in the *rationale* and practice of the art of brewing, the manufacture has considerably increased, and beer is now largely brewed, upon the Bavarian system, in many other parts of Germany, even in the wine districts, especially in the neighbourhood of the Rhine, and in Austria,* where its production has extended, since 1848, through all the provinces along the Danube, even to the Black Sea. So great, indeed, is the repute of the German brewers, that it is now customary with some of our largest brewers to employ in their establishments German chemists; from which fact it may be inferred that persons with the requisite technical skill and scientific acquirements cannot be obtained in this country. At the Paris Exhibition, 1867, the Viennese and Bavarian beer attracted great attention; and as it is from this direction that the competition, already referred to, in the production of beer is now commencing to be exercised, it is conceived that it would be of interest to examine what are the qualities of this beer as compared with the various kinds of malt liquor made here.

In making the comparison, the question of actual or possible adulteration will be, for the present at least, left out of consideration, and it will be, meanwhile, assumed that the various kinds of beer are simply the fermented product of malt and hops. Thus considered, beer should chiefly consist of water, alcohol, and extract—consisting of sugar, dextrin, and nitrogenous substance—together with carbonic acid, small amounts of acetic and lactic acids, and the saline substances partly originating from the water used in brewing, and partly extracted from the malt and hops.

From this point of view the quality of beer, independently of its characteristics of flavour and aspect, will vary according to the proportions of malt and water used in the brewing. This is indicated by the relative amounts of alcohol, acetic acid, and extract contained in the beer, since the amounts of these constituents together bear a definite relation to the specific gravity of the unfermented wort, which is greater or less, according to the proportion of malt to water.

The degrees of attenuation, or loss of gravity of beer-worts, corresponding to various amounts of alcohol produced by fermentation, have been very carefully determined; so that by estimating the amount of alcohol in beer, and adding the corresponding degrees of gravity lost by the wort to the specific gravity of the beer after being deprived of its alcohol, the specific gravity of the unfermented wort—or the original gravity of the beer, as it is termed—is ascertainable. The amount of malt used in producing the wort is then indicated by the rule, that it is at the rate of one bushel per barrel of beer for every 27 degrees by which the specific gravity of the wort—or original gravity of the beer—exceeds that of water.

Vienna Beer.

The chief peculiarity of this beer, like that of Bavaria and other parts of Germany, is due to the fermentation of the wort being conducted very slowly at a low temperature, and so that the yeast produced meanwhile falls to the bottom of the liquor instead of rising as froth to the surface. The beer brewed by this sedimentary fermentation keeps better than that made by the frothing fermentation at a higher temperature, and it bears contact with atmospheric air without turning sour, which is not the case with much of the beer brewed in this country for ordinary consumption. The difference between these two kinds of fermentation is explained by Liebig as consisting in the greater facility which sedimentary fermentation affords for the oxidation and perfect separation of the soluble gluten of the wort by atmospheric air. In the frothing fermentation this is, to a great extent, prevented by the thick layer of yeast formed on the surface of the liquor, and then the gluten, in its conversion into yeast, appears to abstract oxygen from the sugar, so that the proportion of this substance to gluten is reduced, and after the fermentation is completed, some unaltered gluten remains which, by a subsequent process, determines the conversion of alcohol into acetic acid. In sedimentary fermentation, on the contrary, there is little or no scum formed on the surface of the liquor, and air has free access to it, so that less or none of the gluten is left unconverted into yeast.

The storing or maturing of this kind of beer is another point to which great attention is paid; and, instead of being stored in enormous vats, as in this country, casks are used, which are placed in cellars, where a low and uniform temperature is maintained. The basaltic and other porous volcanic rocks, abounding in the Rhine district, afford great facilities for the construction of such cellars, and the rapid growth of the beer-brewing trade there is mainly owing to this circumstance. In Bavaria and the Austrian dominions ice is largely employed for keeping the store-cellars at a low temperature.

Generally speaking, the beer drunk in Austria and Germany has less alcoholic strength than that consumed here. The strongest kinds, such as those known in Bavaria by the names "Holy Father," "Salvator," and "Buck," rarely contain so much as five per cent. by weight of absolute alcohol. The store-beer, or *lager bier*, generally contains about 3·5 per cent., ranging from 4 to 2·8 per cent.; and the ordinary beer for quick draught, *schenk bier*, corresponding in that respect to our porter, contains from 2·25 to 3·5 per cent. of alcohol. In the Austrian dominions, the beer is generally preferred rather weaker than in Bavaria; but in Austria the organisation of the breweries, and the system of conducting the business, have been developed in such a manner as to assimilate more to the vast establishments we have in this country.

Two kinds of Austrian beer are now being imported into England; one is stated to be brewed by Dreher, at Schwechat, near Vienna; the other, by the Brewery Company, at Liesing, also near Vienna. An examination of these, as obtained at the several places where they are retailed, has given the following results:—

	Dreher's beer bought at the Vienna Restaurant, 395, Strand.	Liesing beer, bought at the Crown Coffee House, 41, Holborn.
Specific gravity	1019·76	1019·11
Alcohol	4·43	4·45
Acetic acid	·12	·12
Extract	7·05	6·82
Original gravity	1062·27	1061·67

Both these samples of beer, when fresh drawn, were tolerably bright, and had a thick persistent foam on the surface. The taste, especially of Dreher's beer, is sweeter and more luscious than that of English beer, different, however, from that of Scotch ale; and there is a peculiar flavour of barley. The hop flavour is distinct in both, and the bitterness more perceptible, a minute or so, after drinking. As will be seen from the above results of analysis, there is no very great differenc, between the two samples in regard to quality, so far as that can be determined on the principle already described

* The total quantity of beer brewed in Austria, during 1866, is stated to have been about four millions of barrels, of which quantity upwards of 200,000 barrels was brewed in three breweries situated near Vienna and Pesth.

the proportion of malt used in brewing, as indicated by the original gravity, being for—

Dreher's beer.....2·30 bushels ber barrel of 36 gallons.
Liesing beer .....2·28 „ „ „

Altogether, however, these samples of beer do not appear to be equal in character to the best beer met with in Vienna or Pesth, although the price of sixpence per pint is about three times as much as is charged there.

Fine Arts.

Exhibition at Chartres.—The regional exhibition of agriculture is appointed to take place in the month of May, and the Archæological Society of the department of the Eure-et-Loir has decided that an artistic and industrial exhibition shall be held at the same time. In 1858 the same society organised an artistic exhibition, which was highly successful, but the plan of the coming exhibition is much more extended, and promises to be very important; it will include archæology, objects of art and curiosity, and modern works of art of all countries. The programme includes the three following classes of objects:—1, ancient objects of all kinds belonging to the department, whether found there or being in the possession of persons residing within it, including sculpture, painting, tapestry, furniture, faïences, armour and arms, books, &c.; 2, antiquities belonging to persons not belonging to the department, but having an interest for the history and archæology of the department; 3, works of fine art, painting, sculpture, drawing, architecture, and engraving, by living artists of all countries. The cost of carriage, packing, and unpacking of all articles belonging to the first and second classes will be defrayed by the society if the proprietors desire it. All precautions will be taken against accident; special workmen will be engaged for packing and unpacking; and, besides the officers and servants employed in the exhibition, the members of the committee will themselves watch day and night over the objects of art and antiquity confided to their care. Applications for space are invited to be sent in as early as possible, and, at the latest, before the first day of March. The exhibition is to open on the first of May, and continue open about a month. Contributions to be sent in during the first half of the month of April. Prices are to be furnished of all works of art intended for sale, and a lottery forms part of the plan. The award of prizes is to be made by a jury elected by the committee and the exhibitors themselves. Applications to be addressed to M. Merlet, secretaire du Comité de l'Exposition, Chartres.

Commerce.

The Port of Savona.—The trade of Savona is daily increasing, and the shipbuilding yards have plenty of work. A bark of 1,100 tons burden, the *Ottone* (the largest ever built at Savona), was launched on the 28th November, for a shipowner of that town. At the end of last month 65 emigrants sailed from that port for Monte Video, and three other emigrant vessels are now loading for South American ports. The railway from Genoa to Savona has been opened some months, and a good diligence service is now established between that town and Nice. The works of the railway to Nice are also being pushed forward in a satisfactory manner, and several of the most important tunnels are now completed. There is now every hope of the railway to Turin being continued, as a convention between the Minister of Public Works and the contractor has been signed. The entire line is to be finished in 1872, and the branch to Acqui in 1871.

Consumption of Timber.—The constantly increasing price of wood in France and other countries is often a matter of surprise, especially as the consumption of wood for building purposes, as well as in the form of fuel, decreases in proportion every year. Some notes respecting the special applications of wood help to explain the fact. In the first place the forests of the Old World are nearly exhausted, and in the second, a number of new applications have grown up, while others have been greatly augmented; for instance, the rapid increase in the use of coal and metals causes an increased consumption of timber in the mines; the manufacture of railway carriages requires more timber than all the navies in the world formerly consumed, while the railways take also a large quantity for sleepers; the greatly-increased cultivation of hops in France uses up an immense number of small trees, for poles, which bring the proprietor a high price; in the south of France the export of wine has become so large that the coopers cannot find oak enough in their own country, and are obtaining it from Trieste, Illyria, America, and other parts; it is computed that at least 80,000 steres of wood are used in France alone in the making of lucifer matches; toys also make a great hole in the supply of wood; it is said that two hundred thousand dozens of children's drums are made monthly in Paris alone, requiring thirty millions of bodies and sixty millions of drumsticks per annum. Nearly the whole of the wood used for these drums comes from Villiers-Cotterets, and it represents the produce of nearly fifty thousand acres of timber land. Whole villages in the Haute-Saône are employed in the manufacture of curry-comb handles, which require nearly all the beech grown in the neighbourhood. And amongst other causes of the dearness of wood, we have its application to paper-making, which, from the dearness of linen rags, and the constant improvement of the machinery and methods for working wood pulp, increases at an immense rate; in fact, when we look at the progress going on in production of all kinds, the wonder seems to be that any wood at all should be still found in Europe.

Postal Intercourse between England and France.—The following appeared in the *Times* City article:—"Sir,—Your correspondent 'Scotus,' in his letter on the subject of postage between England and France, scarcely puts the case fairly to the English Post-office. The proposition of the English office is that the halfounce, reckoned as equivalent to 15 grammes, which has long been in use as the weight of the double letter between France and England, shall be made the single rate, the same as is the case with all letters passing between England and every country in Europe, excepting France and countries necessarily served through France. Belgium and Switzerland, whose system of weights is precisely the same as that of France, adopt the weight of 15 grammes for the single letter, and the postage to and from England is only 3d. (30 centimes). To Holland the rate for the same weight is only 3d., or 15 cents. With France the present single rate is 4d. for 7½ grammes, and 8d. for 15 grammes. A letter weighing over 7½ and under 15 grammes, sent *viâ* Calais to Belgium, pays 4d.; the same letter sent to Calais itself would pay 8d. The advantages to the French authorities of raising the weight of the single letter to 15 grammes would be that they would get rid of the use of the present weights of 7½ grammes, 22½ grammes, &c., without requiring any additional weights beyond those at present in use; and, assuming the postage to remain at 4d. (40 centimes), French merchants would be placed more nearly on an equality with their Dutch, Belgian, and Swiss compeers, who now send letters to England for 30 centimes the 15 grammes. The advantage to the English Post-office would be that the single rate would then be the same to every country throughout Europe. The change from one-quarter to one-third of an ounce, as proposed by France, would render necessary that weights of one-third and two-thirds of an ounce should be provided for every village post-office in England, and be procured by every mercantile establishment having correspondence

with France, solely for the purpose of letters to and through that country; and after this change had been effected the anomaly would still remain that while the single rate recognised by every other European country is the halfounce, and the postal charge to Holland, Belgium, and Switzerland 3d. for this weight, the postal rate to France would be 4d. for only one third of an ounce.—We are, &c., Richard Symonds and Son.

"3, Ingram-court, London, January 26th."

Mining in Prussia.—The statistics relating to mining in Prussia show the surprising progress made by that country during the last twenty years in this industry by the introduction of improved systems of extraction by the use of steam power. In 1837 there were 1,587 mines worked in Prussia, giving employment to 33,161 miners. In 1867 this number had increased to 2,162, with 48,351 miners. The total value of the mineral production, which in 1837 was £833,932, in 1867 amounted to upwards of £8,565,000.

Coal in California. — An important discovery of coal has been made at Argenta, in California, situated about 370 miles from Sacramento. This coal is said to be of excellent quality, and will no doubt be of great service to the American steamers that run from San Francisco to China and Japan.

Colonies.

Emigration in 1868.—The total number of emigrants who left the ports of the United Kingdom during 1868 was 192,344; of these 58,268 were English, 14,954 Scotch, 64,961 Irish, 51,956 foreigners, and 6,182 origin not distinguished. In 1867, the total number of emigrants was 195,953. In 1868, 155,532 sailed to the United States, 21,058 to North American colonies, 12,809 to Australian colonies, and 6,922 to all other places. The following is a list of the emigrants, in 1868, whose occupation was classified:—

General and agricultural labourers	50,515
Children under twelve years	38,416
Married women	23,598
Domestic servants	8,592
Farmers	7,258
Miners and quarrymen	8,500
Professional clerks and merchants	7,171
Carpenters	2,553
Tailors	951
Clerks	790
Smiths	712
Spinners and weavers	381
Seamen and coal miners	367

Productive Capacity of Natal. — The following (dated Feb. 4), which has appeared in the *Times*, is by Dr. R. J. Mann, whose papers on this subject, read before the Society in January and December, 1868, will be in the recollection of members:—"It will possibly interest such of your readers as care to mark colonial progress, to learn that in the first nine months of the last year, the latest period for which returns are yet available, the value of imports in the colony of Natal was, for the first time in its history, within £12,359 of the value of exports. The exact figures for the nine months were—value of imports, £212,382; value of exports, £200,023. The value of the exports for the corresponding nine months of 1867 was £168,701, thus giving an increase of £31,322 within twelve months. The value of coffee imported into the colony has been reduced within five years from £26,000 to £9,000 for the year. This, of course, is due to the increase of the colonial produce. Previously to the year 1852 the Natal exports were not worth notice. In 1852 their value was under £28,000. In 1862 the value was £127,000. In 1867 it was £225,691. In the first nine months of 1868 it was £200,000. The estimated production of wool in Natal for the year 1868 was 434,573lbs. The values exported of the following articles were:—

	1852.	1867.
Arrowroot	Nothing	£9,000
Salt meat	Nothing	4,000
Living animals	Nothing	1,400
Wool	£2,000	80,000
Cotton wool	65	5,000
Sugar	12	70,000
Spices	Nothing	12,000
Coffee	Nothing	204

In a letter I have just received from an intelligent friend, holding a high official and very responsible position in the colony, I have the following very precise information regarding the indications of gold within the colony. The precious metal is found exclusively in a very remarkable old deposit of water—worn pebbles, principally of quartz and granite imbedded in coarse ferruginous sand. This deposit occurs in patches, which are scattered from the neighbourhood of the Mukomorize river, in latitude 30·10 S., to the mouth of the Muzumbe river, in gold found in this deposit is in particles, varying from latitude 30·30 S., a stretch of about 30 miles. The the minutest specks to grains the size of a pin's head. My friend adds that he has before him while he writes 150 specks of gold which he had himself helped to wash out of this auriferous deposit, and that operations are in progress to decide whether the numerous quartz reefs which cut everywhere through the granite of the colony contain gold or not. At present it is quite impossible to say whether the Natal gold will be found anywhere to be in sufficient quantity to be worth mining and collecting, but my friend's present impression is that the whole of the Natal coast below the line of the primitive rocks, which run in a northerly direction from the mouth of the River Muzunkulu, in south latitude 30·45 deg., quite up to Mosilikatze's country, between the Limpopo and Zambesi, will be found to be auriferous, and that those rocks will themselves prove to be what Sir Roderick Murchison has termed them, the true geological axis of the colony and district. There had been no fresh facts from the interior goldfields that lie at the inner end of this axis, but there seemed to be no reason to doubt either their extent or their richness. The delay in the acquisition of further reliable information up to that time is referred to the first and only parties who had yet visited the auriferous track not being men of technical experience, or with capacity to pursue their investigations with harmony among themselves. As the mail was leaving, traces of gold were reported on the north-eastern frontier of the colony, near the River Tugela."

Notes.

Maritime Exhibition at Naples. — Following the example set by France and Norway, at Boulogne, Havre, Arcachon, and Bergen, the first maritime exhibition will be held in the autumn of the present year at Naples. This exhibition, which will be international, presents an important field for British exhibitors of naval appliances, as Italy, from her geographical position, is not unlikely to become a great maritime power. This exhibition, as that of Havre, will embrace all apparatus and implements used in fishing, pisciculture, and fish curing, and will include ship stores and provisions, &c.

School for Shepherds in France. — The French Government is determined to establish a school for the instruction of youths for shepherds; the locality selected is the Imperial Sheep Farm of the Haut Tingry, in the department of the Pas de Calais, where there is a magnificent flock of merinos and half-breeds, from which a considerable number of rams are supplied to farmers and breeders all over the country. The farm comprises about 500 acres of land.

The Mont Cenis Tunnel.—The position of these works up to the 31st January was as follows:—

	Metres.
Length driven at Bardonnèche	5,414
" " " Modane	3,860·15
Total length of tunnel driven	9,274·15
Length remaining to be driven	2,945·85
Total length of tunnel	12,220·00

Omnibuses in Paris.—A Paris journal gives the following particulars respecting the omnibus service of the capital:—"Those of the line from the church of the Madeleine to the Place de la Bastille make the double journey 800 times a day; and the total number of omnibuses of various lines that pass the Place du Palais Royal daily amounts to 1,100. Each omnibus carries, on an average, thirty persons per journey, so that the vehicles above mentioned convey about 57,000 persons daily. There are at present 32 regular lines of omnibuses within the limits of the city, besides those attached to each of the railway termini, a large number running to the various places in the outskirts of Paris, and the omnibuses of the American railway to St. Cloud and Versailles, which carry a large number of passengers."

Correspondence.

Velocipedes.—Sir,—This prevailing fashion in locomotion will of course soon fade out, as it did many years ago; for, unless certain conditions be complied with, incompatible with the present or the older form of the machine, it is not an economical use of muscular power, which would be much more beneficially employed in drawing instead of riding in a velocipede and propelling. The first condition would be to obtain a perfectly level road, smooth as a billiard table, when the labour of propelling would be merely nominal, provided, of course, that speed of transit could be obtained without corresponding rapid muscular action, an impossibility with the present construction of velocipedes. In order to overcome the first difficulty—the impossible smooth road—we must have recourse to the patent vulcanised indiarubber tire, a perfect appliance that has been locked up for more than a century by the absurd state of our patent laws, which have stuck patents upon every portion of the process like quills upon a porcupine, and rendered a most valuable invention an unapproachable dead letter. At the Great Exhibition of 1851, a heavy cartwheel so tired was made to roll over the hands and feet of the bystanders without causing the smallest sensation of pain, or the slightest jerk to the wheel. We can now, therefore, dispense with the smooth road, as well as with carriage springs; and, further, the fact of running over a living being will cause no injury to life or limb. Indiarubber tires have been applied to heavy traction engines with perfect success, while the bite on the road far exceeds all expectation. The second condition, the difference of speed required between the machine and the muscular action of the legs, is, singular to state, readily got over by the same beautiful appliance, the indiarubber tire. Let a secondary wheel, 30 inches in diameter, provided with an indiarubber tire, be fixed on a short secondary spindle, with a crank nine inches long at each side placed at 180°; also let a pinion or nut, five inches diameter, indiarubber tired, be fixed on the centre of the main driving axle, the bite of the two being equal to that of any gearing; attach two long horizontal pedals to the cranks with shoes provided with small friction rollers, and the machine will be complete. By this construction the velocipedes will measure the roads or move at the rate of 20 miles an hour, while the muscular action of the feet will only be at about the rate of walking two miles for the same space of time, and an active young man will be able to drive his machine at double that rate, or 40 miles an hour. The minor appliances for stopping and turning sharp corners, &c., may be easily contrived by any expert mechanic; but how to get over the difficulty of passing horses on the road with the machine at speed, I must confess passes my comprehension. No horse will encounter or pass a swift machine not drawn by biped or quadruped; it utterly confounds their own ideas of locomotion. The suggestion by your latest correspondent of supplying the letter carriers with velocipedes would not be very pleasant to pedestrians who might expect to be knocked over at every sharp turn, though, perhaps, by very elastic buffers. The recommendation of a light at night is a snare and a delusion, for it is impossible to discover in what direction the light is moving in the midst of darkness. This machine is erroneously called a "velocipede." The proper name would be "velocifere," because its intention is to increase the speed of transit and diminish that of muscular action.—I am, &c., Henry W. Reveley.

Reading, Feb. 15th, 1869.

Waste in Glass Manufacture.—Sir,—I regard the paper read by Mr. P. L. Simmonds, on waste substances, as of immense value, inasmuch as it is moving exactly in the direction in which science should move, *i.e.*, as nature moves, for in the great laboratory of the universe everything is utilised, and this should be the case especially in our manufactories, where there is often great waste of material. I have observed this to be the case in the manufacture of plate glass, where what is technically called the "welt" takes up a large portion of the glass, and is destroyed, amounting to more than five per cent., and not unfrequently, from the inequality and difference in thickness, causes the whole glass to break when drawn from the kiln. A tool, costing only a few shillings, and requiring no additional labour, was used in France about 80 years ago, when casting plate glass was invented, which saves the "welt," but as the price of plate glass was then very high, and the sizes compared to the present very small, it ceased to be used, and is now unknown to the trade. Its adoption at the present time is very desirable, as English manufacturers have to compete with importers, and it would be far preferable to economise than to adopt the practice, too often resorted to, of manufacturing an inferior article. I have, therefore, thought it desirable to draw attention to the subject.—I am, &c., W. Bradford.

120, Cambridge-road, N.E., February 12th, 1869.

Photography and the Magic Lantern.—Sir,—In a paper read before the Society, on the 20th January, on "Photography and the Magic Lantern," Mr. Highley states that "the honour of introducing a new method of instruction into our collegiate and higher branches of education, by means of the magic lantern and photographic slides, is due to Colonel Tchepelevsky, a Russian officer." May I be permitted to inform you that such a method of instruction has been in use in the schools of the Royal Military Asylum, and also in the army schools, for more than ten years. The honour of its introduction is due to Major-General Lefroy, R.A., and, on his recommendation, the Secretary of State for War entrusted to myself the arrangements necessary for the development of the system. More than eighty stations are now provided with lanterns and slides, and lectures are regularly delivered to the troops at these stations by officers, chaplains, and army schoolmasters, on English history, geography, the manners and customs of nations, fortifications, deeds of daring by sea and land, natural history, and other useful, entertaining, and instructive subjects. During the season 1865-6 more than 1,300 illustrated lectures were delivered to the troops. Nearly the whole of the lanterns, photographic and other slides used (and which have given the highest satisfaction) were prepared by Messrs. Newton, of Fleet-street. That you may be enabled to form a correct estimate of what

has been done in the army schools, I forward for your perusal detailed lists of the slides that have, from time to time, been provided for the use of the troops, under the sanction of the Council of Military Education; and, for full accounts of the success of the lectures, I beg to refer your readers to the reports of the Council of Military Education for 1864-65 and 1866. This illustrative method of teaching has been introduced into several of the army schools in India, and also into the training ships of her Majesty's Navy.—I am, &c., Walter McLeod.

Royal Military Asylum, Chelsea, Feb. 9, 1869.

MEETINGS FOR THE ENSUING WEEK.

Mon.....Society of Arts, 8. Cantor Lecture. Mr. S. A. Hart, R.A., "On Landscape Painting."
R. Geographical, 8½. Staff-Commander J. E. Davis, R.N., "On Antarctic Discovery, and its connection with the Transit of Venus in 1882."
Actuaries, 7. Mr. Bailey, "On Rates of Premium for Foreign Travelling and Residence."
Medical, 8.
Victoria Inst., 8.
London Inst., 6.
Social Science Assoc. Mr. P. H. Holland, "Has the Drainage of Sewage into Rivers done more harm than the Drainage of Towns has done good?"

Tues ...Medical and Chirurgical, 8½.
Civil Engineers, 8. 1 Discussion "On the Lagoons and Marshes of the Mediterranean" 2. Mr. Imrie Bell, "On Sinking Wells for the Foundations of the Piers of the Jumna Bridge, Delhi Railway." 3. Mr. John Milroy, "Description of Apparatus for Excavating the Interior of, and for Sinking Iron Cylinders."
Royal Inst., 3. Rev. F. W. Farrar, "On Comparative Philology."
Ethnological, 8. 1. Dr. Hooker, "On Ceremonies connected with Child-birth in Australia and New Zealand." 2. Don Alonzo Steffens, "On some Ethnological Remains found in the Pearl Islands of the Bay of Panama."

Wed ...Society of Arts, 8. Dr. E. Smith, "On Ventilation."
Geological, 8. 1 Mr. W. Boyd Dawkins, "On the British Postglacial Mammalia." 2. Mr. J. W. Judd, "On the Origin of the Northampton Sands." 3. Mr. M. H. Coquand, "On the Cretaceous Strata of England, France, and Algeria." Communicated by Mr. J. W. Flower.
Archæological Assoc., 8.

Thur ...Royal, 8½.
Antiquaries, 8½.
Zoological, 8½.
London Inst., 6.
Philosophical Club, 6.
Royal Inst., 3. Dr. John Harley, "On Respiration, and its Influence on the Action of the Heart."
Society of Fine Arts, 8. Second Conversazione of the Season, 9, Conduit-street.

Fri .....Royal Inst., 8. Dr. John Bridges, "On Civilisation and Public Health."
R. United Service Inst., 3. Mr. E. B. de Fonblanque, "Reforms in Military Administration."

Sat .....R. Botanic, 3¾.
Royal Inst., 3. Prof. Odling, "Hydrogen and its Analogues."

Patents.

From Commissioners of Patents' Journal, February 12.

Grants of Provisional Protection.

Alkaline solutions, evaporating and calcining—318—W. I. Palmer and W. P. Goulding.
Animal substances, preserving—267—R. Jones.
Bankers' cheques, &c, printing—294—H. N. Nissen.
Basket-cars, vehicles known as—313—J. Proud.
Billiard tables, &c.—303—J. T. Bintley.
Boilers—334—W. Maddick.
Bottles, &c., stoppers for—280—J. McDonald.
Carding engines—316—S. Brooke.
Carding engines, &c.—299—J Tolson.
Carding machinery, &c, feed apparatus for—301—T. H. Kilner.
Cement—330—C. D. Abel.
Chlorine, &c., manufacturing—291—W. Weldon.
Ejector condensers—312—A. Barclay.
Engine slide bars, &c, grinding and polishing—274—J. Easterbrook, J. H. Allcard, and A. M. Wild.
File-cutting machines 297—E. T. Hughes.
File-planing machines—296—E. T. Hughes.
Fire-screens—311—C Hoult.
Gaseous bodies, exhausting, &c.—289—T. Whimster.
Grain, hulling—285—A M. Clark.
Hoists—309—J. A. A. Fontaine.
Horse collars—302—A S. Andrews.
Horse-shoes—286—A. Mallard.
Ingots, casting—305—C. D. Abel.
Iron and steel—326—J. G. Willans.
Iron and steel piles, &c.—284—J. H. Johnson.
Iron, smelting, &c.—3248—I. Baggs.
Kilns for burning and drying bricks, &c.—320—J. Bird.
Lifting apparatus—307—J. A. Limbert.
Millstones, shaping—193—D. Rivenc.
Musical chair or seat—269—C. L. A. Hoelscher.
Oil paint—287—F. Jay.
Oils, &c., extracting from the substances in which they are contained—315—D. Joy.
Ovens—290—P. J. Wielemans.
Photographic pictures—336—J. R. Johnson.
Plough coulters—71—E. Gray.
Printing machinery—277—W. MacLean.
Printing surfaces, applying ink to—250—J. Gough.
Pumps, &c.—282—G. Hawksley.
Railway signals—300—G. H. Adam.
Railways—321—W. E. Newton.
Rotary engines—271—A. Browne.
Sewing machinery—338—A. V. Newton.
Sewing machines, apparatus for driving by electro-magnetism—288—T. E. Lundy and T. Hood.
Ships, &c.—279—T. W. Carter.
Ships, &c., propelling—278—J. Pickering.
Slivers, condensing—308—A. V. Newton.
Spade and shovel moulds—293—S. Taylor and G. W. Dyson.
Steam engines—298—R. Wood.
Stereotype matrices, machine for forming—306—T. G. Daw.
Tailors' shears and scissors—304—J. Whyte.
Taps or valves—281—S. Smith.
Tarpauling, &c.—275—N. C. Szerelmey.
Tops—322—H. Bate.
Vats, &c., measuring and drawing off liquid from—328—J. H. Tyrrel.
Ventilators and chimney-pots—276—G. Hawksley.
Vessels for containing hot liquids—324—V. Baker.
Water-closets, &c., regulating the flow of water in—314—N. Voice.
Window fastenings—283—G. Price.

Inventions with Complete Specifications Filed.

Furnaces and pans for the recovery of the soda from the waste lyes resulting from the boiling of esparto grass, &c.—375—C. D. J. Seitz.
Furnaces, blower for—402—B. F. Sturtevant.
Lasts, machine for making—335—R. R. Frohock.

Patents Sealed.

2544. G. Nelson.	2575. J. G. Tongue.
2547. J. Macintosh.	2580. J. Landless.
2551. R. Robinson and G. D. Edmeston.	2582. L. Gay.
2554. H. Y. D. Scott.	2586. J. H. Atterbury.
2558. W. B. Lspeut.	2593. W. J. Almond.
2559. W. J. Hinde.	2671. R. Saunders.
2560. A. Smith.	2687. T. Lester and W. Trueman.
2568. G. F. Bradbury and T. Chadwick.	2688. J. Fieldhouse.
2572. H. J. Behrens and E. Dart.	2722. E. L. Parker.
	3415. J. Hickisson.
	3594. J. Bourne.

From Commissioners of Patents' Journal, February 16.

Patents Sealed.

2577. J. S. Starnes.	2644. J. H. Johnson.
2578. P R. and W. Hodge.	2645. A. M. Clark.
2583. W. Thomson.	2651. W. Hall.
2594. J. Sawyer.	2686. J. Greenwood.
2598. A. Rollason.	2696. J. C. Martin.
2602. T. Haigh.	2733. W. E. Newton.
2607. F. J. Knewstub.	2750. U. A. Masselon.
2609. J. L. Clark.	2768. E. Cottam.
2611. D. Evans.	2780. A. V. Newton.
2615. W. J & C. A. Kesselmeyer.	2782. G. Davies.
2623. W. Chorlton.	2798. B. Dobson and W. Slater.
2625. G. Tidcombe.	2808. G. Bower & W. Hollinshead.
2629. O. C. Setcheil.	3149. W. Lorberg.
2642. J. J. Long.	3377. M. A. F. Mennons.
2643. J. Gillott and P. Copley.	3757. W. G. Manwaring.

Patents on which the Stamp Duty of £50 has been paid.

559. W. Tongue.	455. J. Vero.
424. J. and H. Charlton.	473. H. E. Newton.
445. W. Young.	479. T. Adams and G. J. Parson.
483. A. H. Hassall.	486. A. V. Newton.
501. J. H. Whitehead.	1853. R. Clough and P. Smith, sen.
433. W. F. Cooke & G. Hunter.	463. F. R. Wheeldon.
457. W. R. Lake.	475. W. N. Wilson.
699. G. T. Bousfield.	485. G. Bedson.
434. C. D. Abel.	487. C. Gall.
571. R. Leake and J. Beckett.	

Patents on which the Stamp Duty of £100 has been Paid.

392. E. Green and J. Newman.	472. J. Kirkwood.
361. J. J. McComb.	736. W. Barford.
384. T. Davison.	408. C. Turner and J. Shaw.
390. E. E. Allen and J. Stewart.	537. J. Tangye.

Journal of the Society of Arts.

FRIDAY, FEBRUARY 26, 1869.

Announcements by the Council.

Ordinary Meetings.

Monday Morning, 1st March.—Adjourned discussion on Mr. Henry Cole's paper, "On the Efficiency and Economy of a National Army, in connection with the Industry and Education of the People." A. J. Mundella, Esq., M.P., will take the chair at 11 a.m.

Wednesday Evenings at eight o'clock :—

March 3.—"On the Adaptation and Extension of Present Means for the Promotion of Scientific Instruction." By H. H. Sales, Esq. On this evening Lord Frederick Cavendish, M.P., will preside.

March 10.—"On the Screw Propeller." By N. P. Burgh, Esq., C.E.

March 17.—"On the Trade and Commerce of Japan." By William Davison, Esq.

March 24.—*Passion Week.*—No Meeting.

March 31.—"On Technical Education, considered in relation to Female Schools." By Ellis A. Davidson, Esq., Lecturer on Science and Art in the City of London Middle Class Schools.

April 7.—"On the Theory of Boiling in connection with some processes in the Useful Arts." By Charles Tomlinson, Esq., F.R.S., F.C.S.

FINAL EXAMINATIONS, 1869.

In order to avoid holding these Examinations on the same evenings as those of the Department of Science and Art, it has been decided to hold them, in 1869, on the evenings of

TUESDAY, the 20th APRIL,
WEDNESDAY, the 21st ,,
THURSDAY, the 22nd ,,
FRIDAY, the 23rd ,,

From 7 p.m. to 10 p.m., instead of on the 27th, 28th, 29th, and 30th April, as announced in the Programme of Examinations for 1869.

In consequence of this alteration the Previous Examinations must be held earlier, and the Forms No. 2 and No. 4, referred to in par. 6 of the Programme, must of course be sent in a week earlier than the dates there fixed for receiving them.

A copy of Form No. 2 has been forwarded to each Local Board, and should be filled up and returned to the Secretary of the Society of Arts by the 11th March.

In reference to the subjects referred to in the notice at page 9 of the Programme, a sufficient number of applications from candidates in Conic Sections, Navigation and Nautical Astronomy, and Mining and Metallurgy, have already been received. Papers will therefore be set in these subjects.

No paper will be set in Italian.

Local Boards having candidates either in the "Theory of Music" or in "Elementary Musical Composition (Tonic Sol-fa System)," should communicate with the Secretary of the Society of Arts without delay.

Free Libraries and Museums.

The Council have appointed a Committee to consider and report how the Society may aid in promoting the establishment of Free Libraries and Museums of Science and Art throughout the United Kingdom.

The following gentlemen have been invited to serve on the Committee :—

T. D. Acland, M.P.
*Antonio Brady, Member of the Council.
Professor Brayley.
The Lord Chancellor, Vice-Pres. of the Society.
*Hyde Clarke, Member of the Council.
*Henry Cole, C.B., Vice-Pres. of the Society.
*Sir Daniel Cooper, Bart., Member of the Council.
*Chas. Wentworth Dilke, M.P.
Hepworth Dixon.
*Captain Donnelly, R.E.
Captain Festing, R.E.
*George Godwin, F.R.S.
Lord Henry G. Lennox, M.P., Chairman of the Council.
Sir John Pakington, Bart., M.P.
Charles Reed, M.P.
*Samuel Redgrave, Vice-Pres. of the Society.
*Seymour Teulon, Member of the Council.
*James T. Ware, Member of the Council.
*General Eardley Wilmot, R.A.
*The Archbishop of York, Vice-President of the Society.

* Those gentlemen whose names have an asterisk (*) have already consented to serve on the Committee.

Institutions.

The following Institutions have been received into Union since the last announcement :—

Milford (Derby) Evening Schools.
Stockport, Sunday School Improvement Society.

Subscriptions.

The Christmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Committee on India.

This Committee met on Tuesday, the 16th February, at four o'clock. Present :—Major-General Sir Vincent Eyre, K.C.S.I., in the chair, Sir Daniel Cooper, Bart., Major-General Sir Wm. Denison, Dr. Archibald Campbell, Messrs. Hyde Clarke, and C. H. Fielder.

The Committee resolved to recommend to the Council the following list of gentlemen interested in Indian matters who should be invited to join the Committee :—

Col. Anderson.
Geo. Appleton.
H. G. Bainbridge.
*General Balfour.
P. Battiscombe.
Thos. Bazley, M.P.
Sir C. Beadon.
Dr. Alexander Beattie.
*Samuel Brown.
J. A. Burkinyoung.
Major-Gen. Pelham Burn.
E. C. Buxton.
*G. Campbell.
Col. Sir Proby Cautley, F.R.S.
H. C. Cavendish.
David Chadwick, M.P.
Edwin Chadwick, C.B.
John Cheetham.
Major-General Clarke.
Col. Collyer, R.E., A.I.C.E.
Gen. Sir A. Cotton.
Juland Danvers.
C. A. Day.
C. W. Dilke, M.P.
James Fergusson, F.R.S.
Sir Bartle Frere.
W. Gilbert.
Perrie Gordon.
Arthur Grote.
Arthur Hall.
R. P. Harrison.
Smith Harrison.
Lord William Hay.
F. Heathcote.
Wm. Henderson.
*F. Hendriks.
Richard Hoare.
B. H. Hodgson.
Dr. John Jackson.
Julius Jeffreys.
C. Jellicoe.
H. M. Kemshead.
Col. N. Lees.
Thos. Login.
D. Mackinlay.
Sir Ranald Martin, C.B., M.D., F.R.S.
C. McGarel.
J. O. Milledge.
E. Miller.
S. B. Miller.
*Sir Robert Montgomery, K.C.B., G.C.S.I.
Dyce Nichol, M.P.
W. D. Oehme.
Col. Sir A. Phayre.
A. Pilleau.
H. Pilleau.
Sir Henry Rawlinson, K.C.B.
R. D. Sassoon.
Major H. J. Sharpe.
*Col. Smith.
G. P. Smith.
J. B. Smith, M.P.
Sir Macdonald Stephenson.
T. Stevenson.
Geo. Stone.
J. J. Stone.
*Captain E. Thackeray.
Thos. D. Thomson, F.R.S.
Edward Thomas.
General Tremenheere.
G. O. Trevelyan, M.P.
*Sir Charles Trevelyan, K.C.B.
S. Turnbull.
Marquis of Tweedale.
*Dr. Forbes Watson.
Sir Andrew Waugh.
Robert Whyte.
G. F. Wilson, F.R.S.
Sir Chas. Wingfield, M.P.
E. W. Wingrove.
H. W. Wimshurst.
J. J. Wright.
*Sir Digby Wyatt.
J. W. W. Wyllie, M.P.

Those gentlemen whose names have an asterisk (*) have already consented to serve on the Committee.

The Committee resolved that Six Conferences should be held during the present Session for the discussion of the following subjects, viz. :—

Tea Cultivation in India.
Hill Settlements and Sanitaria.
Waste Lands in India.
Trade with Central Asia, Thibet, and South-Western China.
Indian Fibres.
Silk Cultivation and Supply.

The following evenings were fixed for holding the conferences :—

Friday, March 12th.
" April 2nd.
" April 16th.
" April 30th.
" May 14th.
" May 28th.

At these Meetings the chair will be taken at 8 o'clock, and the discussion will be opened by a paper.

On the first evening, March the 12th, Mr. C. H. Fielder, Hon. Secretary of the India Tea Association, will open the discussion with a paper "On Tea Cultivation in India."

The subjects for each subsequent evening will be previously announced in the *Journal.*

Members of the Society interested in Indian questions are invited to attend.

Extra Meeting.

Friday Morning, February 19th, 11 a.m.; A. J. Mundella, Esq., M.P., in the chair.

The adjourned discussion on Mr. Henry Cole's paper "On the Efficiency and Economy of a National Army, in connection with the Industry and Education of the People," read on Wednesday evening, the 17th inst., was re-opened by

Mr. Edwin Chadwick, C.B., who said that the positions he had himself taken on the subject of army reform were supported by the testimony of distinguished military authorities. But the attack made by his friend, Major-General Sir William Denison, upon civilian opinion and intervention on army organisation, rendered it necessary to assert that the rule that every man is to be believed on questions on his own art and practice, is to be restricted to his art and practice as it is, and that when any question arises as to a change, or as to practice and art as it ought to be—the practical man was commonly about the last whose dictum is to be implicitly received, if it be against change—the last on account of the very extent and thoroughness of his practice and habits of mind, to judge competently and impartially of proposals of change in them. Hence, in the art military, as in other arts, the greatest improvements had been made by non-professional men. The famous naval tactic, the breaking the line, originated with a clergyman. The percussion lock was the invention of a clergyman. The most able writer on military education, a man of the highest judgment on military policy at this time, was a clergyman. A person who might have aided the present discussion with excellent suggestions on military reform, with good reasons from observation of the Prussian and the English army, was an army chaplain. All the professed artillerists of this country, and of Europe, had been beaten in improvements of large, as well as of small arms, by which the future of wars must be largely changed, by a civilian, a mechanical engineer. The slowness and inaptitude of the military mind in this country to adopt improvements was shown in this, that it took nearly a quarter of a century of firing, by his old colleague in the civil service, Sir Francis Head, and also Sir Charles Shaw, to get arms of precision or the rifle substituted, as on the continent, for the smooth bore, the old brown Bess. To common perception the principle of the Colt's revolver commended itself at once for adoption for the longer small arm. The principle of the quick breech-loader in the needle gun was sufficiently demonstrated practically by the defeat of a large body of Danes by a small body of Prussians armed with it at Duppel. But neither reasoning nor that demonstration availed until the great defeat of the Austrians by its use, when it was adopted in a fright and with a rush. On the great question of army organisation, the military mind was demonstrated to be entirely in default. Thus, it had been held by our highest military authorities, and held almost to the last as an orthodox professional opinion, on the American civil war, that the Southerners, from their greater practice in the use of weapons than the mere untrained shopmen and civilian volunteers of the North, must prevail. And yet more recently, this very question between standing armies and popular armies was put in issue between Austria and Prussia. All the present

advocates in this country of the standing army and depreciators of any popular army were loud in their anticipations of the triumph of the standing army of Austria, against which the armies of France and of Italy had prevailed with so much difficulty. When the trained men, enervated by the dissipation and idleness of the camps and cantonments of Austria, went down before the strong high-waged men, called immediately from the forge or the plough into the ranks of the popular army of Prussia at Sadowa, the authority of our advocates of standing armies went down too, and the modesty of the vanquished and prostrate in authority on army organisation now became them. He ventured to assert, with the support of reserves of strong military authority, that the late advances of large as well as of small arms, as led by Mr. Whitworth, must considerably alter old military practice and the war policy of nations, for whilst with the longer range and greater precision, these gave one to offensive war, they gave two or more to defensive war. In respect to fortified places this admitted of no dispute. There was recently a very able article in the *Journal des Economistes*, by an eminent military critic, which he (Mr. Chadwick) had shown to one of our generals of distinguished service, who expressed his concurrence in it, that under the new conditions, and with the new arms, an army of a hundred thousand men might protect France from invasion by Prussia, and that the great standing army of France was wholly unnecessary, except for the purpose of aggression and menace. Sir Charles Shaw had cited to him the opinion of an able American general, who had recently visited England, and who ridiculed the idea of the success of any invasion of it, as against its present defensive force, lining the hedges, the walling, the farmeries and buildings of the cultivated districts with breech-loading small-arms; and this American general based his conclusion (in coincidence with that of the French authority) on the fact, that during the civil war neither side did or could make way against the other in such cultivated country. Another new condition now demonstrated was that the new arms—which are yet advancing with science—require more and more of intelligence, coolness, firmness, and skill to wield them. General Hay or Colonel Wilford would, no doubt, attest the fact that as a general rule the figure of merit in shooting is almost as the figure of education and intelligence; it might be almost of morality, for the fast man, of shaken nerve and flurried passion, would go down before the temperate man, of intelligence, coolness, and steadiness. Sir Wm. Denison had spoken of our present system of a standing army as befitting our race. Why, if he went back to the history of our most warlike times, it would be found that—not a standing army—but a popular army, based upon a popular general training, was peculiarly fitting to our race. If they would read the work of Roger Ascham, the tutor of Edward the Sixth and of Queen Elizabeth, on commendation of training to the use of the bow, they would see how curiously analogous were the conditions and qualities to those now required, and in which our people were most successful in the use of the rifle. In sedulously promoting and enforcing military training in the juvenile stages of the whole population in all parishes, as described by Bishop Latimer and Roger Ascham, the Plantagenets and the Tudors well knew what they were about. The good old bishop had thus described our early national practice, in a sermon preached before Edward VI.:—"The art of shooting hath been in time past much esteemed in this realm. It is the gift of God that He hath given us to excel all other nations withal; it hath been God's instrument whereby He hath given us many victories against our enemies. . . . . In my time my poor father—a yeoman, who had no lands of his own, only he had a farm of three or four pounds by the year, at the uttermost—was as diligent to teach me to shoot as to learn me any other thing; and so I think other men did their children. He taught me how to draw, how to lay my body to the bow, and not to draw with the strength of arms, as the other nations do, but with the strength of body. I had my bows bought according to my age and strength; as I increased in them so my bows were made bigger and bigger, for men never shoot well unless they be brought up in it. It is a goodly art, a wholesome exercise, much esteemed in physic. In the reverence of God let it be continued." Now whilst the advance in science and the new weapons requires higher and higher qualities of intelligence and steadiness to wield them, the economical conditions of the country, the increasing demand for labour, the advance of wages, notwithstanding the recent depression, would only leave the lowest dregs of the uneducated population to draw from for any standing army maintained upon the existing footing. Sir William Denison had denied the justice of the comments made on the character of the ranks. But here was an account of them given by a military organ, the *United Service Journal*, for July, 1861:—"The army as a service, even with limited enlistment, has not become more popular, nor has a better class of men been induced to join it. On the contrary, in both these respects it has decidedly fallen off. It is no easy matter, if any pressure prevails, to get a sufficiency of men to enlist at all, and every one who knows anything about it will say that our soldiers are far more than they ever were the very scum and dregs of the population. Ticket-of-leave men abound amongst them. One half the recruits raised are practised rogues and vagabonds; they only enlist for the purpose of getting the bounty and deserting immediately after. The numbers who are said to have done so, upon the authority of official documents, during the last year, were no less than between 20,000 and 30,000." It was then, of necessity, that this condition must be reversed for the future of war; that we must have more of intelligence for the ranks. Would any one assert that there would not be, even now, a large difference in the military work, say with ranks composed of men equal in intelligence, which is what is wanted of corporals and sergeants? But the country cannot afford the money to pay for a standing army of this quality, and must depend for it mainly on volunteering, which already had nearly attained it. In these conditions he had proposed to transfer, as much as possible, of the military drill exercises from the adult or productive to the unproductive or the school stage. What might be done in that stage was proved by what is done in the district half-time schools. Sir William Denison stated that boys were drilled, some sixty years ago, at the schools, and that he had not heard that much was done by it. Sixty years ago the military exercises were confined to a comparatively few schools, but he had the information of old men learned in those schools that they animated them. There could, however, be no doubt of what it does now. Boys so drilled volunteered in large numbers for the army and for the Royal Navy; indeed, in such numbers as to induce guardians and other employers interested in the local labour market to check their departure for the services. All conversant with the military training would attest that the younger you begin the better you do with the children, and that they do in the infantile stage what they cannot do in the adult stage. In the one stage they had the tender twig to bend, in the advanced stages, the knotted stick, or the gnarled oak. Mr. Cole had proposed to begin the training of children in the military drill at ten years of age. If he had consulted the practical experience of drill corporals, he would be aware that they find they can begin well with children, with some exercises, at five years and a-half or at six years of age, and that by ten, or a little after, they impart to them a very advanced drill indeed, and practice with light rifles. It was proved that we can drill about one hundred and thirty children in the school stages well, at the cost of keeping and drilling one militiaman, in the adult stage, comparatively hopelessly ill. We could, moreover, im-

part to three lads the efficiency of five for all ordinary labour. We imparted to them the moral qualities of self-restraint, patience, attention, and prompt obedience. Hence, if we had no prospect but of perpetual peace, the training in the school stages would be abundantly worth while, as means for increasing the productive power of the country. He submitted the question of the military policy of this measure to Sir John Burgoyne, and to other distinguished generals, and received from them expressions of concurrence. Amongst these was the late Lieutenant-General Shaw Kennedy, one of the Duke of Wellington's most able officers, and a writer of high authority on military policy. That officer denied our power of maintaining a large standing army on the footing of the present. He (Mr. Chadwick) begged to cite his conclusions sanctioning the propositions:—"According to the principles which I have stated, there will in future be required to be held constantly in readiness for the protection of this country a very large number of men who have undergone a certain extent of military training, and who are organized, in addition to the regular army of the country. This, in my opinion, will be a sufficient protection to the country without the employment of a large standing army. Having stated these principles, I am now able to give direct answers to the questions contained in your letter. It is evident that if a national force is in a great part to be substituted for a standing army for the defence of the country, the more that national force is drilled, disciplined, and made acquainted with the use of fire-arms, the better; and I say, without hesitation, that I conceive no other plan would accomplish this so thoroughly as that of military exercise being made part of the course at school, as proposed by Mr. Chadwick, if such a system can very generally be introduced. I have read over with great care the three heads under which Mr. Chadwick classes the effects of such a system as part of the education at schools—viz., 1. Physical and Sanitary; 2. Moral; 3. Economical and Productive; and it seems to me that his inferences under those heads cannot be controverted." The evidence and the conclusions he had stated on this topic, in connexion with half-time teaching, had been adopted, and were in action in several of the New England states, and also, he was happy to say, in Canada. He had been in a position in poor-law administration to deal with large numbers of army pensioners, and the fact was that the disbanding of a standing army kept under existing conditions, unused to work, might be said to be the creation of an army of miserable, dependent paupers, or mendicants. The reverse was the case with those who were employed in productive public work, or who were to employ themselves in private work. They were better men, as well as better soldiers; better for productive work, instead of the worse for their military training. He therefore proposed, for the benefit of the army, and the relief of the taxpayer, that men should be allowed and encouraged to leave for any civil work on long furloughs, with the condition that they should return to their colours periodically, for terms of exercise, and any new practice for which an amount of exercise, that now served for the militia, would probably suffice. He had cited, in support of this practice, the example of Sweden, which probably did not keep more than one-third of its force in camp, the rest being out in productive employment, to the relief of the tax payer, as well as to the benefit of the soldier; and Sweden, like Switzerland, on this system, had a formidable army, which might be found not to have degenerated from that which fought under Gustavus. This system, which brought higher qualities into the ranks, might be regarded as a more extended development of our great volunteer system. It was to be expected that by the general and thorough adoption of military exercise in the school stages, little of compulsion or of the dreaded inconvenience of a conscription would be needed. He proposed the same principles of encouraging occupation in civil or private service as applicable to officers as well as men. The experience of India had proved that the employment of officers in public works or on civil works during peace was a far better preparation for war than the routine of the camp and the standing army. Lord Napier, of Magdala, who had for twenty years been engaged in making roads and bridges, was an example of this. In war the proper use of the railways was of course an important means. Captain Tyler, of the Royal Engineers, had, in civil service, obtained a great mastery of our railway system, and having come to the term of his "seconding," was obliged to leave the service. This was an example of the Horse Guards and the War Office administration, which was condemned by Sir John Burgoyne, as depriving the service of valuable skill and experience. It was clear that as men could not be got to stand up in ranks, to be mowed down by the new arms of long range and precision, new wars would become very much, as they recently became in America, a war of earth-works, or of engineers, and that whilst for the ranks, men in practice of civil labour, in the effective use of the spade and the pick, would be required, as shewn in the Crimea, where an army was nearly lost for the want of a road—which the dead men and the dead horses occasioned by the failure, might have made if it were a popular army—an extension of engineering and scientific commands would be needed. In America they had by their losses been driven from common commands, with no better qualifications than those of our line officers, to scientific commands—to engineers (West Pointers as they were called); and of these West Pointers, every one who succeeded had been occupied, not in mere routine, camp, or barrack duty, but in civil work of one sort or other. Grant had done work as a private surveyor as well as a leather seller. Others had done railway work. A reform in the principles established would enormously reduce our taxation, increase our military efficiency, and augment our civil productive power.

Major-General Sir William Denison would still maintain that the army were not such blackguards as his friend Mr. Cole wished to represent them. If 20,000 went out from the army every year it was evident that they got rid of them, but he begged leave to doubt the fact, and if they did go out the better ones remained behind. They constantly saw old soldiers acting as servants, and in various situations of trust, and he maintained, therefore, that it was not a fair representation of the army to say that they were a mere set of ruffians picked up in the streets. He did not at all object to carrying out any system of military drilling in schools, but he must say that when he was a boy he did not like it, especially as it cost him a portion of his half holiday. He did not object to such training of the young, but he did not think it gave them much of a military spirit. Coming more immediately to the proposition of Mr. Cole, he would look at it first in the light of economy. Mr. Cole proposed to disband the army, and if so they would be at once an army of paupers; then out of that 130,000 he proposed to select 16,000, which was to make a *corps d'armée*, but in addition to that they must have a proportion of cavalry and eight batteries of artillery, certain companies of sappers, and so on; and then they would form the pattern army. But if after that they were to have 1-13th of the whole population trained in arms, it would be equivalent, as said the other night, to the whole male population between the ages of 16 and 26, numbering in all about $2\frac{1}{4}$ millions—in point of fact, there would be two millions of men who would each have to spend one year of his life in learning the drill, so that there would be two millions of men's time to be paid for annually in some way, and that, he did not think, would be very economical. He wanted to know what was to be the efficient army in case they were called upon to serve; the 16,000 or 20,000 men was only a sample. Supposing a fleet came over and landed 100,000 men on our shores, what would there be to meet them with? Were the two millions of men to be called out?

If they were, they would require officers and rifles, and there must be artillery and cavalry horses. Then, what proportion of the two million would be trained in the more technical branches of military education; as, for instance, that relating to artillery? You could not make an artillery man in a year, nor even in five years; and yet these men must be ready at a moment's notice if they were to be of any use. Before the days of Buonaparte, as a rule, the proportion was two guns to a thousand men, but latterly there had always been three guns to 1,000 men, so that if there were 200,000 men, they would want 600 guns; and the guns would require carriages, horses, and harness, all ready at the moment. Then, again, the engineers would require a certain number of companies of sappers, and so on, and there must be officers to command them; and all this must be part and parcel of the steady outlay of the country. He was an engineer, and had been in the habit of making estimates, and he took credit to himself for having seldom exceeded his estimates; he, therefore, looked closely into the items of expenditure, and it had occurred to him that Mr. Cole's was a mere civil engineer's estimate, which was, generally speaking, doubled when it came to be put in practice.

Mr. Cole begged to remind Sir William Denison that he had provided for all these matters which he had alluded to.

Sir William Denison said if that were so, he had left out other large items. All these items which he had mentioned formed a very large portion of the outlay of the army, and were matters which every officer worthy of the name had carefully to consider and look into. It was on that ground that he objected to persons who knew nothing whatever of these details professing to give an opinion which should be of any value. He would not prohibit any person from professing his opinion; but he protested against having to adopt it. His opinion was formed on experience and knowledge; and he must again repeat, that if he were to go into a tailor's shop and insist upon teaching him how to make a coat, he would, very properly, be considered a great ass. If he were to go down to the establishment of his friend in the chair, and attempted to teach him how to conduct his factory, he would no doubt intimate to him, more or less politely, that he did not know what he was talking about, and had better leave him to conduct his own business. Mr. Cole had laid great stress upon the principle that these details should not be discussed; yet, in point of fact, the whole discussion had turned upon detail. He would not say anything more on the question of the army, but he should be very sorry to give a contract to Mr. Cole to provide an efficient army for seven millions; at any rate he would not give him the contract without first-class sureties, and a guarantee from their friends on the Continent and in America that they should be left quietly alone for the next ten years. Another important subject was that of the defences of the colonies, and he must say that this had been dealt with unfairly. People left England and organised a community—that community was part and parcel of the empire, and it was to a great extent our colonial power which enabled us to keep up our prestige throughout the world. We were known as possessing an empire on which the sun never set. Although the French and other nations tried to follow our example they tried in vain. Would it be fair to set these communities adrift and subject them to all the risks which would follow if England went to war? They would suffer, and yet they had not a voice in saying whether or no we should declare war. He was alluding especially to those large countries which were said to be under responsible government. They built barracks and batteries and did all local works that were necessary, and, in part, supported the troops who had to defend them. It would be very unfair to say to them that they must pay the expenses of defending themselves, while, at the same time, they had no voice on the question of declaring war. If England were foolish enough to give them up, and if they were foolish enough to accept their independence, the result would be a heavy pecuniary loss to both. Supposing we withdrew our troops from Australia, and told the colonists they might make their own arrangements and become independent, in the first place we should lose zealous and affectionate friends, for in Australia the feeling of affection for England was universal, and she was still regarded and spoken of as home. If England had been wise enough not to quarrel with America in the last century, there would, no doubt, now have been an English race able to dictate to the whole of the world. Again, as regarded economy; at present the trade with Australia was protected by a couple of corvettes, but if those colonies were made independent, we should at once want a fleet to protect not only their trade but our own. On their side, again, they would lose the protection of England, which now stood between them and harm. It would be a great folly to give up all those advantages on both sides on the miserable, petty, and selfish plea of economy. In 1846 he went to Australia, and having inquired into the general state of the trade, and the relations of the colony, he found that the annual increase of English capital was then about 20 millions. On coming here in 1866, he was told that the annual surplus increase was now about 100 millions per annum; and while this was the case, and we were thrusting out our surplus wealth and trying it all over the world, he would suggest that the better plan would be to spend a little of it on our own people. One word with regard to education. If the army was to be a popular army, it was much insisted upon that it must be an educated army, but the army consisted of a certain class of people who were picked out from the rest of the community, and unless the population were educated, we could not hope to have an educated army. There was a good deal of talk lately about educating the population, but he begged leave to express an opinion that there was not one in ten of all these people who wrote and talked so much on the subject of education who had the least idea of the true meaning of the term. Reading and writing and arithmetic were not education. His definition of education was to teach a man, in the first place, his duty to God and his duty to his neighbour, and when they had done that they might superadd to it whatever training was necessary to fit him for the situation in which God had placed him. As to teaching a ploughman geology, or any of the other "ologies," it was simply absurd. Teach him to do his duty in the situation that God had placed him, and he would be a well educated man, but try and cram more into him, and you would make him a dissatisfied fool.

Mr. Connolly said that as a working man he took very great interest in the economy of the public expenditure, because he believed if the working classes were to be fully employed, and not to trust to Government for a proper sustenance for themselves and their families, they must be governed much more cheaply than they were at present. Now that the Government were making some efforts towards economy in the several departments—it was said that quills were to be mended, and that only one leaf of paper was to be used instead of two—he hoped the same would be extended. He had a great regard for Mr. Cole, who was a gentleman who had not made many mistakes in his life, but on this occasion he had made one of the greatest imaginable, that was to say, that he ought to have read this paper about three months before Mr. Gladstone formed his Cabinet, and then it was ten to one but he would have been one of that body in place of Mr. Cardwell. His suggestion was something like economy, knocking off seven millions at once, and he believed that at no period had this country been so favourably circumstanced for a sweeping economy as at present. They had peace all over the world, and the principles of statesmen—of acknowledged statesmen—now were peace

at home and non-intervention abroad. The colonists were to be no longer dragged at our heels—they were to be self-governing, and, if possible, self-defensive and self-dependent. This was illustrated in the case of New Zealand, for England had taken away the troops, and this colony, which, according to Sir William Denison, required more protection than any other part of the empire, would be left to the efforts of the colonists themselves, and they would have to fight their own battles if they were to reap the rewards of their own industry. He had been rather loth to interfere in this discussion, owing to the observations which had been made about the tailor, especially as he was a stonemason himself, so, therefore, perhaps, the cap fitted him, but when he recollected that the President of the United States, the commander-in-chief of the army of the United States, had been a tailor, he was emboldened; and, in addition to that, his memory served him to a little illustration, gathered from his early life in Ireland, which, if it did not demonstrate the valour of a tailor, certainly went to show his prudence and foresight. During the rebellion in 1798, there was a certain dandified young officer who came over to take the command of a company, and, not being accustomed to fighting, thought he would make some little preparation to guard himself from the pikes of the rebels. He accordingly instructed his tailor to put in the breast of his waistcoat a nice piece of polished steel, but, from some mistake or other, the tailor put the plate in the back part of his trousers. It appeared that shortly afterwards the company was called into action, and meeting with a strong force of rebels he had to make a retreat. In getting over a hedge at the extremity of the field, he was overtaken by one of the rebels, who made a dash at him with his pike and pushed him over, feeling certain that he had killed him, but the young officer scrambled to his feet and made off, remarking to himself that the tailor knew where his heart lay a great deal better than he did. He believed the English were of all nations on the face of the earth the most capable of defending themselves. They stood alone, surrounded by a moat, wide and deep enough to submerge all the armies in the world, and as long as they had to fight they asked no better foe than to see 100,000 Frenchmen land, and he was quite certain they would never find their way back again. Sir William Denison had deprecated the idea of any man interfering in military matters who was not bred up to it. In matters of detail and discipline that might be so, but surely the War Department was managed by civilians, and had been so for many years. Whatever was the present management, it appeared that they had produced the least efficient and and most expensive army of all Europe. Our object was to get something better and cheaper if possible, seeing that we had no reason to fear war abroad, and that our colonies were to be made self-supporting, which, if they were made independent to-morrow, would be as much advantage to the mother country as they were now, so that there was no reason why a vast reduction should not be made in the army. He contended that it was no advantage to have the colonies dependent; therefore, as we did not mean to be aggressive, and as we were defended by an ocean, and had a warlike, stalwart population, such as no nation in the world ever exhibited, including the sober, steady perseverance of Englishmen, the light step, and active lively spirit of Irishmen, and an evenly-balanced combination of both in the Scotch—with all these elements, and a good navy, we might bid defiance to the world. The real question at issue, then, was how best to take care of ourselves. Ireland had been looked upon as one of the most incorrigible portions of the empire; but it was found that during the late attempt at rebellion by 10,000 or 12,000 natives of the country, the Irish constabulary managed to hold it for the Crown. Sir William Denison had argued that a system which was applicable to France and Prussia would not suit England, and had spoken of the great difference of race between the Irish, the English, and Scotch, and so on; but, to his mind, there was no more difficulty in combining these different elements than those which composed the empire of France at the present day. Normandy, Provence, and other parts of France were as completely distinct nationalities in the middle ages as England, Ireland, and Scotland were at that time. Now they were all thoroughly incorporated as Frenchmen; and Prussia also was made up of different provinces and different nationalities, and he believed it was that very army system which had prevented the unity of the different portions of this country. He believed that heretofore the country had never been governed according to a sense of justice, but it had been governed by a class, and in the interests of a class; and while this was the case, the government had to be supported by hired soldiers. They dared not trust the defences of the country in the hands of a national army. But now they were coming upon brighter times, when the programme upon each side of the House was, "We must widen the basis of the constitution," and when it was understood that the fast line of demarcation which had heretofore existed befween different classes must be blotted out. If the empire were to be governed on principles of justice and equity like that, there would be no need of a standing army to keep the people in order. He was not competent to enter into the details of Mr. Cole's scheme, but he believed that a very small army, such as he advocated, would be perfectly capable of keeping order in the country. They knew what great difficulty was thrown in the way at the commencement of the volunteer movement, but still it had extended, and was extending; and if twice as much money were expended as there was at present, and they did twice as much drill, and made it a rather more business-like affair, and not so much an amusement, it would answer nearly every purpose that was required, which was simply that of defending the country. As for maintaining an army for offensive purposes, we never did, and never could. In older days, it was true, when the soldiers were wrapped-up in steel, they did go and make war on the Continent, but they could not stop there, and ultimately the idea of aggression was given up. If we desired to retain our colonies, they, of all places in the world, were most easily defended. Suppose 5,000 Frenchmen were to land in any of the West India Islands, we should only have to send over a number of iron-clads, and keep them there while they starved. No nation could carry on a war of any extent away from the basis of operations, and no nation would ever do a worse day's work than to attempt to invade one of our colonies; therefore, there was not the slightest necessity to keep up a large standing army for the protection of our colonial dependencies. He had no doubt that, if Mr. Cole's idea was taken up by military men who were capable of working out the details, they could make a most efficient system of defence for this country, and at a considerable saving of expense. If we were to hold the first place among the nations of the earth it would not be by arms, but by our industry. As long as he had to pay about one-fourth of the rent of the little house he occupied, in the shape of taxes, in addition to the indirect taxation, so that an income of £2 a week now was not worth any more than 30s. was when he first came to London, it was evident that the price of labour must be kept up at a very high rate, and, while that was the case, we could not go into the markets of the world and sell our goods at so cheap a rate as to be able to compete fairly with foreign countries. In conclusion, therefore, he would only say that any question of this sort, which tended to greatly reduce the national expenditure ought to receive the fullest and fairest consideration, and he hoped that Sir William Denison would use his influence with some of the scientific gentlemen belonging to the army, and induce them to take this matter up, and see what they could do to carry it into effect.

Dr. Stallard said he should not have addressed the present meeting, but that he had had various opportunities of seeing some of the defects of the present system, and he would, therefore, make a few observations, although, like the last speaker, he must reckon himself in the category of the "tailors." He would suggest, however, to Sir W. Denison that this was not a matter really of detail, but of general principles, and, therefore, he did not think the illustrations really applied. It was not quite true that if a man's coat did pinch under the arm the best plan would be to have it let out; but what if the coat was not as good as it might be, supposing it were too narrow across the back, and too large in the waist, and too long in the tail, and that when it was put on it could not be made to stay unless it was tied with a vast quantity of red tape, which prevented its being used with any comfort or advantage; under such circumstances he should think they would be perfectly justified in going to somebody else to provide them with a better material, and to alter the coat altogether. First of all, with regard to the recruiting system, Sir Wm. Denison had told them that the character of the army was the character of the labouring population, but if that were so, he believed it would be very different from what it was. It could not be denied that the system of recruiting failed to bring into the army a fair specimen of the labouring population of the country; a very small proportion, indeed, could read and write, and not more than three in ten were connected in any way with the mechanical or artisan class; and the proportion would not be so large as that, but that certain higher branches of the service, such as engineers, were included in the calculation. There was abundant evidence to show that the character of the men in the army was not what it should be. The fact of 20,000 soldiers going through the prisons annually was doubted, but there were rarely less than 4,000 in prison at one time in this country. While the strength of the army was generally about 60,000—it appeared by the last report of the medical department to be 57,000—he would ask whether there were any class of labourers in this country numbering 60,000 of which 4,000 were constantly in prison? The cost of these prisons and of the administration of justice was no small matter, besides the withdrawal of such a large number of men from their duty. In addition to the cost of the prisons themselves, there were the extra charges for the officers in charge and various other expenses connected therewith; but the mischief did not stop there, for the consequence was that every soldier was treated as a rascal and blackguard from the very hour he entered the service, and never was considered in any way capable of taking care of himself, either physically or morally. Just look at it from a medical point of view. There were always a large number of men in hospital, and this necessitated an immense expense for medical men and hospital management. If they treated soldiers on a different system altogether—a system of confidence, such as was pursued in some of the continental armies—an immense deal of this would be saved. A great number laboured under perfectly preventible diseases, dependent on want of self-control; in fact, one-third of the admissions into hospital were cases of this kind, which he did not believe could be said of any portion of the agricultural or artisan classes of the country. The same remark applied to many other cases of disorder. If a man had a sore throat he must be sent to hospital, because it was supposed he could not be trusted to take care of himself in the barrack-room. As soon as a man was enlisted, he was put into a room where he had to associate with 14 or 15, or 25 men, and from that hour he never had an opportunity of being alone, except when he was put into the cells. These cells, again, were constantly in requisition, and the number of men confined in them must be added to those in prison to show the total who were withdrawn from duty. When a man entered a barrack-room he entered a regular Pandemonium, which no one could describe except those who had lived in it. Men had told him that no one could imagine what they suffered for the first few weeks. Although this was a system which might raise the blackguard to a certain point (but, as a rule, the moral standard of the barrack-room was the standard of the lowest in it, and not that of the highest), all these things must affect the character of the soldier. Then, as to his duties; it was recommended some years ago that the men should be taught industrial arts, and he believed £1,000, or something like that, was expended in industrial teaching, which was utterly absurd, if any good effect were intended. A great part of the men who entered the army had no knowledge of any handicraft or trade, and therefore there was a better opportunity of improving them if they set about it in the right way. When he went over the barracks of the Marine Artillery, he found that, out of 14,000 men, between 500 and 600 were employed every day in erecting buildings of different kinds, and so on, and if this system were carried out throughout all divisions of the army, it would have an immense benefit in every way. As it was, those engaged in the guard-room were lying about in all directions, having really no occupation. He could not imagine any system in the world more likely to lead these men into every species of vice; and it was this which, in a great measure, necessitated all this complication of hospitals and prisons. Some of the military arrangements were perhaps the most insane things that could be suggested. If they went to Dover, they saw a man standing in a corner of a little cliff, by the side of a gun, not having the slightest idea of what he was doing; and there he was, night and day, according to circumstances, in wet or fine, hail or snow; and after having been there for two hours, he went into the guard-room, which was a place as hot as an oven, from which he again went into the cold air, and the consequence was that he often caught cold, and had to be sent to the hospital. The whole system of guard-rooms was to him a complete mystery. He had noticed at the guard-room at Dover there was an officer who was in charge for twenty-four hours, and his duties could have been equally well done by a couple of policemen. Then, again, how bad was the system of discharging the men who had broken down, and were unfit for duty, in consequence, very often, of the exposure to which they were subjected. How many went away with a paltry pittance of 6d. a day for twelve months, and then after were left to be paupers. If the men in the army were properly trained, and regarded as men, the army was capable of being made into a great educational power, for a man who had been properly drilled in habits of obedience and discipline, and educated in other ways at the same time, would be turned out a better member of society in all respects, instead of being turned out as he was now, a pauper on the parish. Then, on the question of marriage—and this, he believed, lay at the bottom of the whole system—out of the 57,000 soldiers in this country, between 8,000 and 9,000 were acknowledged to be married men, while, in all probability, there were 1,000 or 1,500 men who were married but not known to be so; so that at least there must be 10,000 married soldiers in England; taking the average of two children to each, there would be something like 20,000 children. The consequence was that with those 57,000 soldiers there were associated no less than 30,000 women and children. Why, the very idea would be laughed at either in France or Prussia. The army was seriously impeded by this great number of women and children, and an immense expenditure was added in every way in consequence. A few years ago, no attempt was made to recognise the fact that there were women and children connected with the army, but after considerable pressure had been put for some time an attempt was made to do so, and Parliament made a grant for the purpose of providing accommodation for married people in the army. Of course, if it were right that married people should be provided

for, it ought to be done thoroughly, instead of which, as he had seen in more than one instance, there were often three or four married couples in the same room. At the present moment there were a great number of married couples not provided for in any way, who had to be lodged in single men's rooms. In addition to the grant of £30,000 a-year, there was a considerable amount to be added for repairs, for it was generally found that children were very destructive. Then, again, female hospitals were required, for, although until very lately the women had had to lie in in the ordinary rooms, an attempt was now being made to provide separate accommodation in the shape of hospitals for them. This also required a gigantic system of infantile education. He had known the case of a colonel, the greater part of whose time was taken up in the inspection of infant schools, for it seemed to be considered that it was absolutely essential that a special school should be provided, sometimes side by side with the national school. Then, again, there was an enormous cost in the continued removal of these 30,000 women and children, it being the system to move the soldiers about every six or twelve months. He thought the system proposed by Mr. Cole and Sir Charles Trevelyan was the legitimate mode of meeting the difficulty. If young recruits entered the army at about 21 it would be no hardship to expect them to remain for two or three years single. In his opinion the army would never be what it ought to be until the feeling was that for a man to be turned out of it was the greatest punishment that could be imposed upon him. He had put himself in communication with officers and privates in the Royal Artillery, which consisted of a better class of men, and he had ascertained that when the system was introduced of discharging a man who married without leave, it was soon stopped. He did not quite go with all the suggestions of Mr. Cole, but he quite agreed with the observation that the home army and that required for foreign service should be on an entirely different footing altogether. If the army were established on a proper basis he did not believe there would be any difficulty in finding men, for, in 1852, in the county of Leicester he raised 1,200 in less than three months for the militia, and he never looked at a man who did not measure 5 feet 5½ inches, and rejected many because they did not bring sufficiently good characters. He hoped this question would be thoroughly ventilated, and would not be allowed to drop.

Colonel Leahy, R.E., said he had given the subject considerable attention, and he was sorry that the discussion had digressed so much from the points and principles put forward by Mr. Cole. Having briefly recapitulated the main points of Mr. Cole's proposed scheme, he said in the first place he altogether dissented from the idea that such a discussion was to be limited to military men, and considering the successes which had attended the department to which Mr. Cole was attached in spreading a knowledge of art throughout the country, he hoped that his suggestions to improve the military art would meet with due attention. He believed the simile of the tailor had been misapplied, not only by Sir Wm. Denison, but by most of the speakers. They did not ask the tailor whether they should have a big coat or a little one, or what sort of cloth it should be made of; that was a question which they decided for themselves; and on the same principle he thought it was quite right that civilians should discuss what sort of defences they should have. Mr. Cole had been good enough to refer to a paper which he had lately read, on the subject of the organisation of the army, and he simply referred to that to show that he had divided it into three branches, only one of which he had taken up, so that the remarks which he had then made had reference only to the existing numbers as they were decided by the authorities. He expressed no opinion as to what the numbers ought to be under a different system. The principles to which Mr. Cole called attention was by no means novel, for 23 years ago the subject was discussed with reference to the Army Service Act, 1847. The reason for the introduction of that Act, which provided for a limited term of enlistment, was to induce a large proportion of men to enter the army, and to cause it to be a punishment to be turned out of it. It had also the object of providing a larger proportion of men for the Military Train, and of encouraging men to join a reserve force. It also recommended that men should be taught some industrial employment, so that, when they were discharged, the estimates would be relieved of a portion of the non-effective department. Nearly all these suggestions were taken into consideration by the Recruiting Commission of 1866, and it might be interesting to the meeting to state the conclusions which wound up their report. These were, in the main, that we must not rely on having time to prepare for war, which in the future would be sudden in its commencement and short in its duration, so that under these circumstances we could not regard the army at its present strength as sufficient for more than a time of peace. The question was discussed how it should be increased by means of reserved forces, and of insuring the service, when required, of men who had already served and gone back to civil life; but it was very astonishing to find that, at the conclusion of all, it was stated that measures already proposed to induce men to re-engage, still further tended to check that increase, and under these circumstances the Commission were not prepared to propose any plan as likely to secure any large army of reserve. That was the result they arrived at, and it could not be put too plainly before the country. It might be doubted whether it was good policy to induce men to re-engage, which involved the question of providing them with pensions. No doubt the principles which were advocated by Lord Grey, and concisely stated by him in a letter appended to the report of the Commission, were the right principles to adopt. It appeared that the volunteers cost £1 10s. a year each, and the militia soldiers £6, and of these 70,000 were in training. Now it appeared that the 6,000 permanent staff cost a great deal more than the 70,000 who were called out for training. The sum expended for training was £194,000, as against £205,000 for the permanent staff of 6,000, and this was irrespective of the cost of barracks, or anything of that kind. His opinion was that, considering the large proportion of officers in the army, the training of the militia ought to be provided for out of the regular forces; and, if that were done, he believed the expense of the militia could very well be reduced to about £3 per man. He had gone into the figures somewhat closely, and he found that a young soldier cost, on first joining the army, including everything personally to himself, about £32 a year, but the re-engaged soldier cost about £40, so that, in place of re-engaging the men, they sent them home and took new men. To a certain limit he agreed with Mr. Cole that young soldiers should replace the old ones, but as regarded the scientific and special corps he should certainly rather go in for quality than quantity. There was another point of great importance which he much wondered had not engaged the attention of Parliament. It appeared that in one year they had re-engaged 30,000 soldiers, and those had a right to a pension some ten years hence, the capitalised value of which would be about £130,000, that was the capitalised value of the effects of one year's re-engagement, and that really ought to be put into the Post-office Savings' Bank, if they wanted to provide for the amount of their pensions. As far as he could make out, some 26,000 of those men would be alive ten years hence, and their pensions would then amount to half a million a year, while in twenty years there would be 23,000, and their pensions would be £450,000 a year, so that at that rate it would be a long time before Mr. Cole got down the estimates as he proposed. There was an immense amount paid for non-effectives in connection with the army, and he believed it would be a good system to remove these from the

army estimates altogether, and let them be administered by the Treasury, with the advice of the Chelsea Hospital Commissioners, in connection with the Post-office Savings' Bank. When a man was taken into the army the capitalised amount of his future pension should be paid over to a separate fund, so that the army estimates should simply bear the expense of effective men; in round numbers they now paid thirteen millions for an effective force. Mr. Cole put it at eight millions, but he did not think it possible to get it down so low as that.

Colonel Maude, R.A., without endorsing the whole of Mr. Cole's scheme, would say one or two words in favour of it, as affecting the position of the men. Officers were very advantageously circumstanced as compared with the men. As soon as they had finished their drill or other duties they knew how to employ their time, while the men had no such advantage, and for want of having other resources they took to debauchery, which ended in the crimes to which Dr. Stallard had alluded. The figures, however, which had been stated with regard to crime in the army, must not always be understood to mean what they appeared to mean; for instance, when it was said that one-fifteenth of the army passed their lives in prison, it must be understood that almost all those crimes which entailed imprisonment were caused by drunkenness, and the necessity of military discipline visited the offence of drunkenness much more severely than was the case in the general community. He ventured to say, that if artizans, or even the upper classes, were judged as severely as the soldier in that respect, there would be a great deal more crime appearing in our annals. He became interested in this subject by personal experience; and some years ago, when a superior officer of his insisted on his attendance between ten and one every day at the barracks in case an officer was wanted, in addition to the regular drill or duty, he found this was the most cruel thing which could be inflicted, being, in fact, simply enforced idleness;—there was nothing to be done, and no opportunity for study or recreation of any sort, and then it occurred to his mind that this was what the men had to endure throughout the whole of their career. A great deal had, however, been done lately for soldiers, and their pay had been increased 50 per cent. within the last two years, and a great deal also had been done in the way of education; but, at the same time, he was sorry to say that the crimes which were spoken of, connected with idleness, rather increased than diminished, which would appear to prove that neither money nor education were of such value as moral instructors. There were two things which he thought would do great good—one that of having the fixed hours for military exercise more clearly defined, and the other of employing the men in different industrial occupations. He might mention that some years ago he had to do with the getting up of an industrial exhibition for the regiment he belonged to, in an out of the way part of the world, but it failed, simply because the men did not know any trade at all, and yet they were supposed to be superior to the ordinary run of the army. Another thing to be borne in mind was that Englishmen seemed particularly adapted for out-of-door labour. It was found that even factory operatives in a very short time became thoroughly competent agricultural labourers, and as skilful as any peasant. He would therefore suggest that farmers in the immediate neighbourhoods of camps and barracks should be able to obtain the services, when they were required, of a certain number of soldiers, so many hours a week, at so much an hour, which would greatly facilitate many agricultural operations. It would also be very easy, as suggested by Mr. Chadwick, to establish a contract with railway companies for taking the men at very much reduced fares where they had to go a considerable distance. On this matter he could speak from experience, for he had lately found that one of the large railway companies was very glad to enter into an arrangement of this kind; and where rough work was required the men could easily be supplied with a strong suit on purpose, which could be paid for out of their earnings. Employment of this sort should be purely voluntary, and allowed as a reward for steadiness and efficiency. He believed that such a plan would have very good effects both upon the soldiers themselves and the employers of labour, and would tend to bring large portions of waste land into cultivation, and also raise the wages of the agricultural labourer. It would also introduce the system of piece-work in this kind of labour, which was now introduced in Australia, New Zealand, and Canada with very great advantage. It would afford a stimulus both to farmers and labourers, would diminish idleness amongst soldiers, and would render them capable of earning a livelihood as colonists, and he believed it would render the army very popular with all classes.

Captain Beaumont, M.P., would not venture to express any very decided opinion as to whether Mr. Cole's system was right or not, but he must controvert the assertion made in the paper that a subaltern had only one hour's work a day. He had just come from Sheerness, and it happened that he was very fond of playing rackets, but the subaltern on duty had often told him he could not spare even half-an-hour to play a game with him. If they looked at the duty subalterns had to do, it would be found that it represented an amount of bodily labour which was not by any means consistent with the low rate of pay which they received. It was said that a soldier was looked upon with suspicion, but as an officer of 17 years' experience, having been always what is called a sentry-going man (that is, one always on ordinary duty), he distinctly denied the assertion. It was perfectly true that they had to deal with what unfortunately was the scum of the population, and he would not say whether or not that should be remedied, but considering the material they had at their disposal, it was dealt with in as kindly a way as was consistent with due and proper discipline. He quite agreed with what had been said by Dr. Stallard with regard to married quarters, but this evil was being remedied as rapidly as possible. Marriage itself was a most delicate subject, and, being a bachelor himself, he would not touch much upon it. It had been said that the army should be so regarded that a man ought to consider it the greatest grievance to be turned out, but could they ever expect such a state of things to exist? He believed not, unless they went the length of paying something like four or five times the amount which was paid at present. If a man, an artisan, in full work could get from 5s. 6d. to 6s. a-day, when a soldier only got 1s. a-day, how could they expect the position to be so much looked after? The great point they had to consider was the two systems of army management, that of a regular army, and that of a volunteer or temporary army. The advantages of a regular army were that the men were always drilled to it—they all knew that one of the greatest improvements in manufactures was that of putting every man to that particular work which he was fitted for—but the principle proposed by Mr. Cole appeared diametically opposed to that; he assumed that every man should attempt to be a soldier, and Prussia was brought forward as an instance of success in that particular direction, but he believed it was recognised as a fact, by the highest authorities, that had the Prussian war been continued for another year the whole country would have been bankrupt, owing to the system which existed in regard to the army and navy having almost put a stop to trade and the ordinary business of life. If that was really the state of affairs in Prussia, he would leave any one to judge what it would be in a country like ours. He represented a large northern constituency, where a great number of people were employed, and he knew the answer he should get from them at the hustings if he were to propose that all males between 16 and 26 should be taken away for a certain period to learn drill. It might be economy in one sense that the army estimates

should be reduced for the year, but it was a question whether, on the other hand, there would not be greater loss upon the community. This was the point on which he should have liked to have heard more discussion. It was said that a soldier could be made within a short time, but there were doubts with respect to that. The experience of Garibaldi and his volunteers showed that they answered very well as long as they were fighting against men who were not soldiers, but the instant they came to fight against the Austrians, they could not even make a breach in the Austrian front. They did very well for skirmishing on the mountains, but Garibaldi never himself dreamt of such a piece of folly as to put them in front of regular troops. Then, again, came the Americans. They were very quick, and might be expected to bring men to perfection as soon as any one, and no doubt, at the close of the war, they brought out as fine an army as could well be seen in many respects, but the first time they were in action was at Fort Sumpter. Having blazed away for a long time the fort surrendered, and the only man killed in the whole action was one who lost his life through the fireworks when the fight was over. Two English regiments would have walked right through the whole country, at the beginning of the war, before the men were trained. They must not, therefore, too lightly or easily throw on one side any system which was found to work well. No doubt there were one or two points which required modification. He believed that the three services were far too much separated; he should like to see them brought under one head; then, under such a scheme, the army would be rendered as efficient as possible, and possibly reduced in number, but nothing should be done to affect the efficiency of that number; and then there would be a nucleus round which all the valour of the people might cluster in time of need. In the next place, with regard to the militia, he believed they might be made a very efficient second body of reserve; and, lastly, he should like to see—what would come very nearly to Mr. Cole's suggestion—the volunteers put on a more satisfactory footing. He should like to see the Government take them a little more in hand and increase the capitation grant, and although it might cost the country a little more it would be money wisely laid out, because there might follow a much greater decrease in the regular army itself. As far as he could see, the volunteers had behaved honourably and patriotically, and deserved every possible encouragement. The system he would suggest would be that the man should give his time, at any rate for a certain period, for drilling and training, and should engage at a proper time to subject himself to military law if required. When that was done, every other expense should be borne by the country. He believed a compromise of that kind would tend very much to increase the efficiency of the defences of the country.

Mr. Spencer Walpole said it appeared to him that although they must leave to military men the task of organising the army, still there was a preliminary process of converting civilians into soldiers which might fairly be considered open to general discussion. He would not go into details which had been discussed by other gentlemen, but, according to the wish of Mr. Cole, confine himself to the main characteristics of the scheme proposed, which seemed to be the formation of a very small standing army, and, coupled with that, the liability of a large proportion of the adult male population to serve their country in case of need. He thought the time would have been more usefully occupied if these two points had been more prominent in the discussion. He had a few objections to make under each of these heads, and, in the first place, he thought Mr. Cole had enormously under-rated the requirements of the country in the way of a standing army. He would leave to others to decide the question whether our great colonies should be left to defend themselves, but, at any rate, it was worth reflection that the army which Mr. Cole proposed would be barely sufficient to maintain our Mediterranean garrisons, and it appeared to him to need no demonstration that if England was to maintain her commercial supremacy, which was almost identical with her maritime supremacy, we must maintain in different parts of the world garrisons to protect our different coaling stations. He was aware that Mr. Cole excluded India altogether from his calculations, but the number he proposed was barely sufficient for Gibraltar and Malta.

Mr. Cole begged to explain that he proposed to keep a standing model army always in England, and that the additional numbers of artillery, engineers, and the like, which he proposed should be always kept up, should be employed in the colonies, such as New Zealand, &c. He had provided for the colonial garrisons nearly on the same scale as at present. It might be a question for discussion whether he had sufficiently provided for these matters, but he had certainly not overlooked them as Mr. Walpole seemed to imagine.

Mr. Walpole believed all military men would be of opinion that these scientific corps must be supplemented by ordinary troops in large garrisons. The £30,000 which Mr. Cole had provided for the colonial corps was about the sum now spent in colonial corps strictly so called, such as the gun Lascars and native troops in India.

Mr. Cole remarked that his idea was that the colonies should be in immediate communication with England, so that troops could be sent them by steamships directly they were required; and in all these places, including Gibraltar and Malta, he always proposed to keep a force of artillery and engineers.

Mr. Walpole had no wish to argue the matter, but was quite content to leave it to the sense of the meeting whether or no it was desirable to have standing garrisons in these colonies. Passing to the second point, that one-thirteenth of the population should be liable to military service in case of need, he would observe in the first place that he had no objection whatever to drilling the population; he had been a volunteer himself and knew the benefit of it, but if one-thirteenth of the population were liable to serve as soldiers when required, there was an end of the voluntary system, and it became compulsory. It must come logically to that. If the Government had not the power of calling out these troops, where was the reserve, and if they had, it was compulsory military service, which he objected to, as being only another name for conscription, and he believed the system of conscription was not only bad economically, but opposed to all the principles of free government. If they preferred to pay to keep up a standing army, which he believed the great majority of the people would, why should they be asked to disband that army, and make themselves all liable to military service? He preferred paying another man to do the work which Mr. Cole wanted him to do for himself. He believed it had been a maxim of every political economist, from Adam Smith downwards, that it was cheaper to pay another man to guard your house than to do it yourself. If Mr. Cole's views were sound, we ought, on the same principle, to disband the police, and defend ourselves in every possible way. Of course it was suggested that those who did not like to serve might pay a substitute; but there would be many who might strongly object to military service who could not afford to provide substitutes. There might be two workmen, one earning 40s. and the other 10s. a week; the recruiting sergeant did not go to the 40s. man, because he knew there was no inducement for him to take the shilling; but the moment compulsory service was introduced, there would be no distinction between the well-paid workman and the common labourer; and in proportion as the intelligent artisan was taken, instead of the uneducated peasant, so the productive power of the country would be reduced. The only proper stand-point from which to view this question was what position would they be in in case war broke

out. Mr. Cole's scheme might do very well in time of peace, but he did not think sufficient provision was made for the enormous strain which would be put upon us in time of need.

Sir Charles Trevelyan said he had obtained the permission of the Chairman to speak for a few minutes on one special point which had been alluded to by Dr. Stallard, that of marriage in the army. That gentleman had expressed his opinion that marriage was incompatible with efficiency of military service, and also highly detrimental to the moral character of the women and children thus brought into connection with the army, and there could be no doubt that he was right to a great extent. He had considered carefully what were the motives which led to marriage in civil life, and he felt certain that the animal instincts had much less to do with it than was generally supposed. The most prominent feeling in a young man just entering upon life was that of curiosity to see the world and the ways of the world, but after a time this desire became satisfied or blunted, and a new feeling came over him, which, he believed, was, in most cases, the motive for marriage, namely, a desire to be settled, and have a home of his own. He would not attempt to analyse it further, but it was closely connected with the affections, which crave for appropriate exercise after the novelty and excitement of youth are over. He believed this was the experience through which male humanity ordinarily passed, the first stage being longer or shorter according to the disposition of different individuals, but generally lasting about five years. Now, according to the scheme of a popular army, the great majority of men would serve for one year only, after which they would return to civil life; and of course there would be no hardship in prohibiting these men from marrying, even if they had the wish, which, in the great majority of cases, they would not have. If they married in spite of the prohibition, they should be dismissed. Then, for the regular army, he advocated a seven years' term of service, and even that was not at all incompatible with abstinence from marriage. If a man entered the army at the age of eighteen, his term would expire at twenty-five, which was just about the time when, if his (Sir C. Trevelyan's) theory were correct, he would begin to think of settling, and there would be nothing whatever to prevent his forming a marriage engagement in the last year or so of his service, which would have a beneficial moral influence upon him. There only remained, then, the class of twelve years' men, who he proposed should act as instructors of the rest, and in their case he saw no objection to marriage; on the contrary, the position which they held in the army would be strengthened by their being married men.

Captain Wake, R.N., said he had only a few remarks to offer, and they would be principally on the necessity of making some provision for emergencies. Nobody could suppose that it was left to our own option whether we should be prepared for defence or not. Even Exeter Hall agreed that perilous times were coming upon us, and there could be no doubt that we ought to be prepared in the best possible manner. The first and most important step towards the organisation of a national army was, in his opinion, to obtain a faithful record of all the men in the country, and allot each man his own proper position in the event of danger. There was an enormous army of roughs and paupers in the country who would be of the greatest service in the event of a sudden breaking out of war, provided they each had a station allotted them where they could put themselves under the direction of an officer appointed for the purpose. They did not want every one to be a soldier at once, but they did require that every man should know where his post was in case of danger. It was all very well to talk of ironclads, but he had not so much confidence in our naval supremacy as at the time when wooden ships alone were in use, for the simple reason that wood would float whilst iron would not, and they never knew when an ironclad would go to the bottom. He did not, therefore, think that the system of defence would be complete without a national army, and the first step towards that would be to enrol every man, and allot his position, where he would be placed under the control of somebody who would instruct him in his duties. When this was done, the further organisation of the system might be left in the hands of regular military authorities.

The discussion was then adjourned to Monday, March 1st, at 11 a.m.

Cantor Lectures.

The fourth and concluding lecture of the course by Mr. S. A. Hart, R.A., "On Painting," was delivered on Monday evening, the 22nd inst., the subject being "Landscape Painting." An outline of these lectures will appear in the *Journal* at an early opportunity.

Twelfth Ordinary Meeting.

Wednesday, February 24th, 1869; Thomas Bazley, Esq., M.P., in the chair.

The following candidates were proposed for election as members of the Society:—

Cluff, William, Grosvenor-house, Hoe-street, Walthamstow, N.E.
Dickens, Thomas, Middleton, near Manchester.
Harriss, J. Fordham, 7, Twickenham-park, Middlesex.
Hewson, Henry, 2, Brighton-villas, Twickenham.
Hogarth, George, The Elms, Foot's Cray, Kent.
Jacomb, Arnold, 70, Jermyn-street, St. James, S.W.
Matthews, James, 26, Wimpole-street, W.
Paice, Bowes A., 9, George-street, Hanover-square, W.
Tulk, John Augustus, Dunster-lodge, Spring-grove, Isleworth, W.
Whitley, John R., Railway Brass Works, Bowman-lane, Leeds.

The following candidates were balloted for, and duly elected members of the Society:—

Birkett, Frederick Blow, Hampton-court, W.
Brandreth, Edward, 1, Elvaston-place, Queen's-gate, W.
Daubeney, Colonel, C.B., Osterley-lodge, Spring-grove, Isleworth, W.
Despard, Frederick, West-hill, Highgate, N.
Hughes, Samuel, C.E., F.G.S., 14, Park-street, Westminster, S.W.
Lermitte, Edwin, Muswell-hill, N.
Lloyd, Edward, The Winns, Walthamstow, N.E.
Trevelyan, Sir Charles E., K.C.B., 8, Grosvenor-crescent, S.W.
Wright, Henry W., 3, Keith-terrace, Uxbridge-road, Shepherd's Bush, W.

The Paper read was—

ON VENTILATION.

By Dr. Edward Smith, F.R.S.

Part I.—General Principles.

I am quite aware that there are many persons who seek to increase and to spread knowledge on the subject of this paper, whilst there are others who know nothing about it, and who care nothing, so long as they are not interfered with, and others still who regard it as a fashionable folly of the day, but a necessary evil. There are not a few who attach sufficient importance to it to invent a method of ventilation; and I fear that it may be said that there are nearly as many views on the subject as there are advocates of it, so that, in the dis-

cussion of this evening, we shall, doubtless, be all of one mind!

It cannot be denied that, of late years, increased attention has been given to the ventilation of public buildings, and that improvements have really been effected; but the subject is still novel, and in both its theory and practice calls for more accurate and extended information than we possess. We might, therefore, to-night profitably consider any of the several divisions of the subject, such as the abstract principles involved in the movement of the air, the ills which follow deficiency or excess of ventilation, the numerous methods by which architects and others are groping their way with much blundering to a satisfactory result, or specific directions as to the ventilation of each kind of public and private building.

My own experience, official and otherwise, leads me to think that a discussion of a practical nature upon two of these divisions would be the most useful at the present time, but as they are too extensive for one paper, I purpose to consider only one of them to-night Those persons who ventilate our public buildings have, I think, a tolerably correct opinion on some of the more obvious principles of the science, but they fail in not duly weighing the limitation of those principles in practice, and thus fall into error. Hence I think it will be useful to attempt to correct these errors, by considering, in a brief manner, some of the principles involved in the science of ventilation, with the methods at present in use, and the conclusions at which I have arrived. The second part, to which I have referred, is the practical consideration of the existing modes of ventilating our private and public buildings, and the plans of construction which are required for different classes of buildings, in order to render them healthy and fitted for their purpose; and this must be deferred to another occasion.

The essential part of ventilation is movement of the air from a particular place. It follows that when a portion of air has been removed from a part of a room another portion will rush in, and, although it is usually implied that the removed air is less pure than the new supply, this is not a necessary consequence; since ventilation is required even in the open-air, and in masses of air of equal purity. No ventilation can be effected without movement of the air, but with the movement other actions follow; and so important are they that movement may be beneficial even when the new supply shall be less pure than the removed air. The regulation of the movement of the air is, therefore, the basis of the practice of ventilation, whilst the character of the new supply is an element which demands careful attention.

The necessity for movement of the air is based upon the requirements of the body and the constitution of a mass of air. The body must rid itself of heat and moisture, and of certain noxious and offensive products; the two first chiefly by the skin, the third chiefly by the lungs, and the fourth by various organs. As to heat, the body is warmed chiefly from within by the changes which the food undergoes; and as, nothwithstanding any excess in the supply of heat, it is maintained at about an uniform temperature, it follows that it must rid itself of superfluous heat by discharging it into the air. Air is, however, a bad conductor of heat, and when the excess of heat is considerable, the layer of air about the body cannot remove it with sufficient rapidity, but in proportion to the rapidity of the movement (other things being equal) will the heat be more or less rapidly dissipated. What lady has not proved this by her fan? And in hot weather, or in a hot climate, how delightful it is to hold up the naked hand even, much more to expose a large part of the body to the punkah or the breeze. This, it will be observed, is not a question of air at different temperatures, but with air at the same temperature; we may feel hot when the air is stagnant, and cool when it is in rapid motion. Yet, in certain conditions, and in a degree, cooling of the body may be attended with cooling of the air, for it is chiefly effected by the sudden conversion of the fluids of the body into vapour by perspiration and respiration, from which an immense amount of heat becomes latent, viz., loses its sensible effect upon the thermometer, for the latent heat of vapour is about 1,000 times greater than that of fluid. The abstraction of this heat occurs near the surface of the body, and the air in contact with the body and the body itself may become cooler. Hence the body is cooled both by contact with the air, or by transmission of heat, and by evaporation of fluid, or the absorption of heat, and for both processes movement of the air is necessary. The moisture which is emitted from the body is absorbed by the air, but the capacity of the air to absorb moisture is limited, and at a low temperature is soon exhausted. Hence, as one layer of air loses its capacity, there is need for movement to bring a new supply.

But besides these two operations, the sense of comfort and the state of the spirits, and thence of the health, require movement of the air. You enter a large room which has been shut up for a long time, and with a sniff of the air you remark its want of freshness. If you stay in it you feel low spirited and unhappy, and yawning, with or without headache, will follow; but introduce a punkah, or adopt any mode by which the air is set in motion, and some sense of relief will follow.

So much for the body. But the air itself, in order to keep it somewhat uniform in character and fitted to maintain health, must be in motion.

A closed house is generally a damp house. The lower stratum of the atmosphere holds more moisture than the higher. The air surrounding living bodies receives contamination, as it also generally does when in contact with the works of man; and the sewage system and the gas light system of our day do not a little to foul the atmosphere. But this applies to a limited portion of the atmosphere, and when the air is in motion other portions not thus tainted are supplied, whilst the contaminating matters become less and less noxious or disagreeable as they mix with the larger volume of purer air, until they are no longer perceptible or efficient for evil. This applies not only to spaces enclosed by four walls, but in some degree to our courts and alleys and even to our streets and towns, for it has been shown by Dr. Angus Smith, Professor Roscoe, and others, that such places, being confined, have the air more contaminated than that in the open fields, or on the top of a mountain. Hence we need ventilation to drive the air of rooms into the courts, of the courts into streets, and of the streets into the country, and to draw to us the air the good qualities of which our country friends do not always fully appreciate.

Movement of the air is of two kinds; one always quiet, by the interchange of gases, a physical property which is essential to air and all gaseous fluids by which gases of different kinds mix together, and if enclosed acquire one composition. A whiff of tobacco-smoke, or a jet of vapour of eau de Cologne may be seen or smelt for a moment in a certain spot only, but in a short time, as we know, it extends and impregnates the whole air within certain limits. This is constant, continuous, and without observation, and is of the utmost value in ventilation. It moreover acts in all directions, and is limited only by the amount of the matter to be distributed, and by the enclosure of the whole volume of air. Without this influence the exposure of the body to foul and noxious agents would render life miserable, and in the end would destroy it. How soon would the bedhead, for example, be a reservoir of deadly gases.

The second kind of movement is due to influences acting from without, a body of air. The winds are the great ventilating agents, and their influence penetrates wherever the external air can gain access, but their influence varies with their force and direction, and the obstacles which walls and other impediments offer to the movement of air. Their action must be the basis of any large system of ventilation, and in my opinion they must, under nearly all circumstances, be the chief agents.

Similar effects, but more limited in degree, follow mechanical contrivances. The punkah in hot climates, is an illustration, but in this climate the movement of persons in a given space is the most frequent agent, and when we limit our observation to a room, the movement of persons through it and within it, is not by any means without effect. The currents which occur with open doors and windows are due to the movement of the external air in so far as they result from this mechanical action only, for narrowing an aperture in a stagnant room does not produce a current as it would were the air in motion.

The third important cause of motion is that of heat. Air expands 1-480th of its bulk for every degree of heat, Fahr., above 32°, and, consequently, if we take an ordinary-sized room (say 20ft. long by 12ft. wide, and 10ft. high) there would be an expansion of 5ft. for each additional degree of heat, or a practical loss of 60ft., equal to a layer 3in. deep over the whole room, with an increase of 12 degrees of heat. This would be equal to lowering the height of the room from 10ft. to 9¾ft.—assuming, of course, that no fresh air at the lower temperature were admitted. An essential condition of this change is that the heated air ascends, since it is lighter, and there are currents moving upwards, whilst, at the same time, the air which is colder descends and causes descending and lateral waves or currents until the whole mass has attained an uniform degree of temperature. Every person, and every light in a room, is a cause of these currents, and the room in which we are now assembled is full of them. As the total volume of air increases it follows that some must escape (unless we assume the room to be air-tight, when, with expansion of the air from heat, there will be condensation from pressure), and this will occur at the top of the room if there be openings, or at the sides, or even at the bottom if there be no other mode of escape. When the air becomes cooler it condenses in volume, and more air is admitted by descending or lateral currents into the room.

With elevation of temperature certain other conditions occur, which have great importance.

The power to cool the body by contact is lessened.

The air is capable of absorbing a larger amount of moisture, and is relatively drier, until the increased quantity has been supplied.

The skin is rendered more sensitive to cold, and the tendency to perspiration, by which the heat of the body is removed, is increased.

Above a certain degree there is a tendency to exhaustion of nervous power and relaxation of tissues which render an individual less capable of mental and bodily labour; lassitude, low spirits, headache, and indisposition to make any effort, are well-known results of occupying a close and hot room.

Part II.—Modes of Ventilation.

Such is a short reference to some of the more evident and important principles involved, and I now proceed to offer a few observations on existing methods of ventilation. The ordinary method even at this moment is simply by windows, doors, and fireplaces, and the variation in amount of ventilation is due to the degree in which these are opened. The objections to this plan are:—

1. The attention of some person is required to regulate the openings according to the degree of ventilation required; and as this cannot be the chief duty of a particular person, whether in a private or a public building, and it would not be easy to find a person for the duty with sufficient knowledge and judgment, the result is either too little or too much ventilation.

2. In the summer time, when ventilation is required but fire is not wanted, it is very usual to close up the chimnies, and particularly those of bedrooms. In cold weather and at night all doors and windows are closed, and they act as ventilators only in the degree in which they are ill-fitting, whilst ventilation is particularly required in bedrooms at night, and the use of gas in the long winter evenings calls for good ventilation in sitting-rooms.

Such an arrangement cannot be otherwise than defective, yet it has not been objected to even in some hospitals, for during a late discussion on this subject it was gravely affirmed that the ventilation in workhouses must be defective, because workhouse nurses were said to be less reliable than those of a particular hospital in reference to the opening and closing of the windows.

Many devices have been adopted with a view to ventilate by windows. Some have the double hung sashes by which air may be admitted at the highest and lowest parts, and in a degree in the middle also, in such proportion as may be desired, and this is, I believe, the best construction at present known, provided the window extend so near to the ceiling that, when the upper sash is drawn down but a little, the entering air may be so far above the bed, or above the head of the inmates, that the current may not be injurious. It is, therefore, inapplicable as the sole means of daily ventilation to low rooms, viz., to rooms less than ten feet in height. Some windows have the upper portion to fall inwards, with a view to direct the current of air upwards, and it is held in that position by a cord, or by falling into a hopper with the sides of the V-shaped space closed or open. Such a ventilator admits too large a volume of air in one place in cold weather, and in order that it may be safely used the room must be of great height, as, for example, 14 feet and upwards, but even then it causes discomfort, since the current of cold air eventually falls, and the room becomes cold, unless other means of warmth are provided than open fireplaces. I have, however, seen this plan in operation in windows within three feet of the head of the sleeper, but in such places the natural remedy was applied, viz., to shut them, except when kept open in the presence of superior authority. Others have the lower half of the window to fall forward into a hopper, and the evils just mentioned are intensified; whilst a more modern, but scarcely better, invention divides the window into four or more parts, each or all of which may be opened at pleasure, and fails for the like reason.

A very frequent contrivance in the old iron window frames is to provide a special portion in the centre or upper part of the window which may be opened inwards, outwards, or laterally, or fall inwards into a hopper. Such openings are always placed too far below the ceiling, but the quantity of air admitted in one place is smaller than where the opening extends across the whole sash, and they are only so far less injurious. The old lattice window, which opens by hinges on its side, is in like manner unfitted for the purpose of ventilation, except in conditions where a large volume of air could be admitted without injury.

These evils having been appreciated, ventilation has been effected by placing perforated zinc or perforated glass panes in some parts of the windows: or a strip of perforated zinc has been placed across the top of the window-frame, to act when the upper sash is drawn down, and where the windows have been high, and the ventilating panes have occupied the highest elevation, the plan has been very valuable, but the principle is that of a ventilator, and not of a window, and will be again referred to.

Ventilators, properly so called, are found in great variety. Some are placed in the ceiling, and communicate with the room by openings of various forms and sizes, and with the external air by external gratings, with or without special channels, or simply by the accidental openings in the roof. The principle involved in their use is that the foul air ascends, and should leave the room at the top, whilst fresh air enters at the bottom. The term foulness of air is often another expression for simply heated air. If the heat be generated within the room, whether by gas or living beings, the air will be both heated and foul, but when generated by fire in a proper stove or firegrate, or by hot-water pipes, the air may be heated, but is not foul. But

assuming that the air is both heated and vitiated, it does not follow that the foul air will ascend to the top of the room, since certain noxious matters, as carbonic acid (the chief product of respiration), are heavier than air, and with a still atmosphere, and the source of vitiation at the height of a man or of a bed only, will, in a degree, tend to accumulate in the lower part of the room. The principle is, undoubtedly, correct in reference to the products of gas-burning and to crowded rooms, where the generated heat and foul air are considerable, but for ordinary bed-rooms at night, without gas or fire, and with few persons sleeping in a room, it is not applicable. In such conditions it is true that heat is generated, and that heated air ascends, but as the increase in the quantity of heat is not great, and as the ascending current of the heated air meets air which has not been heated it gives out a portion or the whole of the excess, and further ascent is retarded or prevented. The higher the room, and the less the degree of heat generated, the weaker will be the ascending current, and the less the quantity of air which will pass out by ventilators in the ceiling, whilst, on the contrary, the greater the supply of heat, and the lower the room, the stronger will be the ascending current, and the greater the quantity of air which will escape. Hence its operation is not equal and universal; and, from the above statement, it will be seen that it is always insufficient to remove the heat, unless conjoined with a system of openings in the lower part of the room, that is to say, where the foul air is generated.

Further, it is not an universal proposition that air will be admitted below and escape above. With little increase of heat, it will be admitted both above and below, and with much increase of heat it will escape both above and below, although in greater amount above than below. Some of the openings so placed in the ceiling or roof communicate with the external air by a tube, defended on the outside by a cowl or other contrivance. The rapidity of the current, whether directed outwards or inwards, will depend upon the size of the tube, the difference of temperature of the internal and external air, and the force of the wind, but where the tube is large, and the generation of heat is not great, the current is usually inwards. Some such ventilators have the tube divided by a perpendicular diaphragm, which, in fact, makes the one tube into two; and it is stated that the air ascends by one and descends by the other. Whether it will ascend by either depends upon the amount of heat generated within the room, but even where the latter is very great, and there is a strong current upwards, it will be found that there is an ascending and descending current in both tubes—currents not of equal force or volume, but varying with the admission of air by other openings, as I observed when instituting inquiries into the sanitary state of printing-houses and workshops for the Privy Council.

The fallacy which lies at the root of these statements is in ignoring the fact that inhabited rooms are not boxes hermetically sealed, or having only one opening for the admission of air, ignoring the existence of doors and windows, which even when closed allow a certain quantity of air to pass. If the room were a box, closed, except at the ventilator, it would follow that if air passed out it would also pass in by the opening; and it may be that under certain conditions of temperature the air would rise in one tube and fall in another, but such rooms do not exist. The most frequent approach to this condition is where there are two fire-places in one room, in one of which a fire is burning, and the doors and windows fit well and are shut, for in such a case there may be a down draught in the chimney without a fire. But even this is not universal, for with the tendency to rarefaction of the air which occurs by reason of the heated air passing up the chimney, the hand placed at the sides of the door or window will perceive an unusual rush of air inwards to prevent a vacuum, and thus prevent the necessity for a down draught. Moreover, where there is only one chimney, and the doors and windows fit closely, the fire languishes, and the more so the longer the doors and windows remain shut from the rarefaction or loss of air which the heat induces. Open the door or window, and the fire will brighten, and the sense of oppression felt by the inmate will pass away.

In practice it will be best to consider that air will both enter and leave by openings communicating with the external air wherever placed, and with the ordinary construction of doors and windows if air be removed at any height the deficiency will be immediately supplied; but, in order that heated air may be quickly removed, it is essential that there should be openings at the upper part of the room.

Other ventilators are placed in the upper part of the side walls, and are either entirely open or defended in some manner. Such are air bricks, or yet larger openings, and, when not defended, they will admit air in proportion to the size of the opening, and the force and direction of the wind. When not defended it is scarcely possible that the current of air will not be felt by the inmates, and where much heat is generated, and the current sets upwards and outwards, it may be felt as injuriously as when the current is from without and downwards. Hence some defence is needful, and if none be provided the inmates will, if possible, extemporise one by the aid of rags, clothing, or bricks. The defences are:—

1. Perforated zinc of varying degrees of fineness of perforation—the finer, the more is the current divided and the less it is felt, whilst, at the same time, the greater is the impediment offered to the admission of air, and the less air is admitted in a given time.

2. A solid, but movable barrier, which may be drawn away laterally or vertically, or allowed to fall forward into a kind of hopper, or the ordinary glass or wooden louvre ventilators. Such may be entirely closed, and then they are no longer ventilators, and when the hopper is open not only is the current directed upwards, but the entrance of air is impeded. Hence, when open, the value of these ventilators varies with the quantity of air which they admit in a given time, and their fitness depends upon their sufficiency, and upon the sensation which the inmates have of the existence of a current.

3. A fixed barrier to the direct entrance of air, placed at a little distance from the external or internal opening. This is sometimes so effective as to nearly destroy the value of the ventilator by preventing the entrance of air.

4. Different elevations of the external and internal openings, by which the entering current strikes the wall, or the side of the tube, before it is admitted into the room, and its force is broken. The efficiency of this depends upon the length of the tube and the force of the wind.

A third series of ventilators act by mechanical means, or by an arrangement for the production of heat, and consist of tubes, of various forms, which communicate with the rooms and the external air.

The Archimedean screw is an example of the former, and, being placed at the top of a flue, is moved by a vane acted upon by the wind. It has been proved that a screw, moved in this manner, carries up a column of air as it would a column of water; but it is dependent for its action upon the wind, and when winds are light, as in summer, and circulation of air is specially required, it fails. When in action its efficiency depends upon the length and diameter of the tube, in relation to its own power, and it is more efficient in the upper than in the lower rooms of a lofty house. It must also be added, that the tube will act as a ventilator, like other tubes, without the screw, and will admit or give exit to air on the principle already laid down.

Special openings into the chimney, as by Arnott's and Toynbee's ventilators—the former of which is liable to allow the smoke to escape—and flues passing by the side of chimneys, are examples of the second series, since

their special action as ventilators is due to the warmth of the chimney, by which an ascending current of air is induced. Such flues act in proportion to the temperature of the air within them, and therefore to the heat of the chimney, their proximity to the chimney, their length, and the volume of air which they contain; and it is clear that neither ventilation into chimneys, nor flues placed by the side of a chimney, can produce an upward current where there is not a fire burning, or where the chimney or special flue is not heated. This is very frequently forgotten by architects, and as fires are not commonly made in bedrooms at any season, nor in any rooms in the summer-time, they fail to produce an ascending current. Yet they may not be entirely useless, since air will usually descend by them when it cannot ascend, and they supply air to the room; and as the special flues are less dirty than chimney flues, the air they admit may not be disagreeable to the senses.

To remedy this defect, a jet of gas is sometimes placed within the flue or a reservoir of hot water, or a fire is placed near the upper part of the flue with a view to produce and maintain an ascending current of air. The efficiency of all these methods depends upon the amount of heat applied in relation to the width and height of the flue, and it must not be assumed that because there is a single jet of gas in some part of the flue an ascending current will be always maintained. The efficiency must be tested by experiment. The openings of such flues are sometimes placed at the ceiling either with one grating or with several, more or less concealed in the cornice which extends around the room; or they are placed at different elevations in the side walls, or on the central line of the floor of the room. One of the more recent inventions of this class is the ventilating gas burner, by which fresh air may be admitted from without, and consumed air emitted by the chimney; but the state of the ceiling shows that, in some instances at least, the whole of the foul air is not removed, and it is too costly for universal use. Another is the ventilating stove by which fresh air may be admitted from without, and warm air driven through into the room, and both currents may be regulated. This may be adopted without much increase of cost if the stove be introduced when a stove of some kind is needed. Care should be taken to remove the entrance opening of the warm air so far from the chimney opening that the current may not be directed up the chimney instead of into the room. The forcing or suction pump, or the driving wheel, may also be mentioned; but their use is restricted to large public buildings. They are, however, very effectual in creating a draught, whether by withdrawing or injecting air. All these artificial methods, however, are costly, and nearly all of them are dependent upon conditions which require the aid of man.

Part III.—Conclusions.

It now remains for me to state summarily the conclusions to which a consideration of the subject and my official experience have led me.

1. Interchange of air which proceeds both by diffusion and removal is not instantaneous. The rapidity of the interchange varies with many circumstances.

2. The effects of any natural system of ventilation vary with the season as well as with the special conditions of a building and the number of inmates.

3. There is a relation between ventilation and temperature, which in reference to inhabited rooms is generally an inverse one, and as the human body requires a temperature of the air of from 55° to 65°, according to the season, ventilation in cold weather must be restricted by the lower, and in hot weather by the higher temperature.

4. The movement of the air, although so essential to health, must not be very perceptible lest it should cause discomfort and disease. Hence the inlets and outlets must not be very near to the inmates, and the current must be divided.

5. The ventilation should, if possible, be self-acting after the amount required in a given room and under given conditions has been fixed.

6. Any general rule which may be laid down as to the number and size of the ventilators required in a room will demand modification by experience, since the admission of air will depend upon the elevation of the site, the direction of the prevalent winds, and the impediments which surrounding walls and buildings offer, and these cannot be the same on all sides of a building.

7. Some differences in the plan, and much in the extent to which the plan should be carried, must depend upon the use of the rooms and the destination of the building, as to whether it be a private house, a public building with a fixed number of occupants, or a building, as a theatre, with a very varying number.

8. There is a relation between space and ventilation, for it is evident that with defective ventilation (not entire absence of ventilation) the larger the quantity of air in relation to the number of occupants the less the immediate evil, whilst at the same time, the larger the mass of air to be moved the greater is the force, or the more extended are the means, required to move it. In private houses the cost is often unimportant, but in general, and particularly in reference to workhouses, hospitals, and other charities supported by voluntary contributions, the aim should be, by providing the best ventilation, to reduce space to the strict requirements of the occupants, and thus to utilise in the greatest degree the money to be expended. That relation must be determined by experiment. Both architects and amateurs are apt to give undue weight to the lofty, spacious, and handsome appearance of their buildings, and too little to the solution of the problem of fitness with economy.

9. The test cannot be the life or death of the inmates, for health may be failing long before it ceases. Moreover, there are various degrees of health, and each person has a separate aspect of health, and it is not at all easy to indicate in particular cases the first period when some injury may have been done to it. A test is required by which we may infer that injury would result if the cause were continued, and this must clearly be derived from observation. A close-smelling or a foul-smelling room may not be immediately injurious to health, but it is disagreeable at the least, and as such should not be allowed; and although the most injurious emanations from the body are not offensive to the smell, their emission is accompanied by the emission of offensive odours, and the two will co-exist. There is thus a relation between them which may be made useful as a test, so that if in an inhabited room the air be foul to the sense of smell it may be regarded as injurious to health. But the degree of relationship is not exact, since an uncleanly person, or even a cleanly one, having the peculiarity of emitting strong odours in an unusual degree, will cause the air to be foul almost as soon as he enters, whilst another cleanly person may stay some time in the same room before rendering it offensive. Hence, in making the estimate, we must strive to ascertain whether the foul smell proceeds from dirty clothes, and particularly dirty stockings and unwashed skins, or is simply that which occurs with cleanly persons. When there is no offensive smell it may be assumed that the ventilation is sufficient; but as a certain amount of want of freshness, or closeness, is found in our bedrooms or other rooms without known injury to health, I am of opinion that the ventilation is sufficient when the air, after the night's use, is not more offensive than is found in an ordinary private bedroom of the middle classes. Absolute purity of air in inhabited places, whether rooms, houses, public buildings, courts, streets, or towns, however desirable, is not necessary to health, and is not attainable.

10. The test cannot be the means provided to effect the passage of a given quantity of air through a room in a given time, for if the ventilation depend upon natural

agencies, it will vary with the force and direction of the winds, the impediments to their action upon a particular ventilator, the frequency with which doors are opened, and other varying causes. If the room were closed, except at particular places, and the air were, by artificial means, conveyed through apertures at a known rate, it would be possible. We do not, however, live in closed boxes, and we cannot separate ourselves from the influence of natural causes.

11. Where persons do not occupy the same room or rooms throughout the 24 hours, but use other rooms, and particularly spend much time in the open air, defective ventilation of those rooms will be less injurious in proportion as they are used for a shorter period of time.

12. The cost of ventilating buildings is usually of importance. None can be so little as that mode which introduces the external air directly, but with proper safeguards, whilst all artificial systems are expensive.

13. No system can be efficient, in a public institution, which depends upon windows, doors, and fire-places alone; but, for thoroughly renewing the air on fitting occasions, it is desirable that there be windows on both sides of a room, and particularly in public buildings.

14. When air is introduced on one side of a room only, whether by windows or by ventilators, the extent of its influence will vary with the conditions already named, but there is a relation also between it and the width of the room in reference to satisfactory ventilation. It is evident that, with little force of wind, the air will penetrate into the room but little, and with greater force the more; and also that, with a given force of current, the narrower the room the more certainly will it traverse it, and the wider the more certainly will it not traverse it. Hence, with such an arrangement, a wide room will be less perfectly ventilated than a narrow one, and a point may be readily reached at which the influence of such means of ventilation will be *nil*. Rooms with windows or ventilators on one side only should be very narrow, and still more so if there be no ventilation apart from the windows. A wide room, with windows only on one side, and no special ventilators which act permanently, must be ill-ventilated and unhealthy, as has been shown in the Nightingale Ward of King's College Hospital.

15. When air is introduced on two opposite sides of a room by windows or special ventilators, the current will usually extend further than twice the length of the current from one side of a room, and, as the wind will usually act upon one or the other side, the current will have greater force than with air openings on one side only. But there is a limit to the width of rooms so arranged, for, as the current must not be too great to be borne by those inmates who are placed near the external walls, its power to traverse the inner space is restricted. In very wide wards the ventilation in the middle is not so satisfactory as that near the external walls.

16. Where air is introduced into the centre of the floor of the room a current is produced in the part over which the inmates pass and repass, and is, therefore, very perceptible. Cold air in considerable quantity can rarely be introduced with propriety in that position, but warmed air might be borne.

17. Each room should be so constructed that its ventilation may be independent of that of staircases or any other room, but where two rooms are placed side by side with a partition wall between them, each having windows on one side only, the ventilation of each is improved in proportion as a part of the partition wall is removed. Thus, one room may improve the ventilation of the other, and both be as if they had windows, or ventilators, on both sides.

18. Ventilators should be placed on opposite sides of a room, be of small size, sufficiently numerous to affect all parts of the room, defended on the inside by finely perforated zinc, and be placed at the floor level and ceiling level.

19. Ventilators in a small part of a room only are insufficient for ventilation, since when a current of air passes between two openings the greater portion goes in a direct line, and does not greatly mix with the air lying on either side of it. This may be readily seen when smoke is admitted by an inlet and emitted by an outlet ventilator, or such an arrangement as exists in prison cells.

20. Where the conditions rapidly vary, as in churches, chapels, and theatres, it is impossible to devise a system which will not require modification by an intelligent person. At present the system is universally defective, and only after the heat has become great and the persons very sensitive to cold are the doors or windows opened. The aim should be to regulate the admission of air from the moment when persons enter, so that the temperature shall never be materially increased, but remain at, say 56° in winter, and 62° in summer. Cool air, without draughts, is better borne than hot air with intermittent draughts. In very lofty rooms the apertures for the admission and emission of air should be below the top, not too far removed from the occupants of the seats, the sources of the heat. In addition to this, however, ventilators should be placed in various parts of the ceiling, and be kept under control by a competent person.

21. Such rooms should be thoroughly aired after every occasion of their use, by the full opening of windows. At present, with three services at a church or chapel, this is neglected, and the air is close, heavy, and foul in the afternoon and evening.

22. No artificial means of ventilation should be relied upon solely, which will not act by day and night and throughout the year. Hence with ventilating stoves, which are very valuable, and ventilating air-flues, there should be other and self-acting means of ventilation.

In conclusion, it may be useful that I should sum up the principal errors into which architects are now falling in the systems of ventilation which they recommend. They are:—

1. In not duly estimating the practical limits of the law, that heated air ascends, and the relation of numbers of inmates and size of rooms in the application of the law.

2. In not duly considering that air shafts, acting under that law, cannot act in all seasons, and with and without fire alike.

3. In not duly estimating the amount of air which can be admitted by windows and doors alone.

4. In not duly estimating the practical limits to which an entering current may be carried, whether from one or both sides of a room.

5. In not duly considering the effects of currents upon inmates, and the limitation thus demanded upon the amount, force, and elevation of currents.

6. In not duly estimating the inverse relation of ventilation to temperature in its effect upon inmates, and particularly upon the old and the young.

7. In not duly estimating the influence of the winds, and the impediments of surrounding buildings, &c., upon each aspect of a building.

8. In having incorrect views as to the direction of the current through ventilators at different elevations.

DISCUSSION.

Mr. Varley opened the discussion by a description of what he called the Society of Arts' ventilator, a prize having been awarded to it in 1843, the main feature being a hollow cornice running round the room with perforations inwards, and also a communication with the external air. He said it had been very successfully applied in a school in Baldwin's-gardens and in various other places. He believed the only true mode of ventilating large public buildings was by reversing the ordinary condition of things, by creating a downward draught, which would draw away all impurities, while the fresh air should be admitted at the top, the apertures through which it entered being so divided and arranged that it should come as a shower rather than in a block or

current. He thought this system would be very applicable to picture galleries, where it was very desirable to avoid dust.

The Chairman said he had not intended to offer any remarks to the meeting, but it occurred to him that the subject of ventilation was a very important one, particularly with reference to mines, where the lives of many hundreds of human beings often depended on proper ventilation. There was no way of introducing pure air into a room or building without at the same time making provision for the exit of foul air; and if there were only a sufficient number of apertures, he believed the matter would pretty well regulate itself. He recollected an observation of Dr. Reid's, who was employed to ventilate the Houses of Parliament, to the effect that if houses could be constructed something like a sieve, that would be the most complete system of ventilation. This principle of construction, however, had not yet been introduced. Some few years ago he remembered hearing an explanation from the Rt. Hon. William Cowper of the ventilation of the House of Commons, in reply to a series of complaints which had been made of the draughts which caused inconvenience to members. It appeared that in order to test this matter, a number of very delicate films had been suspended in the House, hardly perceptible to ordinary observation, but those who were employed to watch them could hardly discern any movement, plainly showing that the draughts which had been complained of were, in great measure, imaginary. Mr. Cowper also stated that the temperature of the air was carefully regulated, and its purity ensured by being passed through water; if too damp or too cold it was dried and warmed by passing it over hot surfaces, and if too hot it was cooled by being passed through pounded ice, so that on the whole the atmosphere of the House was as equable as was possible in a building which contained sometimes 500 people, and sometimes only 40 or 50. Dr. Edward Smith had opened up a most interesting field for inquiry, and he hoped it would be pursued.

Mr. Meyer remarked, in relation to the ventilation of hospitals, that it was almost impossible to remove all impurities from walls and floors of buildings constantly occupied by sick persons. He therefore advocated the use of smaller temporary iron buildings, which might be erected in gardens, where the vegetation assisted materially in preserving the purity of the atmosphere.

Dr. Stallard was sorry to say he had not learned much from the paper, which did not contain so much new matter as he had hoped; and several important questions had not been touched at all. They did not yet know so much as they ought as to the real effects of foul air and bad smells; and even the effect of carbonic acid upon the human body was by no means well ascertained. He believed it had been shown that animals could live in an atmosphere containing a very large amount of that gas, provided the mixture of carbonic acid and air were constantly renewed; while, on the other hand, pure oxygen would eventually cause death if the same gas were breathed over and over again, although it might be constantly purified by being deprived of all the carbonic acid which resulted from respiration. Where the oxygen was frequently changed, however, life was sustained. This showed that effectual ventilation did not depend upon the mere removal of carbonic acid. With respect to the practical question of ventilating rooms, he believed they were still much in the dark, and he wished Dr. Edward Smith's paper had thrown a little more light upon the subject. As far as his own experience went, and even taking the results arrived at by the Sanitary Committee for the Army, he thought that in the case of large rooms there had as yet been a failure in all the proposed means of ventilation; at any rate it was plain that small rooms were much more easily ventilated than large ones. With ordinary sized rooms he believed the best system yet proposed was that of Captain Douglas Galton, but even with that a difficulty arose when the fire was not always in action, and in such cases the room might become very offensive at an early hour in the morning. Ventilators which depended on perforated zinc were exceedingly difficult to keep in order in large towns, for a short time since he had been engaged in an investigation at the Tower, when it was found that a large number of ventilators were quite inoperative owing to the perforated zinc being clogged with dirt and soot. He must protest against the standard of ventilation which Dr. Edward Smith had set up, namely, the ordinary condition of a private bedroom amongst the middle classes; he was continually, as a medical man, going into such rooms, and found, in very many instances, that their condition as to ventilation was disgraceful. With respect to the relation between space and ventilation, he looked upon the former as the most important, and was altogether opposed to the idea of sacrificing space to ventilation. He was aware that it was easier to deal with small bodies of air, but at the same time it was more difficult to prevent draughts and currents, which were felt by the sick with peculiar force. One mode of securing circulation he had lately seen applied, which appeared to possess many advantages, and to be an improvement on the method described by Mr. Varley. There was a double cornice made of zinc, which was, at the same time, cheaper and more ornamental than the ordinary ones of plaster; it was composed of two parts, one being in connection with the chimney or a ventilating shaft specially constructed, and having openings into the room, and the other communicating directly, at various points, with the open air, both being capable of regulation by valves. He was not prepared to say that this plan was altogether satisfactory, but it certainly presented advantages of its own, one of which was the facility with which local currents could be set up in different parts of a room. If cold air were admitted at the bottom of a room it almost inevitably produced a cold current surrounding the feet, whilst its admission at the top had the effect of producing a series of secondary currents, which were very difficult to get rid of; they were even known to occur in a common chimney when the fire was burning. He confessed he was still in the dark as to the best mode of ventilating a large room where a number of people were assembled, and he hoped Dr. Edward Smith's second paper would afford them a little more information on the subject.

Mr. J. C. Wilson thought the paper which had been read left very little unsaid on the matter in a scientific point of view, but he differed from Dr. Edward Smith as to the best mode of warming and ventilating private dwelling-houses. He belived a great mistake was made in limiting the question to that of rooms; they should rather take the house as a whole. In all houses there was one fire almost continually burning, that in the kitchen, and the simple practical question appeared to him to be how best to utilise that so as to warm the fresh air which entered the house below; this air would then pass up the staircase and along the passages, warming and ventilating the various rooms, the foul air escaping at the top of the house. Probably the best mode would be to employ the kitchen fire directly in heating water, which, in turn, would warm the air. If necessary, the kitchen fire might be easily kept in continuously.

Mr. Ashe did not quite understand how the double cornice described by Dr. Stallard would work in the event of there not being a fire. At any rate he hoped that before the second paper on the subject was read all these details would be carefully looked into and explained. He also remarked that in many cases the Arnott ventilators did not answer, or smoked, simply from the want of their being properly proportioned to the size of the chimney, of the opening at the fireplace, and of the outlet at the top. In other cases a plate of sheet iron, placed inside so as to form a kind of syphon

with the ventilator, had proved of great service in preventing the ingress of smoke.

Mr. Waller said he agreed to a certain extent with the views of Mr. Wilson as to the propriety of warming and ventilating the whole house, but he did not agree that the outlet should be at the top of the house. The Arnott ventilators were best for ordinary rooms, but if the opening to the chimney were too large they would not act properly. If the opening of the ventilator and that of the fireplace were not much larger than the outlet at the top of the chimney, it would generally act well, particularly if air were admitted into the room from an opening in the wall, and not by leaving the door open.

Mr. Philip Palmer said that Dr. Edward Smith had found fault with the present method of ventilating churches, but he should be very much obliged to him if he could suggest a better. He believed the difficulty arose from the way in which churches were now built, for, generally speaking, the windows were now nearly on a level with the seats, so that the hoppers or louvres were but very little above the heads of the people, who consequently suffered from the draught when they were opened.

Mr. Tracy believed Mr. Wilson's suggestion of ventilating the whole house from the hall was the correct one. Between architects and speculative builders, he believed the idea of the Chairman, that houses should be built like sieves, was pretty nearly carried out, and, where this was not the case, the houses were not by any means healthy to live in; as an instance of which, he might mention Buckingham Palace. He believed architects looked too much at the outside, instead of considering for what purpose the house was intended, and using every effort to make it comfortable and convenient to live in. Engineers could now tell exactly the proportions requisite in a chimney shaft to a certain sized furnace, and in the same way he thought architects ought to provide for the number and size of the apertures requisite for ventilating every room in a house.

Mr. Roger Smith remarked that, as the question of the incapacity of architects had been brought forward, and Buckingham Palace had been mentioned as an instance, it was only fair to mention that the larger portion was built by Mr. Cubitt without the assistance of any architect at all.

Mr. Cooper said, in reference to the suggestion which had been made as to ventilating a whole house from the hall, he might mention his own experience in a coal mine in Wales. The men had a great objection to cold draughts, and liked to be warm and comfortable at their work; and it was found, on the erection in the pit of a donkey engine, which was worked by steam generated at the mouth of the pit for the large pumping engine, the great length of pipe which conveyed the steam to the small engine not only made the air warm and comfortable. but kept up the ventilation throughout the works, which were rather extensive.

Mr. R. Rawlinson, C.B., did not agree with Dr. Stallard's criticisms on Dr. Edward Smith's paper, which he considered afforded a very good basis for inquiry and discussion. He quite agreed with Dr. Edward Smith that where foul air could be kept in motion it was much less noxious than purer air in a state of stagnation. He had before now been much puzzled to account for the good health of the people who worked in the midst of abominable stenches, which were supposed to be highly injurious, and he could only come to the conclusion that in such cases they were obliged to keep the windows and doors open, and thus a constant renewal of the air was kept up, which accounted for the immunity they seemed to enjoy from fevers and other diseases, to which one would have supposed they would have been subject. Air was as much a substance as water, and must be treated in the same manner, namely, if an opening were made for foul air to go out, a corresponding aperture must be provided for pure air to enter, or no movement would take place, and he must confess that, as a rule, this condition had been overlooked by architects. In modern houses of the better class, also, the builder's and joiner's art was brought to such perfection, every door and window being fitted so admirably, that there was no chance for ventilation at all, no special provision for it being made. It must not be forgotten that the class of houses he was alluding to were destined for a twofold use,—for domestic occupation and for receiving company, but the latter condition was entirely left out of sight in the construction. He did not know of a single house in London where any arrangement was made for extra ventilation on the occasions when the rooms were literally jammed with people. Human beings dreaded cold air much more than impure air, probably from its effects being more immediately appreciable, and as a consequence, wherever there was a visible opening of any kind it was always objected to. In his own house, after suffering a long time from headache, he introduced patent ventilators into the windows, but his wife and daughter never let him rest until they were removed; then Arnott's ventilators were put in all the rooms, but these also were objected to. At last he took off the top of the architrave from the dining and drawing room doors, and having made an opening through the wall, replaced the architrave, having first cut away diagonally a portion of the top so as to leave an opening for the entrance of air above the door, and this being not seen was in time forgotten, and had been found of signal service. His next step was to draw down the staircase window about four inches, and screw it fast, so that it should remain open night and day, and great increase of comfort had followed. In winter the aperture might be lessened to about one inch, and the effect might be further modified by putting a face board in frnnt, so as to direct the current of air upwards. Then, again, water-closets should, in every case, have a fixed means of ventilation freely into the open air, of not less than twelve square inches at the top; this should never be closed, and the arrangements of the seat should provide for its being closed before the handle was drawn up, an aperture in the cover being made for that purpose. Whenever there was a skylight at the top of a house there also should be a fixed means of ventilation. In the case of hospitals a much greater authority than himself, Miss Nightingale, was decidedly in favour of the natural plan of admitting the external air by windows on both sides of the room, modifying the current where necessary by double sashes or screens. This, however, required great cube space, and he did not believe any system of ventilation would make rooms as healthy as they should be when they were constantly occupied by patients, night and day. They wanted some arrangement by which a ward could be periodically entirely emptied, cleansed, and ventilated; and if any system could be devised by which the rooms should be occupied only twelve hours out of the twenty-four, he was satisfied that a great improvement in the health of the inmates would be the result. In the case of the great London hospitals, immense benefits had been derived from the use of carbolic acid (cloths dipped in it being hung up so as to diffuse the vapour), which appeared to have the power of destroying the poisonous organisms or emanations which infected the air of sick rooms, and where it was employed surgical cases could be treated with much greater safety than before. He knew of three large buildings scientifically ventilated, St. George's Hall, Liverpool, the Assize Courts, Manchester, and the Houses of Parliament. St. George's Hall and the Assize Courts were ventilated by Mr. Waterhouse, jun., and he had been informed by Dr. Percy that the system employed was incomparably superior to any plan hitherto adopted. With regard to the Houses of Parliament, the arrangements of the basement were probably the worst that human ingenuity could devise, for a main sewer ran right through the centre, and this sewer was until a very recent date, and

he believed was still, tide-locked, so that for a certain number of hours every day the contents were imprisoned. This would probably be remedied when the embankment and the low level sewerage works were completed, but there was nothing to prevent the sewer being moved and carried under the esplanade, or at the other side of the building, instead of along the centre of it.

The Chairman having proposed a vote of thanks to Dr. Edward Smith for his instructive paper, which was unanimously agreed to,

Dr. Edward Smith, in reply to the observations which had been made, said the subject of ventilation was a very wide one, and he ought not to be blamed for not having touched upon matters which did not come within the scope of the particular department which he had allotted himself for the evening, as mentioned in the paper. The ventilation of mines was, of course, a special subject, and could not be treated in the same way as the ventilation of houses or buildings. With regard to churches, one great defect in modern churches was the system of side galleries, the highest parts of which were, perhaps, fifteen feet above the floor, and underneath were sometimes congregated a great number of people, while there was no means of escape for the foul air. He should recommend openings through the galleries, so that the heated air could escape to the upper part of the building, and freely make its exit. The apertures for this purpose should be near the top, and small in size, so as not to cause a draught, while the present system of hoppers might still be retained for the purpose of ventilating the church when empty. One gentleman had complained that no information had been given how to use his doors and windows as means of ventilation. He contended that, inasmuch as windows were required to be closed at night, they must not be depended upon for ventilation, but other means must be provided. The system he recommended in workhouses was to build all the bed rooms with external windows on each side, but they were not dependent on these for ventilation, there being independent apertures for the purpose, defended on the inside by perforated zinc. The ordinary rooms might be built in two parallel rows, with a corridor between, and into that there opened a number of ventilating windows on each side, hung on a centre, and so arranged that they could not be closed. The closets were now all built so as to allow of a cross draught, a window being placed on each side. The same system was in a great measure applicable to ordinary private dwellings, and he could also recommend the suggestions of Mr. Rawlinson. Dr. Stallard objected to cold air being introduced at the top or at the bottom of a room, and he, therefore hoped that on a future occasion he would give them some suggestions of his own as to how it should be supplied, and also the results of his investigations into the action of carbonic acid, which was a most important subject.

The paper was illustrated by models of various systems of ventilation, contributed by Mr. Varley, Mr. T. Twining, Messrs. Hart and Son (who showed M'Haffie's self-acting ventilator), and Mr. Waller. Mr. Twining's model was intended to illustrate a plan proposed by him for establishing a through draught between the front and back of any building (including even those on the internal corridor system) without making the respective inmates dependent on each other. The corridor itself might be ventilated if necessary on the same principle.

Fine Arts.

Society of the Friends of Art, Lyons.—This society has just issued its annual report, which not only deals with what has been already done by it in aid of art, but also with the means which remain to be brought into play. The report expresses regret that the exhibitions of the society do not attract artists of the highest reputation, or pictures of the greatest interest, Paris presenting more material inducements to the artist than the provinces can possibly hold forth. One inducement suggested as capable of producing some effect is that the principal administration should apply a portion of the funds at its disposal in the purchase of modern pictures for its museum; the choice of such acquisitions, says the report, would be more sure, less contestable, than that of ancient works, and would have the effect of completing the collection and keeping it *au courant* with the history of art, by introducing year by year some of the most remarkable works of each period, and thus giving to students, as well as connoisseurs, all the pleasure as well as the practical advantages of comparison of the various styles of art. A museum should be less a depository of ancient art than a living city in which all ages and all kinds of merit are sympathetically united. If such a plan were adopted, it is certain that eminent artists would find it worth while to send their works to such an exhibition as that of Lyons, in the hope of their being purchased for its museum. The income of the society amounted last year to £2,382, and was employed as follows:—Purchase of fifty works of art, £1,110; prizes, £211; annual publication, £138; expenses of carriage, reduced by the railway companies to half the ordinary rates, £134; expenses of the exhibition and printing, £214; salaries and sundries, £224. In addition to this, the society acted as agent in the purchase of works of art for the town and for private amateurs to the extent of £1,020. Putting all the purchases and prizes together, the society was the means of benefiting artists to the extent of about £2,480 during the year—a result which certainly cannot be regarded as unimportant.

Commerce.

Exports of Silk from Milan to Germany and Switzerland.—The exports of silk from Milan to Germany and Switzerland during the year ending 30th September, 1868, show a considerable increase on those of the previous year, and were as follows:—

	From Sept. 30, 1867, to Sept. 30, 1868. No. of Bales.		From Sept. 30, 1866, to Sept. 30, 1867. No. of Bales.
By Splugen pass..	8,281	.....	9,358
By St. Gothard pass	6,207	.....	4,821
Total No. of bales	14,488		14,179

To Vienna, *viâ* Nabzernia, the number of bales sent from Milan during the year ending 30th September, 1868, was 1,569, weighing 116,728 kils.; whilst that of the previous year amounted to only 987 bales, weighing 73,337 kils.

Movement of Shipping at Antwerp.—During the past year, 1868, 3,547 vessels entered the port of Antwerp, and 3,504 sailed during the same period.

MEETINGS FOR THE ENSUING WEEK.

Mon.....Farmers' Club, 5½. Prof. Voelcker, "On the Adulteration of Feeding Stuffs and Artificial Manures."
Social Science Assoc., 8. Rev. Brooke Lambert, "On the Position of the National Schoolmaster."
Royal Inst., 2. General Monthly Meeting.
Entomological, 7.
British Architects, 8.
Medical, 7. Annual Election.
London Inst., 6.
Medical and Chirurgical, 8. Annual Meeting.

Tues ...Civil Engineers, 8. 1. Mr. Imrie Bell, "On Sinking Wells for the Foundations of the Piers of the Jumna Bridge, Delhi Railway." 2. Mr. John Milroy, "Description of Apparatus for Excavating the Interior of, and for Sinking Iron Cylinders."
Pathological, 8.

Anthropological, 8.
Syro-Egyptian, 7½. Mr. Bonomi, "On the Advancement of Egyptian Discovery."
Royal Inst., 3. Rev. F. W. Farrar, "On Comparative Philology."
Wed ...Society of Arts, 8. Mr. H. H. Sales, "On the Adaptation and Extension of Present Means for the Promotion of Scientific Instruction."
Pharmaceutical, 8.
R. Society of Literature, 4½.
Obstetrical, 8.
Thur ...Royal, 8½.
Antiquaries, 8½.
Royal Inst., 3. Dr. Harley, "On Respiration."
Linnæan, 8.
Chemical, 8.
Royal Society Club, 6.
London Inst., 6.
Artists and Amateurs, 8.
Fri .....Geologists' Assoc., 8.
Royal Inst., 8. Mr. W. Huggins, "On some further results of Spectrum Analysis, applied to the Heavenly Bodies."
Archæological Inst., 4.
Sat .....Royal Inst., 3. Prof. Odling, "Hydrogen and its Analogues."

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb. *Delivered on 1st January*, 1869.

Session 1868.

119. (x.) Trade and Navigation Accounts (30th November, 1868).
433. (ii.) Endowed Charities—General Digest.
461. (1.) Newspapers—Return.

Delivered on 8th January, 1869.

2. (i.) Railways Abandonment—Warrant of the Board of Trade.
2. (ii.) Railways Abandonment—Warrant of the Board of Trade.
2. (iii.) Railways Abandonment—Warrant of the Board of Trade.

Session 1868.

436. Local Taxation—Returns.
473. Iron-plated Ships and Batteries—Returns.

Delivered on 12th January, 1869.

Agricultural Returns of Great Britain, and Abstract Returns for the United Kingdom, &c., and Foreign Countries.

Delivered on 16th January, 1869.

Session 1868.

151. (x.) Trade Accounts (Foreign Countries).
402. (i.) Sale of Liquors on Sunday Bill—Index to the Report.

Delivered on 1st February, 1869.

Session 1868.

170. (ii.) Navy (Health)—Statistical Abstract.
232. (ii.) Industrial and Provident Societies—Return.
478. Poor Law Unions (Valuation Lists)—Return.

Delivered on 3rd February, 1869.

344. (a vi.) Poor Rates and Pauperism—Return (A).

Delivered on 10th February, 1869.

Established Church (Ireland)—Appendix to the Report.

Delivered on 11th February, 1869.

Session 1868.

344. (a vi.) Poor Rates and Pauperism—Return (A), corrected copy.
392. (i.) Grand Jury Presentments (Ireland)—Index to the Report.
471. Navy (Transports)—Return.

Delivered on 12th February, 1869.

Session 1868.

151. (xi.) Trade Accounts (Foreign Countries).
433. (iii.) Endowed Charities—General Digest.

Delivered on 17th February, 1869.

Business of the House—Rules, Orders, and Forms of Proceeding of the House of Commons relating to Public Business, 1869.
Queen's Speech.

Delivered on 18th February, 1869.

Private Bills—Statement of Proceedings.

Delivered on 19th February, 1869.

3. Bill—Endowed Schools.
1. (i.) Parliamentary Elections Act (1868) — Additional General Rules, &c.
7. Railway and Tramway Bills—Report of the Board of Trade.
China, No. 1 (1869)—Correspondence.
China, No. 2 (1869)—Correspondence.
Manufactures, Commerce, &c.—Reports by Her Majesty's Secretaries of Embassy and Legation, Nos. 5 and 6 (1868).
Poor Relief (Scotland)—Twenty-third Annual Report.
Sugar Drawbacks—Additional Papers.
Mecklenburg-Schwerin—Declaration of Accession to the Treaty of Navigation between Great Britain and Prussia.
Mecklenburg-Schwerin, Mecklenburg-Strelitz, Lauenburg, and Lubeck—Declaration of Accession to the Treaty of Commerce of May, 1865, between Great Britain and the Zollverein.

Patents.

From Commissioners of Patents' Journal, February 19.

Grants of Provisional Protection.

Artificial teeth—317—A. E. Harris.
Buildings, &c., warming and heating—3282—A. H. Smith.
Casks—414—C. T. E. Lascelles.
Chimneys, guards for—356—W. Blundell.
Clyster-pumps—382—E. J. D. Fossard.
Corsets—332—C. E. Brooman.
Cotton, &c., paste for fixing and brightening aniline and pigment colours in printing on—420—J. Clayton.
Cotton, &c., twisting yarns and other threads of—310—R. Caunce and M. G. and B. Bradley.
Electric light, producing—390—F. Jenkin.
Explosive projectiles—354—J. Jobson.
Feeding bottles—392—R., G., and C. W. Phelps.
Filters—416—J. F. Bentley.
Furnaces, &c.—422—J. A. F. Suter and T. C. Hinde.
Guns or ordnance, working—348—J. Vavasseur.
Hats, &c.—412—W. Lever.
Jacquards, &c.—378—B. Walker and W. Tilson.
Jelly broth, compound for preparing—374—H. A. Bonneville.
Lamps—428—G. A. Nowell.
Lifting apparatus—360—J. Taylor.
Looms—396—J. Wilkinson and W. Scott.
Looms—408—W. Hilton.
Meters for measuring water—432—B. P. Stockman.
Mixed fibres, separating animal from vegetable fibres in materials composed of—410—J. Stuart.
Organs—340—H. and J. Bryceson and T. H. Morten.
Paper, manufacturing—404—J. H. Johnson.
Paraffine oil—376—E. Meldrum.
Puddling furnaces—362—J. Halford.
Puddling furnaces, &c.—370—W. R. Lake.
Puddling furnaces, &c.—386—W. R. Lake.
Railway trains, communication in—292—T. Pimbley.
Railway trains, communication in—394—W. Williams.
Railway trains, communication in—406—K. B. Edwards.
Railway trains, communication in—424—J. E. Billups, W. Cooper, G. T. A. Hine, and W. Young.
Rosettes and trimmings—366—C. G. Hill.
Semolina and flour, machinery for manufacturing—342—J. J. Bagshawe and W. F. Batho.
Ships, &c., propelling—346—P. Jensen.
Slip hooks—350—G. Bray.
Steam engines, governors for—384—J. H. Johnson.
Stearine—364—A. Browne.
Steel and iron—426—G. F. Ansell.
Stoves—430—H. P. Hansen.
Surface condensers and refrigerators—358—J. Henderson.
Vacuum gauges, &c.—388—B. Hunt.
Water and drain pipes—3158—A. Robins.

Patents Sealed.

2508. J. McFarlane.
2596. H. N. Waters.
2599. H. Hughes.
2604. E. J. E. Niepce, jun.
2608. T. W. Rammell.
2613. T. Wrigley and J. Holding.
2617. J. Watson.
2646. R. Harvey.
2684. W. S. Fletcher.
2702. T. G. F. Dolby.
2709. E. Cortazzi.
2727. T. Butterworth.
2729. A. M. A. Laforgue.
2784. A. A. Lejeune.
2789. A. B. Ibbotson.
3167. R. Pearce.
3535. A. V. Newton.
3881. H. G. Thompson.
3923. H. G. Thompson.
3976. H. A. Bonneville.

From Commissioners of Patents' Journal, February 23.

Patents Sealed.

2632. G. S. Dracopulo.
2634. J. Jeavons and C. Martin.
2636. R. Scholefield.
2657. J. Hanson.
2664. B. Burrows, sen.
2665. N. J. Holmes.
2667. W. Strang.
2673. C. H. Gardner.
2689. H. Walker.
2695. L. F. A. P. Riviere.
2718. F. Preston and R. C. Ross.
2721. A. M. Clark.
2742. W. H. Crispin.
2831. M. Benson.
2998. J. H. Johnson.
3181. W. T. Rickard and W. C. Paul.
3720. A. Krupp.
16. J. G. Tongue.

Patents on which the Stamp Duty of £50 has been paid.

478. J. Young.
513. J. Kidd.
498. E. J. C. Welch.
520. T. Kennedy.
521. A. Moore.
539. H. S. Swift.
592. W. Clark.
574. T. Bulley.

Patents on which the Stamp Duty of £100 has been Paid.

448. J. Willcox.
425. J. Combe.
506. T. Watson and R. Dracup.
1248. J. E. A. Gwynne.
459. J. Spence.
492. T. N. Kirkham and V. F. Ensom.
482. R. Foster, jun.

Journal of the Society of Arts.

FRIDAY, MARCH 5, 1869.

Announcements by the Council.

Ordinary Meetings.

Wednesday Evenings at eight o'clock :—

March 10.—"On the Screw Propeller." By N. P. Burgh, Esq., C.E.

March 17.—"On the Trade and Commerce of Japan." By William Davison, Esq.

March 24.—*Passion Week.*—No Meeting.

March 31.—"On Technical Education, considered in relation to Female Schools." By Ellis A. Davidson, Esq., Lecturer on Science and Art in the City of London Middle Class Schools.

April 7.—"On the Theory of Boiling in connection with some processes in the Useful Arts." By Charles Tomlinson, Esq., F.R.S., F.C.S.

FINAL EXAMINATIONS, 1869.

In order to avoid holding these Examinations on the same evenings as those of the Department of Science and Art, it has been decided to hold them, in 1869, on the evenings of

TUESDAY, the 20th APRIL,
WEDNESDAY, the 21st ,,
THURSDAY, the 22nd ,,
FRIDAY, the 23rd ,,

From 7 p.m. to 10 p.m., instead of on the 27th, 28th, 29th, and 30th April, as announced in the Programme of Examinations for 1869.

In consequence of this alteration the Previous Examinations must be held forthwith, in order that the Forms No. 2 and No. 4, referred to in par. 6 of the Programme, may be sent in earlier.

A copy of Form No. 2 has been forwarded to each Local Board, and should be filled up and returned to the Secretary of the Society of Arts by the 11th inst.

A sufficient number of applications from candidates in all the subjects referred to in the notice at page 9 of the Programme having been received, papers will be set in Conic Sections, Navigation and Nautical Astronomy, Mining and Metallurgy, and Italian.

Local Boards having candidates either in the "Theory of Music" or in "Elementary Musical Composition (Tonic Sol-fa System)," should communicate with the Secretary of the Society of Arts immediately.

Free Libraries and Museums.

The Council have appointed a Committee to consider and report how the Society may aid in promoting the establishment of Free Libraries and Museums of Science and Art throughout the United Kingdom.

The following gentlemen have been invited to serve on the Committee :—

T. D. Acland, M.P.
*Antonio Brady, Member of the Council.
Professor Brayley.
*The Lord Chancellor, Vice-President of the Society.
*Hyde Clarke, Member of the Council.
*Henry Cole, C.B., Vice-Pres. of the Society.
*Sir Daniel Cooper, Bart., Member of the Council.
*Chas. Wentworth Dilke, M.P.
Hepworth Dixon.
*Captain Donnelly, R.E.
Captain Festing, R.E.
*George Godwin, F.R.S.
Lord Henry G. Lennox, M.P., Chairman of the Council.
Sir John Pakington, Bart., M.P.
Charles Reed, M.P.
*Samuel Redgrave, Vice-Pres. of the Society.
*Seymour Teulon, Member of the Council.
*James T. Ware, Member of the Council.
*General Eardley Wilmot, R.A.
*The Archbishop of York, Vice-President of the Society.

* Those gentlemen whose names have an asterisk (*) have already consented to serve on the Committee.

Thames Embankment Committee.

The Council have appointed a Committee to report upon the best way of dealing with the Thames Embankment, so that the opportunity may not be lost of making this noble site conducive to the embellishment and improvement of the metropolis.

The following gentlemen have been invited to serve on the Committee :—

The Archbishop of York, Vice-Pres. of the Society.
The Duke of Buccleuch, K.G., Vice-Pres. of the Society.
Lord Henry G. Lennox, M.P., Chairman of the Council.
*The Lord De L'Isle and Dudley, Vice-Pres. of the Society.
*Lord Elcho, M.P.
*Baron Meyer de Rothschild.
Rt. Hon. Russell Gurney, Q.C., M.P.
The Hon. Auberon Herbert.
*A. B. Beresford Hope, M.P.
*William Boxall, R.A.
*Sir William Bodkin, Assistant-Judge, Vice-Pres. of the Society.
Montague Chambers, Q.C., M.P.
*Henry Cole, C.B., Vice-Pres. of the Society.
*C. W. Dilke, M.P.
*W. R. Drake, F.S.A.
Lieut.-Col. Ewart, R.E.
*Alderman Sir T. Gabriel.
*W. H. Gregory, M.P.
Thomas Hughes, M.P.
Sir John Lefevre, K.C.B.
*John Locke, M.P.
*J. E. Millais, R.A.
*S. Redgrave, Vice-Chairman of the Council.
John Ruskin.
Alderman Salomons, M.P.
*Lieut.-Col. Scott, R.E.
*Seymour Teulon, Vice-Chairman of the Council.
*Sir Charles Trevelyan, K.C.B.
John Walter, M.P.
*Richard Westmacott, R.A.
*Joseph Whitworth, LL.D.
*Watkyn Williams, M.P.

Those gentlemen whose names have an asterisk (*) have already consented to serve on the Committee.

Artistic Copyright.

Lord Westbury has presented to the House of Lords the Bill "for Consolidating and Amending the Law of Copyright in Works of Art," pre-

pared under the direction of the Council, and the second reading has been fixed for the 12th instant.

Subscriptions.

The Christmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Art-Workmanship Competition, 1869.

The following is the report of the Judges, Messrs. George Godwin, F.R.S., Richard Redgrave, R.A., and Sir Digby Wyatt :—

In spite of the individual specimens of excellence, to which we shall presently allude, we are bound to confess that the response made by art-workmen to the Society's liberal invitation to compete for prizes offered during the last session, cannot, in our opinion, be regarded as satisfactory.

It will be remembered that the lists of subjects proposed differed materially from those of previous years—it having been considered well, as an experiment, to test the workmen's powers in the combination of original design with skilful workmanship, and in novel directions, rather than to keep them in the groove of the reproduction of the best works of the past.

We deemed some change of this nature requisite, from our observation that, while a fair level of mechanical perfection had been attained by the workmen generally, no such marked progress was realised from season to season as to justify the continued application of the large annual outlay made by the Society, in the attempt to foster and effect the improvement desired, but which could scarcely be said to have manifested itself.

Whether it is that the task recently set to the art-workmen has been beyond their present powers, or, as is more probable, that they look with anxiety only to what affects their regular employment, possibly, in some cases, apprehending notoriety as a fault rather than merit in their masters' eyes, certain it is that the results of their labour, taken as a whole, are not such as we had hoped for, nor such, by any means, as we think would have been made by French, or even Belgian workmen, had a similar invitation been addressed to them.

We do not necessarily attribute this to incapacity on the part of our art-workmen as executants, but ascribe it rather to their want, in this case, of the directing and sustaining power which is supplied to them, in the course of ordinary business, by the superior education and attainments of their masters and the artists and designers, from whose drawings, models, or suggestions, they may habitually work.

That it would be a national gain for British workmen to acquire that measure of facility in the application of skilled workmanship which distinguishes so highly the best class of foreign workmen, no one would probably deny. It was to encourage development in this direction that the modification, to which allusion has been made, was introduced into last year's programme.

The response being, in our judgment, so uncheering, we feel bound to recommend to the Society of Arts either a return to former programmes, or such a change in the conditions of their invitation as should recognise and reward not only the skilled workmen, but the talent and energies also of the masters, through whose application of capital and knowledge such workmen might be brought to the production of the real excellence and novelty we had hoped to have seen united in the present exhibition. We are emboldened to make the above suggestion in the full conviction that no such radical change is likely to be adopted without receiving that careful consideration at the hands of the Council of the Society of Arts, possibly after conference with us, which its importance may justify.

In the first division, "Specimens of Art-Workmanship in Prescribed Processes," we have recommended such rewards to be given as we considered right under the circumstances, but we do not feel justified in dwelling at length upon any of the specimens so rewarded.

Mr. Thomas Godfrey's panel for a cabinet, consisting of six different woods, is skilfully carved in delicate relief, in a manner familiar enough to French, Italian, and Spanish workmen, but not, as yet, common in this country.

In the second division—"Specimens of the Application to Ordinary Industry of Prescribed Art Processes," we regard as by far the most hopeful product, "the slab for insertion in the frieze of a chimney-piece," painted on a red tile, by Mr. J. B. Evans.

Considering the almost universal application of the processes of enamelling on metal in France, and the strides made at Birmingham in the industrial application of the process, we had certainly expected more important contributions than those forwarded by Mr. Frederick Lowe. They being the best and, the ring-tray in particular, being satisfactory both in design and execution, we have considered him entitled to a reward of ten pounds, but we are certainly unable to regard either specimen as "most beautiful."

Some of the clock dials exhibited by Mr. J. Thwaites, are agreeable in design and pleasing in execution. The collection is, however, of singular inequality in point of merit in design.

Mr. W. H. Slater's blackware slab, painted with the subject of "Pluto," is of good average execution.

Among the subjects sent in for exhibition, but not wrought in accordance with prescribed processes, the most to be commended, by far, is the painting on china, "Giving a Bite," after W. Mulready, R.A., by Mr. W. P. Simpson; it is an admirable specimen, although not a very important one as to size, of painting on porcelain, and we have awarded to it "The North London Exhibition" prize, in addition to a sum of five pounds from the Society of Arts.

We were particularly pleased with the delicacy of the modelling of the subjects "St. Cecilia," and the "Virgin and Child," after Donatello, by "W. W.;" we considered these to be admirable specimens of cabinet modelling.

We were much pleased with the steel die sunk by G. Morgan, after the head of a female modelled from life by himself; we regarded this as a work of great promise in a branch of art too little practised or considered at the present date.

Mr. John Barker's bracket, carved in Caen stone, and his flowers, and some carvings in marble, executed by "W. X. D.," were satisfactory.

Mr. Robert Taw's embossing in copper of a yacht in full sail, showed both taste and skill, although we regarded the form in which they had been brought to bear on the present occasion to be rather a misapplication of both.

Mr. Thomas Wills' alto-relief in boxwood, with an ebony border, of "Venus Genitrix;" Mr. Deere's renaissance ornament in copper; Mr. Eyre's painting on porcelain of the "Death of Goliath;" and Mr. Emms' wrought-iron-work for cabinet, were also commendable.

George Godwin.
Richard Redgrave.
M. Digby Wyatt.

The following is a list of specimens sent in competition, with the Prizes awarded :—

Works sent in in Accordance with the Prescribed Processes.

First Division.

1. (D.) Earthenware Slab, with figures painted in enamel colours. By J. B. Evans, Howard-place, Shelton, Staffordshire Potteries. Price £4 4s.

2. (E.) Earthenware Vase, with painted ornament in enamel colours. By the above. Price £8 8s. **PRIZE** of £2.
3. (M.) Design in Ivory and Gilt Metal-work, for cover of an album. By George Berry, 31, Brewer-street, Golden-square, W.
4. (N.) Clock Case, in amboyna and purplewood, with inlay of ivory. By Thomas Jacob, 4, Upper Charlton-street, Fitzroy-square, W. **PRIZE** of £5.
5. (N.) Marquetrie Panel. Designed and inlaid by F. Braun, 12, Star-street, Edgware-road, W. Price £9. **PRIZE** of £2.

5A. (P.) Centre of a Chimneypiece, a combination of mosaic and inlay with carved stone. By John E. Daly, 33, Medway-street, Westminster, S.W. **PRIZE** of £5.

6. (Q.) Panel for a Cabinet, consisting of six different woods. Designed, carved, and inlaid by Thomas Godfrey, 21, Chatham-road, Wandsworth-common, S.W. **PRIZE** of £5.
7. (Q.) Panel for a Cabinet. By Charles Line, 41, Prince of Wales's-crescent, N.W. Price £12. **PRIZE** of £4.
8. (Q.) Panel Frame, carved in various woods. Designed and carved by E. T. Grove, 130, Albany-street, N.W. Price £5.

Second Division.

9. (A.) Cases of Specimen Clock Dials. Nos. 1 to 6 enamel painted; Nos. 7 and 8 dead surface suitable for public buildings, as not reflecting the light; Nos. 9 to 11 glass dials in imitation of engraved dials, and superior to them for durability in consequence of the work being at the back. All the dials can be produced in any size. By J. Thwaites, 38, Spencer-st., Clerkenwell, E.C. **PRIZE** of £5.
10. (B.) Frame for a Miniature, of strongly-gilt gilding-metal and enamelled; solder of 18 carat gold. Designed, traced, engraved, and enamelled by Frederick Lowe, 13, Wilderness-row, E.C. **PRIZE** of £10 for the exhibit of this and No. 11.
11. (C.) Ring Tray, similar in material and process to the above. By Frederick Lowe.
12. (D.) Slab, for insertion in the frieze of a chimney-piece. By J. B. Evans, Howard-place, Shelton, Staffordshire Potteries. Price £6 6s. **PRIZE** of £10.
13. (D.) Ditto. By the above. Price £4 4s.
14. (D.) Ditto. By John Slater, Field-place, Stoke-on-Trent. Price £6 6s.
15. (D.) Ditto. Painted Birds, after Bouvier. By Frank Harris, Hartshill, Stoke-on-Trent. Price £1 11s. 6d.
16. (D.) Ditto. Painted Trophies, birds &c., with green ground-laid border, with gilt raised ornamentation. By the above. Price £3 13s. 6d.
7. (D.) Ditto. "The Virgin and Child;" after Titian. By "Pax."
18. (D.) Ditto. Figures. By W. P. Simpson, 6, Queen's-road, Bayswater, W. Price £10 10s.
19. (D.) Ditto. Flowers. Painted by J. Longmore, 14, Hardinge-st., Fenton, Stoke-on-Trent. Price £1 1s.
20. (D.) Ditto. "Pluto." Painted on blackware, after the style of the Limoges Enamels. By W. H. Slater, James-st., London-road, Stoke-on-Trent. **PRIZE** of £5.
21. (E.) Tablet for Monumental or Commemorative Purposes (unfinished, but sent to show design). By James Griffiths, Field-place, Stoke-on-Trent. **PRIZE** of £2.
22. (H.) Book Cover, enrichment in gold upon coloured ground. By C. Pfander, 28, Bayham-street. N.W. Valued at £3 10s. **PRIZE** of £3 for the exhibit of this and No. 23.
23. (H.) Ditto, enrichment in cameo tints upon black and gold grounds. By the above. Valued at £3 15s.
24. (I.) Set of Fire-irons. By E. Millard, 35, Little Clarendon-street, Clarendon-square, N.W.
25. (O.) Pedestal for a Bust, forming a clock case, consisting of carved marble combined with mosaic. By W. H. Barrett, 2, Alma-terrace, Fentiman-road, S.E. Price £18.

Subjects sent in for Exhibition, but not in Accordance with the Prescribed Processes.

Carving in Stone.

26. Bracket, carved in Caen-stone. By John Barker, 2, Paradise-street, Lambeth, S.E. **PRIZE** of £5 for the exhibit of this and Nos. 27 and 28.
27. Panel of Flowers, carved in Caen-stone. By the above.
28. Panel, carved in Caen-stone. By the above.
29. Child's Head, carved in Stone. By John Wallace, 162, Grove-street, Camden-town, N.W. Price £4 10s.

Carving in Marble.

30. Boy's Head, in Relief, a Portrait. By W. X. D. Price £2. **PRIZE** of £4 for the exhibit of this and No. 31.
31. Medallion Head of Michael Angelo. By W. X. D. Price £2.
32. Bust of Queen Adelaide. By G. Bool, 9, Warwick-place, Pimlico, S.W. Price £12.
33. Carving in Relief. By Owen Thomas, 66, Harewood-street, N.W. **PRIZE** of £1.

Modelling in Plaster.

34. Bust, "Ophelia." By A. J. Smith, Great Northern Stone Wharf, Wharf-road, King's-cross, N.
35. Modellings, after Donatello, of St. Cecilia, and the Virgin and Child. By W. W. Price £5. **PRIZE** of £5.
36. Portion of Ornament. By E. Gibbons, 5, Mary-street, Arlington-square, N.
37. Medallion, "Science Trimming the Lamp of Life," executed after cast of medal by Wyon. By R. C. Hindshaw, 23, Worsley-street, Regent-road, Manchester. Price £10.
38. Frame containing six emblematical figures of the Months. Designed and modelled by G. Morgan, 41, Pelham-street, Brompton, S.W.
39. Head of a Female, modelled from life. By the above. **PRIZE** of £5 for this in combination with No. 40.

Metal Work.

40. Reduced copy in steel of the above. By the same exhibitor.
41. Embossing in Copper of a Yacht in full sail. By Robert Taw, 8, Prince of Wales's-crescent, N.W. **PRIZE** of £2.
42. Wrought Iron Work for Cabinet. Designed by B. T. Talbot. Executed by G. Emms, 2, King-street, Old Kent-road, S.E. **PRIZE** of £1.
43. Repoussé Work in Copper. By J. Gwillim, 19, Sidney-square, Mile-end, E. Price £20.
44. Renaissance Ornament in Copper. By G. Deere, 23, Weston-street, Pentonville, N. Price £10. **PRIZE** of £2.
45. Specimens of minute engraving. The Creed, the Lord's Prayer, and the Ten Commandments. Engraved by hand, in black letter, on threepenny pieces. By W. Roberts, 146, Stanhope-street, Hampstead-road, N.W.

Carving in Wood.

46. Head of our Saviour, carved in lime wood. By E. J. Broughton, 23, Queen-street, Webber-street, S.E. Price £6 10s.
47. Alto-relief in box-wood with ebony border, "Venus Genetrix." By Thomas Wills, New-road, Hammersmith, W. Price £15. **PRIZE** of £3.
48. Bust of a Female in lime-wood. By William Cushing, 14, Cardington-street, N.W.
49. Panel of Flowers. Carved by Arthur Line, 19, Prince of Wales's-crescent, N.W. Price £4 10s.

50. Clock Case in walnut wood. By R. Flipping, 67, Charrington-street, N.W. Price £7.
51. Highland Dirk, carved in ebony. By John Sinclair, 6, Sutherland-street, West-end, Edinburgh.
52. Presentation Pipe, carved in sycamore. By the above.

Needlework.

53. Specimen of Needlework for a Book-cover. By Miss H. Pfander, 28, Bayham-street, N.W. Price £3 5s.

Painting on Porcelain.

54. "The Death of the Christmas Carol Singer." By J. J. Slater, Ricardo-street, Burslem, Staffordshire. Price £10.
55. "The Death of Goliath." By John Eyre, 16, Newman-street, Oxford-street, W. Price £5 10s. **PRIZE** of £2.
56. "Giving a Bite;" after W. Mulready, R.A. By W. P. Simpson, 6, Queen's-road, Bayswater, W. Price £26 5s. **PRIZE** of £5. Also the "North London Exhibition Prize."*
57. Study from Life. By W. P. Rhodes, Liverpool-road, Newcastle-under-Lyne.
58. Portrait from a photograph, worked with a crayon on a glazed surface, and fired. By A. B.
59. Portrait from a photograph. By the above.
60. Head of Our Saviour, from an engraving by Sharp, after Guido, by the same process as No. 58. By the above. **PRIZE** of £2.

Committee on India.

This Committee has resolved that Six Conferences be held during the present Session for the discussion of the following subjects, viz.:—

Tea Cultivation in India.
Hill Settlements and Sanitaria.
Waste Lands in India.
Trade with Central Asia, Thibet, and South-Western China.
Indian Fibres.
Silk Cultivation and Supply.

The following evenings have been fixed for holding the conferences:—

Friday, March 12th.
" April 2nd.
" April 16th.
" April 30th.
" May 14th.
" May 28th.

At these Meetings the chair will be taken at 8 o'clock, and the discussion will be opened by a paper.

On the first evening, Friday, March the 12th, Mr. C. H. Fielder, Hon. Secretary of the India Tea Association, will open the discussion with a paper "On Tea Cultivation in India." The subjects for each subsequent evening will be previously announced in the *Journal*.

Members of the Society interested in Indian questions are invited to attend.

Proceedings of the Society.

Piscicultural Committee.

The Council, having had brought under their consideration the importance of Pisciculture, as affecting the rearing, breeding, and preservation of fish, and thus influencing the supply of food to the people of this country, have appointed a Committee on the subject, and the gentlemen whose names are given below have been invited to serve upon it:—

*Edmund Ashworth.
*Thos. Ashworth.
*Redmond Barry.
*A. D. Berrington.
J. A. Blake, M.P.
Rev. H. Blissett.
*T. F. Brady.
*Earl of Breadalbane.
*Frank Buckland.
Higford Burr.
James Caird.
Marquis of Clanricarde.
*E. W. Cox, M.P.
George Clive, M.P.
J. Dodds, M.P.
Sir P. de Malpas G. Egerton.
*Richard Foster.
*Francis Francis.
*H. George.
Rt. Hon. T. Milner Gibson, M.P.
*Richard Gibson.
*Dr. Günther.
*G. W. Hart.
*Charles Hambro.
S. Hart Jackson.
*Henry Lee.
G. S. Lefevre, M.P.
Sir Coutts Lindsay, Bart.
*J. Lloyd, jun.
*Harry Lobb.
*J. Keast Lord.
*Col. Lyne.
*A. P. Manley.
Earl of Mansfield.
Dr. Mitchell.
A. Mostyn Owen.
Duke of Newcastle.
*J. Paterson.
*Dr. Peard.
*W. Pease, jun.
A. F. Pennell.
*H. Cholmondeley Pennell.
*J. S. Phillips.
*Hon. Edwin B. Portman.
G. P. R. Pullman.
*Wm. Pullman.
Duke of Roxburghe.
*Major Scott.
Earl Somers.
H. Spackman.
Viscount Stormont.
The Duke of Sutherland.
*J. F. Symonds.
*H. Tegetmeier.
J. Tomline.
G. R. Waterhouse.
G. F. Wilson, F.R.S.
B. Wood.
*B. Woodman.
*Robert Worthington.
*J. Youl.

Those gentlemen whose names have an asterisk (*) have already consented to serve on the Committee.

The Committee met on Wednesday, the 3rd inst., at two o'clock. Present:—Mr. Frank Buckland in the chair; Messrs. Jas. A. Youl, A. D. Berrington, F. Chadwick, J. W. Willis Bund, E. P. Lindon, Robt. Worthington, Henry Lee, J. Wayson, T. F. Brady, G. W. Ward, B. Woodman, J. E. Walker, B. Price Jordan, Capt., Spratt, R.N., Col. Lyne, G. F. Wilson, F.R.S, Major Scott.

The Chairman said he was glad to meet so many gentlemen connected with the English fisheries, and with regard to the object they had more particularly in view at that time—namely, the desirability of joining the deputation to the Home Office upon the question of the Amendment of the Salmon Fishery Laws, it was exceedingly desirable that some united action should be taken to impress upon the Government the importance of protecting the English fisheries. There were many questions that needed ventilation, and he hoped they would be taken up—the questions of weirs, lower and upper proprietors, the water rights of manufacturers, pollution, &c.

Mr. A. D. Berrington supported strongly the objects of the deputation, and thought that trout required greater protection, and the fishing for trout required amendment.

Mr. Francis Francis said that a supervision of nets was needed. Any legislation was useless unless certain

* This Prize consists of £4 17s. 10d., being the interest of £167 7s. 3d. Consols invested in the name of the Society of Arts, to be awarded by the Council "for the best specimens of skilled workmanship" at the Society's Exhibition.

nets were prohibited; and no Act was worth anything that did not deal with them.

Mr. Chadwick said the question of nets was one of the points he was instructed by his board to press, and advocated the change of the size of the mesh from two inches to three inches. He thought the weekly close-time was too short, and advocated its commencing at 6 p.m. on Fridays, and ending at 6 a.m. on Mondays. He also dwelt on the difficulty there was in obtaining prosecutions; the penalties were so small that manufacturers often found it to their interest to pollute the water and pay the penalty.

Mr. J. F. Brady thought that it was all a question of bye-law, there were so many different things to be considered with regard to each river, that it was impossible almost to legislate for the whole, unless the peculiarities of each were taken into account.

Mr. Francis Francis moved the following resolution:—"That a deputation from the Society of Arts Committee attend to support the deputation to the Home Secretary on Thursday, the 4th March."

The resolution was carried.

Extra Meeting.

Monday Morning, March 1st, 11 a.m.; A. J. Mundella, Esq., M.P., in the chair.

The second adjourned discussion on Mr. Henry Cole's paper "On the Efficiency and Economy of a National Army, in connection with the Industry and Education of the People," read on Wednesday evening, the 17th February, was opened by

Sir Charles Trevelyan, K.C.B., who said that on a previous occasion he had pointed out that the alternative was between a standing army with a long period of service, and a popular army with short periods of service, instruction, and morality. He then touched on the leading characteristics of a standing army, and remarked that in the case of a popular army all these characteristics were reversed. Under the present system of a standing army we could only place in the field about 40,000 men, while it was requisite, in order to balance in any way the power of France, with her 800,000 men, that at least 400,000 men should be at our command, which, at the same rate of expenditure, would cost 150 millions, the mere mention of which was an absurdity. It was evident, therefore, that we must have recourse to another plan, which would be to bestow our principal pains and expenditure, not on the army at large, but on a small picked force, or *cadre*, chosen for the purpose of instruction, who would, in their turn, be the instructors of others. The object was to obtain the greatest number of possible soldiers with the least number under arms; to keep a small army on an active footing, to be reinforced on emergency from large reserves. All branches of such an establishment together, came, of course, to an enormous total; but such a force, nevertheless, represented only that cheap defensive organization on which many States were now bent, and to which all must be driven some day or other if financial ruin was to be averted. Austria was the last nation to adopt this model, which she had done within a few months. Formerly a man was liable to serve in the regular army for eight years, during which time he could neither marry nor follow his ordinary avocation, and at the end of that time he still remained two years in the reserve; now he only had to serve three years in the regular army; and whilst he remained in the reserve, which he did for seven years, he followed his ordinary occupation, being simply called out a few weeks in each year for exercise, so that in spite of the great increase in numerical strength, the new system was economically a gain and not a loss. The difference between the two systems might be well illustrated by the operations of a miller; if he only ground as much corn as he could store in his own buildings his operations would be very limited, but, so far from that, he went on grinding to meet the necessities of the whole country. In the same way, with a system of *cadres* of instruction, we could go on "grinding" soldiers to any amount required. Again, the two systems were opposed to each other in the matter of the age of the soldier. With a standing army you must have a long, with a popular army only a short, period of service, the one priding itself on its veterans, the other on its youthful and vigorous men. And what was the experience of mankind on this subject? Going back to the ancient Greeks, who were renowned above all other nations for their military achievements, they were all familiar with the famous pæan or warlike hymn of Tyrtæus, which spoke in a spirit-stirring strain of its being a shame to see an aged man slain in front of the battle, while it was a glory to the youth. The passage he referred to was as follows:—

αἰσχρὸν γὰρ δὴ τοῦτο μετὰ προμάχοισι πεσόντα
κεῖσθαι πρόσθε νέων ἄνδρα παλαιότερον,
ἤδη λευκὸν ἔχοντα κάρη πολιόν τε γένειον,
θυμὸν ἀποπνείοντ' ἄλκιμον ἐν κονίῃ,

* * * * *

αἰσχρὰ τάγ ὀφθαλμοῖς καὶ νεμεσητὸν ἰδεῖν—
καὶ χρόα γυμνωθέντα· νέοισι δὲ πάντ' ἐπέοικεν,
ὄφρ' ἐρατῆς ἥβης ἀγλαὸν ἄνθος ἔχῃ.
ἀνδράσι μὲν θνητὸς ἰδεῖν, ἐρατὸς δὲ γυναιξὶν,
ζωὸς ἐὼν, καλὸς δ' ἐν προμάχοισι πεσών.

Again, in India, and amongst all Mahommedan nations, the name of a soldier was Jawán, which was synonymous with youth, and in the most military nation in Europe, happily our own countrymen, the Irish, the expression that went most to their hearts in speaking of any deed of prowess was, that "the boys" had done it. He might also refer to General Trochu's captivating, but deeply reasoned, chapters on "Jeunes Soldats et vieux soldats" and "Les grognards du premier Empire," which supported the same view with reference to the youth of the soldier. Perhaps some lady would translate them with the grace which always belongs to the practised female pen, and publish them in a separate form under the auspices of the Society. It was an old observation that battles were gained as much by the legs as by the arms of the combatants, and if that were true formerly, it was much more so now, when so much depended upon getting under cover, for with the present arms of precision and rapidity the men were rather mowed than shot down when exposed to the fire of the enemy. In comparing a popular with a standing army, one of the most important points was economy, and, first of all, with respect to the effect on the labour market. To permanently withdraw 200,000 men must be a great loss to productive industry, but, under the system he proposed, no one would be permanently withdrawn from productive labour but the officers, commissioned and non-commissioned, forming the instructional *cadres*, and the loss from that source would be far more than compensated by the fact that the labourer, when passed through this instructional course, became in consequence much more valuable. Such was the experience both of Prussia and France, where it was found that the peasants, after a few months' association with their comrades, were turned out far more efficient, not only in a military point of view, but in regard to all the business of life, in fact, their services were eagerly sought after, and it could hardly be said that our English clodhoppers were not as much in need of a little brightening up as the French *paysans*. In fact, under the system of a national army all might be said to be bees, and none drones. As he had before remarked, all military establishments were greatly increased in costliness, first, from

the general rise of wages; secondly, from the higher standard of comfort which now prevailed; thirdly, from the happily higher standard of morality and humanity which, from the exertions of philanthropists, was now applied to the army; and, fourthly, from the increased cost of scientific arms and munitions of war. What did they do in other affairs of life when they found themselves saddled with the expense of a costly article? The obvious course was to husband it to the utmost, and make it go as far as possible. Colonel Leahy had calculated that the expense of *old* soldiers was ten times that of *reserved* soldiers, so that, on this principle, they would have 400,000 trained reserve men, on the system of a popular army, for every 40,000 on the system of a standing army. In fact, it was the mill over again, in the one case the process being continuous, and a certain number of trained soldiers being turned out every year, while in the other the operation stopped at a very limited number. On the question of morality, the moral defects of the present system were really too painful to dwell upon, and he would therefore at once pass to the change which would take place if the system of a popular army were adopted. The bounty money, drinking, and wheedling, would all be eliminated from the recruiting system, and the soldier's engagement would be put on the footing of an honest well understood contract, like that which was made with the police, or which their respected Chairman or any other employer of labour entered into with his workmen. He might here pay a well-deserved tribute to a gentleman who had lately passed from among them, Mr. Godley, a man who united in a very high degree philosophical and practical qualities, and who added to them a spirit of Christian philanthropy, which led him to apply those talents to the improvement of the condition of his fellow creatures. It was from this gentleman that his strong opinions on the present system of recruiting were derived, and happily Mr. Godley's views were fully recorded in the report and appendix of the Recruiting Commission. As to the class of confirmed reprobates in the army—not the loose young men who were in many cases much improved if not reformed by discipline, but the confirmed blackguards—the army, with its high feeding and gentlemanly leisure, was the last place for them. They were the last class of men who should be exempted from the common lot of humanity, to eat their bread in the sweat of their face. The place for them was at the plough of the day-labourer, or the pick-axe and the barrow of the navvy. As he proposed to remodel the army, it would be a place only for industrious and well conducted men. The commissioned officers would be employed in teaching the theory of their profession, the non-commissioned in teaching the practice; and the men in learning both theory and practice; and when this system was once adopted there would be no need to seek out of the way modes of employing the men in various industrial occupations. The motive for this desire was an excellent one, but the real business of a soldier was soldiering, and this truth could not be too much insisted on. Division of labour was as valuable in the army as elsewhere, and the only reason why it was suggested that soldiers should be employed as handicraftsmen was because they were kept too long in the army; when they were only kept long enough to become thorough soldiers, such expedients would be no longer necessary. The ordinary soldier would, under the system he proposed, serve for one year only, which would be long enough for him to acquire a thorough knowledge of his duties, and those who remained long would be occupied in teaching the one year's men, and would then have prospects of employment in the civil service. The leading idea connected with an "old soldier," especially in the minds of English mothers, was that of a demoralising agent, but this would be entirely reversed when the old soldiers were those only who were permitted to remain on account of good character and conduct, and who were permitted to marry. In fact, the term "old soldier," would become one of honour rather than reproach, and would imply a high moral character instead of a low one. All the young soldiers would be so fully occupied with the novelty of their situation, the necessity of learning their duties, musketry instruction, &c., that they would no more think of marrying than did an undergraduate in his first year at college. An article which appeared some years ago in the *Edinburgh Review*, when the regeneration of Italy first awakened attention, accounted for the remarkable position held by Piedmont, a small state, sitting astride the Alps, by the military discipline which all her sons underwent. The same training was now looked to for converting the semi-barbarous Calabrians and Sicilians into orderly and obedient subjects. This had been the experience of other countries, especially of France, and he doubted not it would be the same in England when once the system was adopted. English rustics, with many good qualities, which placed them at least on a level with the peasantry of other countries, had a certain stolidity about them which military training was eminently calculated to remove. He did not hesitate to say that the finest corps in Her Majesty's service was, not the Guards, nor the Artillery, nor the Rifles, but the Irish Constabulary, consisting of 12,000 men. An officer of the Guards dare not send a single man, taken indiscriminately from the ranks, alone on any particular duty, but this was constantly done with the Irish Constabulary, and with the fullest assurance that the man would do his duty soberly and to the best of his ability, and then return immediately to render an account of his trust. There was no reason why the whole army should not be elevated to the same position. Sir Charles Trevelyan said he would not refer again to marriage, which had better be read than talked about. He had said all he had to say about it in the early part of the fourth chapter of his last pamphlet. This was a vital point in the reform of the army, and the most decisive proof of the soundness of the mode advocated by him was that the young soldiers, who would be the great majority, would not care to marry, while the old soldiers would all be permitted to marry. Then came the important question as to the precise model they would adopt. The measures suggested by him might be arranged in two classes. The first class consisted of measures intended to render our military system more efficient, to improve the organisation of the different descriptions of force of which the army was composed, and to perfect the methods of instructing and training the troops. The second class consisted of measures intended to render the conditions of military service more attractive, and to procure an abundant supply of recruits from all classes of the population without departing from the voluntary principle, or having recourse to conscription. Under the first class he included—1. The organisation of our military forces on the basis of assigning to each county or other territorial division a separate military establishment. 2. The formation of composite county regiments, each consisting of one or more battalions of troops of the line, of one or more battalions of militia, and of one or more corps of volunteers. A permanent quarter within the district to be assigned as the station of the head quarter or depot battalion of each of these composite regiments. 3. The recruits, both of the line and of the militia battalions, to be trained together at this head-quarter depot, which should be furnished with school-rooms, lecture-rooms, a gymnasium, rifle-practice ground, a spacious parade, and with all other appliances of a great training establishment; also with a military club for the use of all commissioned officers of the county regiments, whether belonging to the line, the militia, or the volunteers. 4. The training of recruits at the depot battalion, to consist not only of military exercises, but also of intellectual instruction. Officers of militia and of volunteers to be required to qualify by going through a prescribed course of military instruction at the depot.

5. Battalions of the line to consist of soldiers engaged for a term of seven years' continuous service at home or abroad. 6. Non-commissioned officers, and a small percentage of picked soldiers, to be eligible for re-engaging for a second term of service. 7. The militia battalions to consist, first, of men transferred from the line battalions after the completion of their term of seven years' service, and, secondly, of recruits enlisted for one year's continuous service at the depot, followed by a term of ten years' militia service, during which they would be forced to assemble for training for a certain number of days in each year, and they would be liable in time of war to be embodied for continuous service. In the second class of measures, those intended to render military service attractive, were included—1. The reduction of the term of the soldiers' engagement from twelve to seven years. 2. The abolition of the purchase of commissions. 3. To raise the pay of officers, and in other respects improve their terms of service. 4. The allotment of a certain proportion of all vacant commissions, to be filled by the promotion of qualified non-commissioned officers at an early period of their service. 5. Appropriating to qualified and deserving non-commissioned officers and soldiers the whole of the appointments in the departments of the army below the superintending establishment of controllers and deputy-controllers. 6. Rendering a term of seven years' service in the regular army a means of obtaining employment in certain branches of the ordinary Civil Service. It would take too long to dilate upon these details, but if the principles he advocated were right something of this sort was inevitable. Going to another point, they had heard various objections to withdrawing the regular troops from the colonies, but, in truth, they were not wanted there. The colonies might be divided into three categories:—First, those which could take care of themselves, such as Australia and New Zealand, the Cape of Good Hope, and perhaps some others; next, those which, from the peculiar circumstances of the climate, and other reasons, were not worth the expense and risk of taking—such as the West India Islands and similar colonies; and, lastly, came one great colony which might, perhaps, be taken, and which certainly could not be efficiently defended by English troops—he referred to Canada. No doubt, if the United States thought fit to make an effort at all corresponding to that which was made by the Northern States during the civil war, Canada might for the time be over-run, and it would be useless to attempt defending it by a few thousand men. The way to defend Canada would be to attack the commerce of the United States all along the seaboard, and so produce an effect upon her whole system, from Boston to New Orleans. The most effective way of defending the colonies was to have the troops concentrated in a high state of efficiency at home, with a supply of fast steamers, such as had been constructed for furnishing the reliefs to the Indian army. Even for direct military action the troops would be more effective in this way than if scattered in small detachments all over the world. Then with regard to India. Under the East India Company there was a separate local European force for India, but in the great re-settlement after the mutiny it was determined that the European portion of the Indian army should be furnished by regular reliefs from the British army. The main grounds of this decision were, 1st, that the European regiments could not be maintained in an efficient state if they were entirely separate from this country; and, 2nd, that the existence of a purely local army would encourage a dangerous tendency towards premature independence. He might appeal to Mr. George Campbell if the spirit in which Anglo-Indians were working was not to educate the people of India for self-government and independence. To take the measures which tended most directly to that end was best both for India and for ourselves. If India were once placed on the road to attaining national greatness and independence on the European model, it would take no one could say how long for them to arrive at the desired end, and during all that time England would be her natural protector, and it would be only at some indefinite period, when she had become one of the most powerful nations in the world, that England would have to withdraw. Anything that risked the success of this policy was to be deprecated, and one thing which would certainly have this effect would be the establishment of a local European army. Mr. Campbell and others might remember how this point was approached in what was called the white mutiny, and how immediately its influence was felt. Nothing had occurred to diminish the force of these considerations. On the contrary, the rapid growth of India in physical and intellectual power made it more than ever desirable that, for the sake of both countries, no real bond of union should be unnecessarily relaxed. To reverse this policy, and to return to the rejected plan of having a separate European army, was, therefore, practically impossible. It was, however, not at all the case that the Indian service was unpopular. On the contrary, there was a certain class of men by whom the Indian service was actually preferred, so that, with fair offers of pay and promotion, the ranks of a separate Indian army could be readily filled. If this were so, it followed that the connection of our army with India was favourable to recruiting. In India, as the popular feeling expresses it, the soldier was treated like a gentleman; he had servants to wait upon him, more liberal pay and rations, increased facilities of marriage, and, above all, so great a variety of civil situations were open to him, that if he qualified himself he had a certain prospect before him of rising to a higher social position. They would be always sure, therefore, of having an abundant number of volunteers for that part of the army stationed in India. It was customary when a regiment was about to return home to call for volunteers for the regiments that were to remain, and it was a well-known fact that on such occasions the number coming forward was so great that the difficulty was one of selection; sometimes half a regiment would volunteer; and on a late occasion at Chatham, when volunteers for India were asked for, an extraordinary number availed themselves of the opportunity. It was evident, therefore, that every object might be attained by working out the present Indian military system, with regimental *cadres* returning home perhaps at shorter periods than at present, say seven years instead of ten; so that the regiment touching its native soil might, Antæus-like, receive renewed vigour and strength for its duties. There would always be a certain class of soldiers who would wish to follow their profession to the end, and for them India would be a suitable field. The advantages of India as a field of instruction for our officers also could hardly be overestimated. In concluding his remarks, he wished to touch upon the financial part of the question, and in so doing he would, for convenience sake, follow the order in which the subject was treated in the letter on military expenditure in the appendix to his pamphlet on "The British Army." Of course a true financial statement always included a great many things which at first sight appeared very remote from finance. The propositions with which he started, viz.—that they had before them the alternative of a standing army and a popular army, applied to the financial as well as every other part of the question. He would quote what he had written last autumn on this subject:—

"The 'Recruiting Staff' extends the ramifications through every part of the United Kingdom, and its operations are supported by three classes of premiums—bringing money to the crimp, levy-money to the sergeant, and bounty-money to the recruit. Having got the recruit, another scheme of premiums has been devised in order to keep him—a second bounty and free kit on re-enlistment, extra pay during the period of re-engagement, and a life pension after twenty-one years' service. The charge for soldiers' pensions alone in the present year is £1,218,200. Then there is a large establishment of 'Staff Officers

of Pensioners,' the object of which is to get such further work out of the old men as they are capable of, and to exercise a benevolent superintendence over them. Now let us consider how the change proposed to be made will affect the state of things which has been described. That change is to make the army so popular by reducing the term of service to seven years, and opening to the soldier not only the higher promotion of his own profession, and of the administrative departments connected with it, but also the wide field of subordinate civil employments, that instead of the Government touting through its agents in the lowest haunts of vice for the refuse of the people, men of character and education belonging to every class of our population will seek to be admitted into the army, and those will be rejected who are for any reason unfit. As the recruiting for every branch of the service will be conducted regimentally, the ranks of the infantry of the line being completed from the home or militia battalion of each regiment, and the men will apply to the Government as in the police and in private employment, instead of the Government applying to them, the entire recruiting staff, together with bringing money, levy money and bounty money may be discontinued. As the soldier will as a general rule, serve only for seven years, the second bounty, the extra pay during re-engagement and the life pension after 21 years' service will cease, except the pensions of the few non-commissioned officers who will be retained after seven years' service. As there will be no enrolled pensioners, and few pensioners of any kind, the establishment of staff officers for their superintendence will *ipso facto* cease.

"Our army is with difficulty held together by a penal system of extreme stringency, the penalties of which are specially directed against desertion, including the barbarous and everywhere else disused practice of indelibly marking the letters of shame. The sum provided in the estimate of this year for the 'Administration of Martial Law' is £88,713, besides the expense of building and upholding military prisons and barrack cells, and the loss of the services both of the offenders and of the officers and soldiers employed in their apprehension, custody, trial, and punishment, involving indefinite escort guard, and court of inquiry and court martial duty. As care will be taken not to admit men of bad character, and soldiers who are guilty of disgraceful conduct will be expelled from the ranks, that small percentage, answering to the roughs and dangerous classes of civil life, who do little or no duty, and occasion constant expense in maintaining them in prison and finding guards for them, will no longer exist in the army. The crime of desertion is the creation of our present system, for when the soldier has once been inveigled and cajoled into relinquishing his free agency, he is bound for a longer term than in countries where the conscription prevails. Under the new constitution of the army, the man seeking to be engaged will feel that he is asking a favour, and almost the only punishment will be dismissal from the service. Some other use will then have to be found for the military prisons; the establishments connected with them, including the Board of Inspectors, may be discharged; and (which will be the greatest saving of all) no deduction whatever will have to be made from the effective force of the army on account of men in prisons and barrack cells and men appointed to guard them, or on account of deserters and men employed in searching for and escorting them, to say nothing of the officers and men engaged on the numerous courts of inquiry and courts-martial arising out of this coercive system.

"But, although not capable of exact calculation, there is no cause of the excessive expense of our army to be compared with the intemperance and vice prevailing in it. It is these, and not bad climate and hard service, which fill our military hospitals and return upon our unions so many men broken in constitution and character. The expense of enforcing the Contagious Diseases Act has increased from £28,000 to £40,000, and the hospital vote has risen from £275,589 in 1867-8, to £380,771 in 1868-9, being an increase of £105,182 in a single year. Our expense under these heads must go on increasing while we confine our treatment to the symptoms and do not attack the seat of the disease. Indeed, the case is much worse than this. The disease is actively promoted by us. Our recruiting is carried on in public-houses, without any inquiry being made into the character of the persons recruited, and the temptation to intoxication and every evil inducement is stimulated by the head-money given for each recruit to the crimp and the recruiting sergeant. In the same spirit a portion of the soldier's pay is issued as 'beer money,' and the officer has the 'Prince Regent's allowance for wine,' the object of which is 'that no officer should be so poor as not to be able to drink his pint of wine a day.' And how is the strongest instinct of human nature dealt with in our army? The men are kept with the colours for twenty-one long years, and in the absence of marriage, or of the hope of early marriage, such wide-spread debauchery prevails that it has become necessary to regulate it by law, involving almost a public sanction to it, in order to mitigate the injurious consequences to the health of the troops.

"It may seem over-sanguine to expect a total change in the moral state of the army, yet, as the actual circumstances have made it what it is, we may reasonably hope that altered circumstances will make it something very different. The immoralities of the recruiting system, through which our young men enter the army, and the example of the long-service men, under the influence of which they live, will both disappear. Instead of being the last resource of the reckless, the army will be a desirable profession to the most respectable and purpose-like of our youth, who, preferring the future to the present, aim at achieving an honourable social position and a happy domestic settlement. They will often be actually engaged to marry, and will constantly look forward to the time when they shall have earned the means of doing so. There will be no counteracting influence to prevent the young men of this class from setting the tone of the army. The only remaining old soldiers will be non-commissioned officers who have been permitted to re-enlist after the termination of their seven years' engagement on account of their good conduct and soldierlike qualities, and these will generally be married men; and instances will abound of self-denying exertion having obtained its reward by promotion to commissions or to appointments in the army administrative departments or the Civil Service. Everybody connected with the army knows the value of 'a clean defaulters' book and a healthy man.' The greatest economy of all would be that we should have to pay for none but effective men: for, to whatever degree this was attained, we might diminish the number of our troops in the same proportion, not only without any diminution, but with a great increase of efficiency, because we should be saved to that extent from the embarrassing, neutralising effect of unhealthy and disorderly men. Such men are worse than useless, because, besides doing no work, they require other expensive establishments to look after them. Above all, our army would cease to be a sink of moral pollution, by the overflow of which our civil population is contaminated, and we should not long be obliged to have recourse to such lamentable expedients as the Contagious Diseases Prevention Act, which, while they diminish the physical suffering, deepen the moral taint, because they indirectly countenance vice, and destroy the last sense of shame at its open profession. The responsibilities of empire also have to be considered. Those only who have lived in heathen countries know what a scandal to our nation and to Christianity itself will be removed by a change in the principle of our military system. The natives of India ask whether the

Gora log (European soldiers) are of the same caste as the *sahib log* (European gentlemen); and seeing the exhibition our soldiers too often make of themselves in the grog-shops and houses of ill-fame in the bazaar, they wonder why, if this be the result of a Christian education, the missionaries take such pains to convert the Hindoos and Mahomedans to Christianity. To abstain from intoxicating liquors is a cardinal point of both those religions, and it is a disgraceful fact that the tendency of our influence has been to encourage excess in the use of them. We are not speaking now of money, but of money's worth; and surely it is worth something, even for the peace and duration of our Indian empire, so to constitute our military force that it may present the aspect of a Christian army to the population of many races, languages, and religions, whose welfare is dependent upon us.

"Our army is greatly over-officered. As the officers do not in general go through any preliminary professional training, the public has to maintain those who are learning their duty as well as those who are in the effective discharge of it. In the absence of any sufficient reserve of officers, either in the ranks, or in the militia, or in the military colleges, the regimental establishments of officers must be framed on a scale to meet the casualties of war, and to provide for any augmentation that may take place in the numbers of the men, as well as to carry on the regimental duties. But the two characteristic circumstances which make the officering of the British army so much more expensive than that of the Continental armies, are—first, that the men, being taken only from one class of society, and that the lowest, and being held to long terms of engagement without any professional prospects, require more looking after than the men of other armies; and, secondly, that as the officers purchase their pay and means of retirement (in this sense only is 'purchase' a 'self-supporting system of retirement') in the price of their commissions, and in reality serve for nothing, they cannot be expected to work as those do who are paid the full value of their services. In fact, they do not do so, and they are allowed leave of absence far beyond the officers of any other army or any other branch of the British public service; and it will be found that the standard of work is lowest, and the excess in the number of officers greatest, in those portions of the army in which the price of commissions is highest.

"The excess of officers, however, is by no means confined to the regimental establishments. The necessity of compensating both those who have paid heavily for their commissions and those who have been passed over for want of the means of payment, has led to the introduction of "unattached" promotion, which is made at the discretion of the Commander-in-Chief and the Secretary of State, without reference to any fixed establishment, and is charged on the half-pay list. This is an anomalous and dangerous practice, because it eludes Parliamentary control, and can be carried on only by the misapplication of a fund, the object of which is to provide for reduced and invalided officers. In the French and other Continental armies the charge for half-pay is very small, and this was also the case in the army of the late East India Company. In our army the charge amounts in the present year to £331,500, although from April 1, 1862, to December 31, 1866, £311,599, realised through the Military Reserve Fund by the sale of commissions to officers of the line, was applied to the extinction of half-pay received by officers of the line, artillery, and engineers.

"The rate of promotion also mainly depends upon the proportion between the lower and higher ranks; and the cause of the prevailing slowness of promotion in the British army is our practice of crowding the lower ranks beyond the possibility of their being relieved by absorption in the higher within a reasonable period. The obvious hardship and injustice of this state of things occasions a constant pressure to increase the numbers in the higher ranks beyond the real wants of the service, and to purchase the premature retirement of efficient officers expressly for the purpose of procuring more rapid promotion for the juniors. The reduction of the excessive number of junior officers, therefore, has a financial advantage far beyond the saving of the charge for the officers reduced. In no other way is it possible to return to the sound principle of fixing an establishment suited to the wants of the service, and of promoting only to vacancies on that establishment, the half-pay list being restored to its original object of providing for reduced and invalided officers. If my proposals are adopted the officers and men of the large and expensive Militia staff will be fully utilised, by incorporating them with the depot battalions of the composite line, militia, and volunteer regiments, instead of their being kept during the greater part of the year in enforced idleness. The cost of the permanent staff of the disembodied militia for 1867–8 was £269,150, besides £16,500 for non-effective allowances. The existing depot battalions and regimental depots will also merge in the depot battalions of the new composite regiments, the command being taken by the senior officer present, whether he belongs to the home or to the general service portion of the regiment. The anomalous establishment of inspecting officers of reserved forces will merge in the military staff of the generals commanding divisions, which should be strengthened to the necessary extent and completed by a due proportion of the administrative establishments under the controllers. On the other hand, there will be a large reduction of the costly military and civil staff in the colonies, and the military force itself stationed in the colonies will be reduced in accordance with their altered circumstances, and our increased power of holding our military force in a concentrated state at home ready for service in any part of the world where it may be required. Although the savings which have been indicated are such as would arise from a change of system, whatever the numbers might be, and would be entirely independent of those which would be obtained by a reduction of force, this change of system would greatly facilitate such a reduction by increasing the efficiency of the troops, and placing large trained reserves at the disposal of the Government.

"Lastly, there is a class of savings which, in one respect, is the most advantageous of all, because it combines economy with increased simplicity and facility of administration. Of this description is the consolidation, with the proposed higher rate of pay, of numerous miscellaneous allowances in money or kind, the issue of which in a separate form increases the complication, expense, and delay of military administration, without conferring any benefit on the officer; the discontinuance of all official connection with the army agents (the authorised brokers and stakeholders of the purchase system), who are paid £41,000 a-year for doing in duplicate what must, under any circumstances, be done in a more simple and direct manner by the public establishments; and the substitution of a net rate of soldier's pay for the stoppage system and the separate allowance for beer. The expediency of these changes has been demonstrated over and over again, and it has been shown that the overgrown, unmanageable character of the War-office establishment, and the complex, cumbrous, expensive nature of our detailed administration cannot be corrected until these changes have been made; but the *vis inertiæ* of our official system, and the opposing forces of our mixed system of government have hitherto prevented their adoption. It is an additional recommendation of the larger measures now proposed that, if they are accepted, these important details must follow as a matter of course. The existing scheme for the remuneration of the officers (if that deserves to be called a scheme which is merely the fortuitous result of a number of isolated attempts to cobble an originally defective arrangement) must collapse on the abolition of purchase, and the grant of a reasonable rate of pay; and the soldiers' stoppage and beer-money

could not stand after the admission of the educated classes to the ranks by the reduction of the term of service and the opening of military and civil promotion to the soldier.

"The new advantages proposed to be conferred upon the soldier are merely the removal of restrictions which bind him to the colours for an inordinate period, and prevent him from having an open career in the public service. They will not, therefore, occasion any new expense, and the important savings which it has been shown must arise from them will be obtained without deduction. As regards the officer this will not be so. There will be considerable savings in this case also, but they will not be obtained without some outlay. An indispensable preliminary condition of all improvement in our army is the abolition of the purchase system, because, without this, promotion would be anything but a benefit to the soldier, and any new advantages conferred upon the existing officers would merely aggravate the burden upon their successors, who, according to the unfailing laws of demand and supply, would have to pay so much more for their commissions; and when, at last, the necessity for abolishing purchase came to be acknowledged, the charge upon the public for compensation would be increased in the same proportion. I have shown in my first pamphlet and in the third chapter of the second, that the popular estimate of the compensation that would have to be paid is greatly exaggerated; but, whatever the amount may be, it will be the price of an organic reform rendered necessary by the neglect of past generations, and intended for the benefit of the generations to come; and it should, therefore, like the expense of the fortifications and of the reconstruction of the law-courts and public offices, be charged to the capital account of the nation, and the repayment of it should be spread over a considerable period. The other new charges would be an increase to the pay of the officers—enough, but not more than enough, to enable them to live by their profession—and the grant of retired allowances after not less than twenty-five years' service. The cost in this case also has been over-estimated in popular opinion. It is commonly assumed that the existing number of officers would be maintained, and that the great majority of them would retire on pensions; whereas the number of officers would really be greatly diminished, and the majority of this diminished number would either retire before they became entitled to pensions, or would remain in the army after they became entitled, in order to obtain the higher professional rewards. Pensions would only be applicable to a certain limited class of officers who, after having passed twenty-five years in the service, determine not to continue in it.

"To sum up, the main cause of the excessive expense of the men is that we require from them long terms of service, and shut them out from all promotion, military or civil, so that we have to pay at an extravagant rate for recruiting them, for preventing them from deserting, for keeping them in health, and for pensioning them when they are worn out; and, after all, we have to maintain an undue proportion of non-effective men, who, although they do little or no work, are the most expensive of all. The main cause of the excessive expense of the officers is that they are maintained in numbers greatly beyond the wants of the service, which arises from the fact that, owing to the purchase system, they neither have, nor can have, any real remuneration, and it is therefore impossible to enforce either a proper previous training or a proper standard of work; and, in order to compensate the officers in some degree for their insufficient remuneration, an inordinate effective establishment has been supplemented by a still less justifiable unattached and non-effective list. The two keys of the reform of the army are, therefore, the reduction of the soldier's service, and the abolition of purchase. What the ulterior pecuniary result would be if these two changes were properly worked out through all the necessary subsidiary measures I will not undertake to say, but it would certainly lead to a large reduction of expenditure. It is also certain that both the force for home service and the force for general service would be more effective than at present, and that, instead of being a prolific cause of demoralisation, the army would become a national training school of the highest value for all classes of our population."

In conclusion, Sir Charles Trevelyan said he was of opinion that with such a system as he had attempted to describe, the army expenditure might be easily reduced to ten millions a year, and this would leave five millions for the general service of the country, and as this seemed the place where each man was come to forage for his own particular hobby—all of them were interested in general education, their respected Chairman in technical and industrial instruction, and Mr. Cole in completing the Kensington Museum—so he also might be allowed to trot out his little Shetland, viz., the concentration of our public offices, and the embellishment of the Thames Embankment.

Mr. Botly thought they were very much indebted to Mr. Cole for having brought before the Society, and through them before the public, a matter of so much importance, as to which they seemed to have been asleep for a long time, but which history told them was a matter which had always been objected to, viz., the existence of a standing army. At the time of the Commonwealth, and even previously, a standing army was always much objected to. During the reign of Charles II., it was stated by Rapin, in his history, that the army which had held England in awe for so long was reduced to a single regiment; but the King introduced a novelty, which was disagreeable to many at the time, when he formed a guard of two regiments, one of horse and one of foot, and it was immediately apprehended that he had a design on the liberties of the people. The opinion of the late Lord Herbert was quoted in Mr. Cole's paper. Some years ago he (Mr. Botly) had a conversation on this subject with that lamented nobleman, who then stated that he was not in favour of an army in time of peace being at all large, but of having an effective nucleus, such as could be easily increased in time of need, so that his view coincided very much with that put forward in the paper. They must all agree with the complimentary remarks that had been made on the first engineer officer who had been entrusted with the supreme command. And with reference to the readiness with which soldiers who had spent a short time in the army returned to civil occupations, he might point to the case of Switzerland, whose inhabitants were well known to turn with the greatest facility to agricultural and other peaceful avocations, even including watchmaking, and it was found that their military training had a very beneficial influence upon them. If, by the plan proposed, seven millions could be saved annually, who could calculate the prodigious effect that would be produced on the industry, commerce, and agriculture of England? It was beyond calculation what might have been the prosperity of this country at the present time if the hundreds of millions which had been spent in war had been employed in productive industry. Another point was the morality and general character of the soldiers, but in addition to that he would add that a great demoralisation of the community at large was always observed in the neighbourhood of large camps or military stations. Sir Charles Trevelyan had mentioned the enormous cost of our army as compared with that of other countries, and had very justly observed that, on that ground alone, the argument against standing armies was decisive. It had been doubted by some speakers whether civilians were in a position to discuss this subject at all, but it was a well-known fact that the greatest inventions of modern times, in various branches of life, had emanated from persons trained up in totally different occupations; for instance, the projectors of the Eddystone Lighthouse were men brought up as mercers; and the greatest work on nautical tactics

was written by an attorney of Edinburgh. In conclusion, he hoped they would have many more papers as interesting as the one they had been discussing, which he had reason to believe had been very favourably received by City men, and would, no doubt, have an influence wider than they at first sight might be disposed to imagine.

Lieut.-Col. Hewitt, R.E., said he would endeavour to confine his remarks to practical points, because it had been his lot to have considerable opportunities of seeing the working of the English army under various circumstances. The impression produced upon his mind was that we ought to be very cautious in making any great alteration in the system of the army. He did not believe that military men were at all opposed to reform, but they were desirous of seeing it carefully undertaken. In the first place, he would remark that the paper started on the basis of the estimates for the year now expiring, which amounted to about 15 millions, but the actual figures upon which the discussion ought to be based would be nearer 12 millions, because, in the first place, there was a considerable drawback from those estimates, and they also included the non-effectives, with regard to which there could not be much alteration made, at any rate for a long period, even if a change were immediately made in the constitution of the army. By the estimates for the present year he saw that there was a further reduction of about half a million, which would bring the sum total to about 11½ millions, which certainly was not very largely in excess of the estimate given in the paper. In discussing this question there was one matter which, as an engineer, he should say was the "key of the position," and that was the force which was necessary to be kept up in India and the colonies. According to our system, in furnishing a garrison to India, we had to ship every year five regiments of infantry, a regiment of cavalry, and a certain proportion of artillery to that country; and, if a constant relief for these troops were to be maintained, it was necessary to keep up a certain strength of the standing army at home. Whether we could alter that system of relieving the foreign troops was a very wide question, which he would not then enter upon; but he must point out that the strength of the regular army in this country must be dependent on the numbers which were required to be sent to India. It was said that we could remove the troops from some of the colonies, but their presence there was required for the sake of trade and commerce in some cases, and in others from the interests of diplomatic action. For instance, in the China seas we must keep up such a force as the Foreign Office required; and in the West Indies, where there was a small European population in the midst of a large number of blacks, who might rise at any time in insurrection, as they did in Jamaica, it was necessary to keep European troops. Again, in the Mauritius, there was a small English force in the midst of a French population, and with a French island close at hand, where a number of hostile forces could very readily be increased directly they knew there was any likelihood of the English forces being diminished. The question had been mooted as to the employment of soldiers on public works or in private capacities; but they were even now very much employed in reaping and haymaking, and he was sure the soldiers were all the better for it. Not long since a contract was going on, under his own direction, at the Tower of London. A contractor, stating that he had some difficulty in providing a sufficient strength of labour to complete the work within the specified time, asked him if he could have the assistance of some soldiers. He at once obtained the consent of the general officer, and the men were immediately set to work. In public works under Government, the engineer department, with which he was connected, were very largely employed. He had had those under his command so engaged in Gibraltar, in Ireland, at Shorncliffe, and other places, and there were many instances in which work was found for the men to do in ordinary regiments. However, there were but a very small proportion who had ever learned any trade before they entered the ranks, and this would, of course, prevent their profitable employment. In the case of the Engineers, however, in consequence of their having better pay, and a variety of situations being open to them at the close of their period of service, they were enabled to enlist a superior class of men, who were thus available for employment in various capacities. He was glad to say that Mr. Cole had opened at the South Kensington Museum a number of appointments for deserving non-commissioned officers from the Royal Engineers. The same thing had lately been done in France, where a number of subordinate appointments, not connected with the military service, had been thrown open to men who had been in the army, and he should like to see a similar system introduced in England. It would not only be an inducement to good conduct amongst the men themselves, but when these men were seen going about filling these situations it would be a great inducement to young men of good character to enlist. Mr. Cole had pointed out that the question was mainly between having a large highly paid army and conscription. Of course officers had nothing to say against the conscription, because it would supply them with a superior class of men to deal with; but he doubted whether this country would for a long while to come be educated up to the point of submitting to the conscription. He was not one of those who were accustomed to cry down English troops in comparison with those of foreign nations, which was sometimes done a great deal too much, and he might mention that when he was in Algeria one of the leading generals there, who held high command, asked him what he came there to learn, for having been encamped by the side of English troops in the Crimea, he could say that they were far beyond the French. To the same effect was the opinion of a Russian officer, who was here on a diplomatic mission last year, and who told him that he was perfectly astonished at what had been done in the way of improvement in the English army during the last six years. Allusion had been made to the Army Works Corps, and he might therefore say what he knew about them. When they were engaged in the Crimea they read in newspapers a great deal about this Army Works Corps, which was coming out to make the trenches and so on, and considerable amusement was sometimes caused at the remarks which were made, but when the men came out, and they were highly paid for their services, it turned out that there was one omission in the contract, which was rather an important one, and that was that although they came out to take part in military operations, there was no provision that they were to go under fire. They undertook to make a road, and they made it, with the assistance of thousands of soldiers, and a large number of officers there to superintend them, but the sappers were not relieved from their work in the trenches as some of them had been led to expect. The men of the Army Works Corps worked very well; but on one day, the 9th of September, when there was a little firing going on, he did not see much of them. The effect upon the sappers and miners when they saw this corps of highly paid men come out from England was to put them upon their mettle, and induce them to use every exertion to do the work better than those who were sent out to assist them. He hoped that on any future occasion the force of engineers would be kept up, and if any increased number of men were required, they might be enlisted perhaps for the war only, but at any rate they should be enlisted as soldiers, and be required to undertake whatever duty they were called upon to fulfil.

Mr. Geo. Cruikshank said an allusion had been made by a military officer to drinking in the army as being one great cause of expense, and in corroboration of this statement he might mention that many years ago, when the question of the health of barracks was brought forward, he attended at the Horse Guards to explain his

system of ventilation. The reply he received was that no doubt his suggestions were very good, but that drinking was the great curse of the army. This might seem to come from him with less force than from others, he being a teetotaller; but, unfortunately, it was too true, It had been truly said that if our army were all teetotallers, it would be the most powerful in the world; and with regard to the character of the army, he maintained that there was no better conducted man in society than a sober, well trained soldier. Some allusion had been made to our men not being well prepared at the commencement of the Crimean War, but on that point he begged leave to differ. He believed that the men were all thoroughly prepared for the field, but there was a great deal of mismanagement in higher quarters, which was the cause of the great sufferings to which our army was subjected. He knew it to be a fact that a mercantile captain gave information as to the best point for landing the troops at Balaclava, and, although his advice was not taken, he believed no troops in the world could have better met the preparations which had been made for them by the Russians at Sebastopol than the English did, but if they had landed at a proper place they might perhaps have gained their object in a few days. With regard to the Guards and the Irish constabulary, he must say that they were two distinct classes. The Guards were as perfect in their evolutions as possible—more like machines than human beings—and that perfection in drill, every military man knew, was of great importance in the field. One other point of great importance which had been alluded to several times was, the education of of the young in military duties. He learned his exercise when he was 10 years old, nearly 67 years ago, at a time when fears were entertained of a French Invasion, and at the age of 16 or 17 he joined a rifle corps, when he found he did not want any drilling, having already learnt it, therefore he would say that if an Act were passed making it compulsory that every boy should be taught his exercise, there would be no fear of an invasion, for any possible enemy of England would have this consideration, that there were millions of men ready to turn out at a moment's notice if they were wanted. First of all, therefore, before making any changes in the present system, he would recommend that all boys should be drilled. For eight years he had had the honour of commanding a battalion of volunteers, and one great point with him was to have a good body of cadets. Attached to the company which he had lately commanded there was a body of 80 cadets, who always fell in when the company were drilled, and they went through their exercises as well as any of the men, and sometimes better. If this plan were adopted of imparting a knowledge of military exercise to all the youths in the country, the only thing necessary besides would be to have arms ready for them in case of need. He disagreed with Mr. Cole as to a reduction in the standing army, for he believed it was important to keep it up to at least its present position, and then with a good reserve in miltia and volunteers he had no fear of any emergency. From his experience with the volunteers, he quite agreed with Lord Elcho that the capitation grant should be increased. If it were only 10s. extra per man it would be a great service. He had witnessed the evolutions of the volunteers at Brighton with a military man by his side, who remarked to him that after what he had seen that day he was sure there was no fear of an invasion, and in this opinion he most cordially agreed.

Admiral Sir Geo. Sartorius said it might appear strange for a naval officer to be speaking on a subject of this nature, but he believed the two professions were so nearly connected, that what related to one in a great measure also related to the other. There were certain points which seemed not to be taken notice of either by Mr. Cole or by many of the speakers, viz., the great change which had been introduced by steam in navigation, the insular position of England, the great development in artillery, and particularly the great perfection in precision and extended range which had been attained in small arms. All these considerations together made it absolutely impossible, if we used the means at our command, that we could ever be invaded. He believed England was safer at the present moment by far than ever she had been; civil discord alone, and no combination of foreign nations, could ever place England in danger. But it must also be remembered that with regard to political position, we held the first rank amongst the nations of the world, and had certain duties to perform; and therefore, although we had no necessity for a standing army to repel a foreign invasion, we ought to have such a force, say 60,000 or 80,000 English troops, as would enable us to turn the scale in favour of our own views and interests in the case of any foreign complication. It had been considered by some what we could do in case of an invading army, 50,000 men or so, being landed on the English coast; but he did not believe such a thing was possible, and if it were, there would be no difficulty in disposing of them with the aid of our militia and volunteers.

Sir Alexander Malet, Bart., K.C.B., said he was anxious to make a very few remarks on what fell from Sir Charles Trevelyan with regard to the English colonies. Having been engaged for the last 42 years in the diplomatic service, he had had some opportunity of hearing the opinion of foreigners upon different matters which bystanders often saw more of than those actually engaged. A small paragraph appeared the other day in a paper, which perhaps not many persons read, to the effect that an agent from the Transvaal Republic had appeared at Berlin, and though the object was not exactly known, it was supposed that it might be to enter into some negociation with the Prussian Government to transfer that seceding colony of Great Britain to Prussia. It might not perhaps be quite susceptible of absolute proof, but Prussia, perhaps more than any other continental nation, was of opinion with the first Napoleon that it was necessary for a state to have "ships, colonies, and commerce." They knew that Prussia desired possession of Holland, but that was probably not so much for the accession of power which she would thus gain in Europe as because with Holland was connected the colony of Java, which England had so foolishly, in his opinion, ceded to the Dutch. From Java he passed naturally to the subject of India. Sir Charles Trevelyan had said that we were educating our Indian subjects to be their own masters. All he could say was that he hoped it would be a very long while before that time would arrive. The value of India to England was immense, especially in the opinion of foreigners, and it could not be doubted that the possession of that vast country, for which Englishmen had spent so much blood and had struggled so manfully against the most dangerous insurrection in modern days, was a matter which it was impossible to overvalue. India had been the safety-valve which had taken off what would perhaps otherwise have been a "dangerous class" of highly educated gentlemen, for what would there have been for them to do but for the vast field which India held out to such men? He believed that the maintenance of our dominion there was of so much importance that it ought to be held paramount to all other considerations, and as it was impossible to hold India without a constant army, one should be kept up if solely for that purpose. He had no doubt that for the defence of England herself the volunteers and militia would be amply sufficient.

Capt. Wake, R.N., said that the remarks which he had intended to make had most, if not all, of them been much better said by Sir Charles Trevelyan. He was quite certain that a very good knowledge of drill and military exercises might be readily acquired at school. It would save a great deal of time afterwards, and it also added to the efficiency of the individual in whatever position of life he afterwards occupied. His great point, however, was that every man in the country should have

an appointed station to which he might go in the case of emergency. He might mention, as an illustration, that on one occasion H.M.S. *Bombay* was very nearly on fire, and the only thing that saved her was the arrangement which had been previously made, that every man knew exactly his station to run to in case such an accident occurred. That was exactly what he wanted to see in England, so that every man in the country, not only roughs and the lower classes, but every man, from the Prince of Wales to the dustman, should have his allotted station under an officer appointed to take command. The only way to enjoy peace was to be prepared for war, and everyone seemed to agree that we were coming upon perilous times. It was very difficult to get anything done in England, there were so many different opinions; and if a foreign invasion took place within the next few months, it would be a considerable time before anything could be done to meet it, because everyone would be disputing as to what was the best plan to adopt. It was, therefore, of the greatest importance that these questions should be discussed when there was time to settle them without danger. The victory of the *Shannon* over the *Chesapeake* had often been referred to with pride by Englishmen, and was sometimes supposed to have been accomplished because the English were so much better men than the Yankees, but the fact was the victory was gained simply because the Englishmen were trained and knew what they had to do; each had his post, and remained there till called upon to board the enemy. There was no hesitation; it was done at once, and the whole thing was over in fifteen minutes. He believed the time was coming when every man would have to stand by and guard his own property, and, therefore, he was very anxious that these precautionary measures should be taken as early as possible.

Mr. Geo. Campbell (Chief Commissioner of the Central Provinces of India) said he did not feel competent to discuss the general question, but might be allowed, perhaps, to say a few words on the special view of it raised by Sir Charles Trevelyan, although it had not been touched by others, and he believed it was desired to exclude India altogether from consideration. It would be all very well to do so if possible, but it struck him that it would be very much like inviting one of the Siamese twins to dinner and forgetting the other. Looking at the matter merely from a British point of view he was very favourably impressed with Mr. Cole's idea, and if not he should have been convinced by the arguments which he had heard. He quite believed that for defensive purposes a popular and economical army was the right thing. No doubt there was a good deal in the argument that in many cases it was cheaper to employ a man to do certain things for you than to do them yourself, as in the case of a policeman; but it was not the case always. For instance, no one could pretend that it would be better and cheaper for a farmer occupying an outlying position in New Zealand to pay a soldier to march up and down in front of his property, perhaps for years together, without being of any practical service, rather than to arm himself, his sons, and servants, so as to be prepared to repel any attack which might be made upon him. The same thing, he believed, applied to the defence of a country like England. It had been suggested that the habitual use of arms was inconsistent with the genius of the English nation; but he could not agree in this view, for he believed the English, and especially the Scotch, were more nearly allied to the Prussians than to any other European nation, and they had brought this system of a popular army to the greatest possible perfection. There was no doubt, also, that it was a great advantage to the population to be trained in military exercises; he had been much struck with this on a recent visit to Scotland, when he saw the militia called out, and finding that the majority of them were miners, he could not but be struck with the great benefit which must be derived by men who passed the greater part of their time in the bowels of the earth from being called out for a few weeks in the summer for out-door exercise. The only doubt was whether the few weeks during which the militia were under training was sufficient to make them into thorough soldiers, ready for service at a moment's notice; he had not the least doubt that, with six months' training, either the Militia or Volunteers would be able to meet any army in the world. The expenditure on the army was no doubt very large, but it was said, on the other hand, that the estimates ought really to be taken at twelve millions, and that it was better to let well alone. That might be true if we were thoroughly satisfied that at present it *was* well; but very grave doubts existed on this point; and it was very evident that we were not at all in a position to meet any of the great continental armies. It was, however, quite impossible to treat this question apart from India and the colonies, and as long as the present system was continued it was absolutely necessary to maintain a standing army. A national army would do very well if there were no colonies, but happily we had them all over the world. This was not the case with the other European nations. In the case of France, Algeria might be considered as their Aldershot, and, with the exception of that colony, French soldiers were not liable to serve abroad. Their other colonies, such as they were, were garrisoned by a distinct class of men called "marines," who, in fact, answered exactly to the ordinary rank and file of the English army. His own opinion was, that many of the colonies might be left to themselves, and others might be garrisoned by men on the same footing as the French marines, but India stood apart and distinct from all the rest. He had heard a great many hard things said of Anglo-Indians, but never before to-day that they belonged to the "dangerous classes" of society, who were better out of the way. As to its being our duty to prepare the people of India for independence, he would not express any decided opinion, but, taking a practical view of the point, he was quite positive that this would not be accomplished in the present generation, the next, or the one following; and therefore, for the present, it might be left out of consideration. As to the value of India to the mother country, he might not perhaps take quite so sanguine a view as some people, but the amount of English money invested in India, in various ways, could not be much less than 200 millions, and therefore, whatever view they took of its abstract value, it was plain that Englishmen would not lightly abandon it. There was an enormous population there, who were not difficult to govern if arms were kept out of their hands, but their numbers were so great that it had been said that if each native were to throw one clod of earth, every European in the country would be overwhelmed. It was, therefore, evident that however orderly or well-disposed they might be, it was necessary to keep a large European army always there, and not only that, but also a native army in addition. The European army, of course, was required to keep the native army in check, and it had been found in former days that there were great difficulties in the way of keeping up a local European army as in the time of the East India Company. The difficulty was who were to guard the guardians, for there were peculiar circumstances which rendered a mutiny much more probable in India than elsewhere. The Government was despotic with regard to the natives, but in the case of Europeans there was the greatest liberty and even license. The European army was under popular influence to an extent unknown in any other country in the world. If a private soldier thought he was hardly treated by his officer, he immediately wrote a letter to the newspapers, which was read by every soldier in the barracks next morning. There was one paper published in Calcutta which circulated almost exclusively amongst the soldiers, the license of which would hardly be believed. The consequence was that it would not be safe to trust the defence of

India to any local force. Sir Charles Trevelyan had suggested that the difficulty might be got over by something in the nature of a volunteer force for service in India, but the objection to that would be that if this were carried out, and the men were allowed to re-volunteer when their term had expired, it would come at length to something very much like a local army under another name. He was not, however, prepared to give an off-hand opinion upon this point. He looked upon it as a matter of vast importance to establish a national army on the plan suggested by Captain Wake, telling off every man to his station, but he did not think the question of a standing army or a national army could be decided until we had settled exactly what to do about India. Having disposed of that, he did not think we should have much difficulty in doing what was proposed by Mr. Cole, or something very similar.

Mr. Edwin Chadwick, C.B., said he had to bring forward in support of the question a reserve force of what now was in reality a popular force, that might be an efficient part of a defensive army—a force of picked men of the highest military quality we had ever had on battle field, which might be brought up to thirty-eight thousand men, namely, twenty-seven thousand for England, Scotland, and Wales, and eleven thousand for Ireland. He meant, of course, the police. As a commissioner of inquiry for the establishment of a general police force for this country, he could speak confidently of the quality of the force available—that the ranks would be as if it were composed of non-commissioned officers. A commissioned officer, who had been in war, and who, as high constable of a country force, well knew the material of which it was composed, had declared to him confidently that with it he could roll over an equivalent number of the militia force or of the regulars. It was remarkable how low the capacity of organisation was in this country, and in Parliament, where there were military men who should know better, who allowed this force to continue disorganised—even into companies as it were—under independent commands, which could be overwhelmed by mobs of larger numbers hastily gathered together, and allowed cities to be left at their mercy. Thus in Lancashire there was a police-force of three thousand men, for defence against internal enemies, split up under separate independent commands, of which the largest was of some seven hundred men at Liverpool, and some six hundred at Manchester. As each might separately be overcome by a mob, it was a necessity that a military force should be kept in barracks in the county, and it was kept there in military routine from year to year, to meet the extraordinary emergency of a mob rising, and to maintain the freedom of election and the liberty of the people against them at dissolutions of Parliament; whilst if the police-force were properly organised, the three thousand men in the county could be concentrated in sufficient force for such occasions—and as against yet more extraordinary occasions sufficient contingents might be concentrated from an aggregate of twenty-seven thousand police for Great Britain. The superiority of a police-force over a military force, as against internal enemies, had been displayed in Ireland. The superiority of such a force for defensive warfare against external enemies, admitted of demonstration. In this respect it admitted of considerable improvement, without detriment to its ordinary crime-preventive, or crime-repressive, or order-maintaining service. The mounted part of a police would, with improvements, constitute a superior cavalry. It was part of their (the Commissioners') principle of the organisation of a police, that it should be organised for beneficent service, against domestic calamities, fires, and accidents—that the police should have in charge fire-engines, and they had now stretchers, and were accustomed to aid the wounded by police surgeons. The police might well have charge, in cities and proper stations, of Whitworth's greatest artillery (his least and lightest), his two or three-pounders, which were of longer range than the heaviest of the old field guns, and of more varied and efficient application. A general organised police for military purposes would be superior, in principle and action, as a defensive force, to any army ever seen in battle field, in our own or on any other ground, in old or in our own times—and that force, in the United Kingdom, he undertook to say might be got for nothing; that was to say, within the direct local rates and expenses, and the existing civil expenditure—in great part wasted—for the ineffective repression of crime. The organisation of the scattered police forces and their mobilisation for systematic purposes were indeed needed, for the efficiency and economy of their every-day civil services, against the armies of depredators and delinquents at large and for preventive action against crime. That most expensive and wasteful class of administrators, the unpaid vestrymen of the metropolis, had objected to the policemen being occupied in sword exercises and military drill. Why, sword exercise was baton exercise, and the military training doubled the efficiency of the police for their individual defence against roughs and thieves, and was a necessary means of the economy of the requisite force. A police force might, however, be highly military in its organisation, and less military in its civil action. It was a defect of the Irish police force, that it was too military in its civil action. These ignorant vestrymen and their representatives would subject the public to the expense of double inferior forces, military as well as civil, and maintain by their mutual inefficiency a third army, that of depredators at large, spoiling the ill-defended; and for the repression of civil riots would maintain an inferior and unconstitutional army, repressing by the indiscriminate cutlass, instead of the constitutional baton, or the prehensive hand of the police constable. This was a great topic of administrative economy. The need of the maintenance of a standing army was advocated for our colonies. But we should instruct ourselves, and we should instruct them to get up and maintain for themselves such a popular force as he had described, for every day use, as well as for superior defence. We should also be instructed to drill all our children for the augmentation of our productive power, as also for defence against internal as well as external enemies. The evidence he had collected, and the conclusions he had put forth in respect to the drill in the school stage, were being acted upon in some of the Canadian States, who had voted money for the purpose, and they were also being acted on in Massachusetts and the New England States; and they ought to be advised to attend to them in our colonies. This was a topic for development. It was lamentable to hear it maintained, as had been done by Admiral Sartorius, that we should be at the expense of keeping up such a standing army as fifty thousand men to throw it in to turn the balance on one side or another in continental quarrels. An example of this doctrine might have been presented on the occasion of the war between Prussia and Denmark, when there was a large party who were so minded and would have had us thrown our military weight—such weight! with such expenditure—on the side of the Danes. If we had done so our whole standing army, our thirty or fifty thousand men, maintained from year to year at the expense of so many millions, would certainly have been mowed down by the repeating rifles as the Danes were, and would have been all miserably gobbled up, to our disgrace before the world; whilst with the larger popular army contemplated, presuming the war to be popular, a greater force could be sent, and great reserves would have been available. The question now was really between a small and expensive standing army, of inferior and dangerous quality, and a large popular army, of superior *morale* and quality, at greatly reduced expense.

Major-Gen. Sir Wm. Denison said he appeared rather as the advocate, summing up the evidence for the defendant, because, having belonged to the army for three or four and forty years, he felt himself identified

with it, and he must say he thought they had been rather hardly dealt with. They had been abused, and told that the term "old soldier" was synonymous with blackguard; but he contended that this was an entire mistake. There were in the army, as in every other trade, calling, or profession, both good and bad, but he maintained that the drill and discipline of the army had very often the effect of converting a rough and blackguard into a decent man. And this was shown to be true from the fact that discharged soldiers were constantly employed in clubs, public institutions, and elsewhere as messengers, and in various situations of trust. It was plain, therefore, that the army was not formed of the scum of the earth, or, if so, it was refined and purified. What he wished to do, which every one else had left undone, was to go a little into arithmetic on this matter. Several statements had been made about the cost of the national army, Mr. Cole undertaking to supply it for £7,000,000, while Sir Chas. Trevelyan mentioned £10,000,000, but no one had gone into any detailed estimate of how it was to be done. A difference of opinion had also been expressed as to whether the present expenditure should be taken at 12 or 15 millions; but, taking it at the latter amount, it must be remembered that for that they had a regular army and militia of about 250,000 men, and 150,000 volunteers, making together 400,000 men available for service, though of course a large number were scattered about in different parts of the world. In place of this there were two propositions before the meeting, Mr. Cole's and Sir Chas. Trevelyan's, which latter was quite different, being entirely voluntary, while Mr. Cole's plan of requiring one man in every thirteen to be enrolled was very much like conscription. Sir Charles Trevelyan's idea was that the army would be such a nice institution, formed of incipient angels, that everyone would be struggling to enter it; this was all very pretty to talk about, but practically no army would be at all the sort of thing that young angels would be anxious to have much to do with. However, Mr. Cole's was the scheme which they were invited to discuss, and to that he should confine his attention. The proposition was that one-thirteenth of the population were to be drilled for a year, which it was assumed would be sufficient to make perfect soldiers of them, and then they were to be called out for training every year for twenty days. Objections had been made with regard to this plan in the case of India and the colonies, and they were got rid of by saying that India was to pay for itself, and the colonies were not to be defended.

Mr. Cole said the colonies were to be defended.

Sir W. Denison said that Sir Charles Trevelyan, in his classification, had entirely omitted garrisons, such as Gibraltar, Malta, Bermuda, and so on.

Sir Charles Trevelyan said he included Gibraltar and Malta under the head of India, being on the route thither.

Sir Wm. Denison said it could hardly be expected that Gibraltar should support itself as it was proposed that India should. Taking the case of India, we required there 65,000 or 70,000 men, and they required to be constantly relieved. There was great mortality, mainly owing to the climate being unsuited to the white man, so that about 2,000 died every year, and about 2,000 more came home invalided; so that there was a constant supply of four or five thousand men annually required in addition to the periodical reliefs, for which purpose five regiments went out every year. These could not be taken from Mr. Cole's 16,000 men. If he understood Mr. Cole's plan, he intended to trust to Providence and fast steamers, leaving only a few officers, artillery, engineers, and so on, in places like Gibraltar and Malta, supplementing them by a stronger force as soon as possible in case of need. But even on this supposition we must have the troops ready to send out at a moment's notice. It had been said that in future we should have information through the newspapers of what was going to happen. He could not say that he had so much faith. We learned from the newspapers all that had happened, and sometimes a great deal that had not, but he did not believe in the prevision of newspaper editors as to what was about to take place. What would be the use of a brigade of artillery and a company or two of sappers in a place like Gibraltar, which mounted 800 guns, and had an enormous extent of parapets to be lined? If we left it in that sort of way, the surrounding population, being many of them smugglers and accustomed more or less to the use of arms, would be only too glad, on finding the doors unsecured from motives of economy, to walk in and take possession. At the very least, 5,000 men were required for each of these places, simply as a peace garrison. Then there were garrisons required at Bermuda, Antigua, Mauritius, and other places, and these troops must be relieved at stated intervals, and, fast as the steamers were, they took three months to reach India. With regard to the colonies. It was unfair, as he had formerly observed, to tell them to look after and defend themselves, and, at the same time, give them no voice in the question, whether or not war should be declared. It would be a beggarly policy to act in such a way from supposed motives of economy. There was no analogy between a colony like Australia and an English county, because in the latter case, if there were any talk of hostilities, there would be such a noise made in Parliament as would soon put a stop to it, unless there were very good reasons indeed. He would not say anything about Sir Charles Trevelyan's beautiful notion of training up the people of India to govern themselves; but in 1861, his (Sir W. Denison's) reply to Sir Bartle Frere, in Calcutta, on the same subject, was, that if they did so, the natives would turn round the next morning and kick them all out, and most deservedly so. In the first place he did not believe in their capacity for self-government, but if it were possible it would be the most suicidal policy in the world. The Indian was the same now as he was in Abraham's time; at any rate we had been there for the last hundred and sixty years, and had produced no change. The Hindoo was a coward and a liar, the most abject slave to those in authority over him, and the most cruel tyrant to whoever was in his power; in fact, these two qualities always went together. But now to the point of the economy of the system proposed by Mr. Cole. One thirteenth of the population were to be trained for a year, which might in round numbers be taken at two millions. They could not be paid less than one shilling a day, and with the other necessary expenses he should be putting the cost at a very low figure indeed at £25 a-year per man; there was £50,000,000 to begin with, and it would, in all probability, be much nearer £100,000,000. That did not look much like economy, and this included nothing for officers, barracks, clothing, hospitals, &c., which would certainly bring the sum required up to the hundred millions. Where was that to come from? But supposing that were provided for, borrowed, perhaps, then came the annual expense of training the men twenty days, and the cost of training the additional 25,000 men each year, which would be about one-thirteenth of the annual increase of the population. If the soldier's lot was to be made so remarkably pleasant, they could not pay him when called out for drill less than he earned on an average, and the lowest sum which could be named, therefore, was half-a-crown a-day; but putting it even at one shilling a-day, it would amount to two millions, which was a tolerable amount to begin with. True, it might be said that the manufacturer or employer would save the wages during these 20 days, but on the other hand he would lose the profit which he expected to get from it, even supposing such an amount of labour could be spared. But he should like to ask the Chairman, or any great manufacturer, how he would like to have all his hands taken away, and his machinery stopped, for 20 days in the year. It came, in fact, to this, that 48 millions of days' work would be abstracted from

the productive industry of the country each year, besides the yearly increase in proportion to the growth of the population. It was quite sufficient to go into the matter fairly in this way to dispose of it altogether. It was all very well to make a general estimate and say so much for this, and so much for that, and it made seven millions altogether, but if the thing were gone into in detail, the scheme would be seen to be as much a delusion economically, as it would be, in his opinion, practically. Mr. Spencer Walpole had very truly observed that it was much cheaper for a man earning 6s. or 7s. a-day to hire a substitute than to do his own soldiering, and, generally speaking, it was much better for the public service to hire a man permanently, who could be kept under strict discipline if required, than to take the ploughmen and artisans of the country and make them into soldiers. He did not believe, with their present standing army, militia, and volunteers, that there was the least occasion for alarm on any ground whatever, and he must say that when he heard in a foreign land, a few years ago, that such a panic had been felt in England about invasion as to lead to the expenditure of £12,000,000 on fortresses, he felt somewhat inclined to be ashamed of his country. In the estimate he had made he had not gone at all into details, but he might just mention one or two matters which had to be provided for. In the first place there were the officers to pay, and they would no doubt be much pleased to hear that Sir Charles Trevelyan's suggestion for increasing their pay was to be carried into effect. Then there were the non-commissioned officers to drill them, the commissariat to feed them, and medical men to look after them, clerks to keep accounts, &c., and postage. All these things might seem small in themselves, or when connected with an army of forty, sixty, or a hundred thousand men, but when they came to deal with two millions, they would add up to an enormous amount. It was only necessary to state the case thus plainly to dispose of it; and if Parliament, with such figures before it, paid the least attention to such a scheme, he should be very much surprised.

Mr. Cole, in replying to the observations which had been made, wished in the first place to clear himself from the imputation which had been thrown out against him by some of his friends, that he had libelled the army. The fact was he had passed no opinion of his own on the army. He had looked into various authorities, and had quoted what he found there, and he supposed what was stated in a Parliamentary Blue Book, printed only two years ago, might in general be relied upon. In order, however, to clear himself in the eyes of some valued friends in the army, he would give up his authorities in full, who were responsible for the adventurous statements he had ventured to make. He was now told that they had ceased to recruit in the same way as formerly, that the soldiers were not more vicious than the average population, and that they had immensely improved; of course he could not say that what happened yesterday still existed to-day, but the last authorities he consulted were Her Majesty's Commissioners, Lord Dalhousie, Lord Eversley, and Adjutant-General Lord William Paulet, and the other commissioners, who he supposed might be believed. These were their own words:—"The present system of recruiting rather seeks to inveigle young men into the army, than by a fair representation of military service, and an honest and open declaration of the advantages which a military career presents, to hold up the army as a profession, of which a fair proportion of those who are capable of bearing arms might well avail themselves." Then, again, he quoted the late Sidney Herbert, who said:—"We get our men, with difficulty, by every kind of cajoling and inducement we can devise; and, in our necessity, descend to those means which men do not have recourse to till they think all others are exhausted." Then, again, the Commander-in-Chief was asked—"Your Royal Highness must be aware that the mode of recruiting for the army at present is not the most creditable which might be observed in inducing young men to enter the service?" And what did he say? "No;" and he did not suppose Sir William Denison would say a word against that.

Major-General Sir William Denison said that referred to the mode of recruiting; his objection was to the description of the man's character after he was made into a soldier.

Mr. Cole continued.—The next question was—"Could your Royal Highness suggest any mode of improving that system?—I think that it would be impossible? With the volunteer system you must get the men where you can find them. Of course, if you can get a better class of men, so much the better, but our experience has not proved that we can do so; and, therefore, my fear is that, do what you will, you must take what you can find, whether it is exactly what you wish or not." Then the last question was—"And even though you wish it, you cannot be very particular as to the place in which you recruit?—No; I do not think that you can help that." He hoped, therefore, that he had relieved himself of the charge which had been brought against him, and as to the men themselves, he had spoken of them as being unrivalled for enduring pluck, and making the noblest soldiers in the world. However, all that was completely beside his argument, which was simply this, that the existing system cost a great deal too much, and was in fact the most monstrously extravagant and indefensible system in the world. Were they so differently constituted from Frenchmen that their soldiers must cost three times as much? A French soldier cost about £36 a-year, and why should an English one cost £111, according to last year's estimates. The cost of living and house rent were not so very different in the two countries, and the French soldiers, though they might be beaten by the English, were quite as good as was necessary.

Admiral Sartorius remarked that the French soldiers were not volunteers.

Mr. Cole said that he could not see that it was at all necessary that an English soldier should cost three times as much as a French one; and the real cause was our wretched administrative system. He really could not forbear quoting from the *Saturday Review* of Saturday last a short passage on this subject:—"A chief is wanted to supervise the whole department of supply, and what do we find? Why, we have two generals, Sir Henry Storks and General Balfour, assigned to this work at the War Office; and a third magnificently paid general, called a quartermaster-general, to do substantially the same work at the Horse Guards. Of these three only one is wanted, and it is well known that the principal duty of the quartermaster-general is to make routes, and to send requisitions for stores to the twin department which exists at the War Office. Then, again, there is a Military-Secretary at the Horse Guards, and his counterpart at the War Office, in the shape of an Under-Secretary of State, developed out of what once was called the Secretary for Military Correspondence. The necessity for these offices is created by the dual system, and one, if not both, might be dispensed with if the general wielding the powers of the Commander-in-Chief were placed at the elbow of the Minister as his military adviser. Then, again, we have at the Horse Guards three adjutant-generals—that is to say, the Adjutant-General of the Army, who alone is needed, and two deputy-adjutant-generals, quite independent of the first, who report direct to the Duke of Cambridge as the immediate commander of the engineers and artillery respectively. Not only are all these needless and costly offices established as a consequence of the dual government, and of the quasi-independence of the Horse Guards, but a very large per-centage of the work of the two departments consists of tedious correspondence and wrangling about trifles, between Pall Mall and Whitehall." That was one of the reasons why an English soldier cost £111. He had in his hand a Parliamentary paper,

entitled an annual return of the accounts of the manufacturing establishments under the War Office, extending to 274 pages, which anyone could purchase for 2s. 10d.; it was issued on the last Saturday, and some of the items were so extraordinary that he must quote them. These accounts were signed by Mr. Whiffin, the chief auditor, and also certified by Col. Boxer and Brevet-Major Arbuthnot and others, and finally by the Secretary of State for War; they disclosed such a system of petty *espionage* and needless detail as was astonishing, and would ruin any commercial firm. There was an item for putting new straps to seven cavalry capes; the value of the material was put at 1s. 2d.; cost of piece work, 4d.; direct labour, estimated at 2s. 4d.; indirect labour (including, of course, the proportion of Col. Boxer's services), 5d.; total expenditure, 3s. 11d.; all marshalled in columns, which was the most costly kind of printing. The next item he would read was that relating to one cape which wanted repairing, the cost of which was 3½d., every item being entered as before; next, there was one of these capes which, it seemed, wanted "ripping," for which the piece-work was 1d., total direct labour 1d.; nothing was charged for indirect labour in that instance. In another case there was an entry where the Stores Department had to issue some miscellaneous goods, for which wages were charged 1d., direct expenditure, ¼d., indirect expenditure, ¼d., total, as per balance-sheet No. 1, 1½d.; total, as per balance-sheet No. 2, 1¾d. All that nonsense ought to be got rid of at once; no one, military or civil, could defend printing such petty details as those at the public expense. Then, again, as to the question of cost. Was Sir William Denison aware that we still had about four millions to pay for the Abyssinian expedition? We were assured that five millions would be ample; but it was found now that every soldier taken to Abyssinia and back cost the country about £900, and the total cost was nine millions. We went to work in what he had heard described as a "frenzy" of extravagance. There must have been most wasteful and extravagant expenditure to account for such an outlay. He had wished to avoid these details, but they had been forced upon him. The other day he had quoted what was said by Major Edwards, that with all this extravagant expenditure we were not able to put more that 30,000 men into the field, and were no better prepared for war than at the time of the Crimean campaign. Was that true or not? No one had contradicted it; and if it were true, who was responsible to the taxpayers for such a disgraceful state of things? He would sooner run the risk of sweeping away the whole system at once, and then setting about a scheme of re-organisation, with the aid of his friend Sir William Denison, than allow such a condition of affairs to remain; and he might add that on Saturday only he had been assured by a general officer that the statement was quite true. If that were so, the statement having been made some years ago, it was discreditable to the Parliament, the military secretary, the Commander-in-Chief, the military officers, and every body concerned in the business. The instant such a fact was known it ought to have been remedied, but it never would be remedied until the present system was swept away. He had stated that in England there was an officer to every 18 men, but, on going more minutely into figures, he found that last year there were 6,549 officers, and 116,000 rank and file, so that, in fact, there was an officer, attached or unattached, to every 17 men; no wonder the cost was £110 per head per annum. What was the use of Parliamentary responsibility if such abuses could not be got rid of? He would like nothing better than to show how well the army could be done for at the rate of £8,000,000 a-year. And he was encouraged in his belief by seeing what Mr. Cardwell has done in three months. The army estimates for 1869-70, issued that very morning, he ventured to say, were an honourable achievement full of promise—reducing the cost more than a million. He prayed that Mr. Cardwell would go on reducing a million every year for seven years, and then what the *Times* was pleased to call his (Mr. Cole's) "colossal designs" would be accomplished. Sir. Wm. Denison had fallen into a great mistake in supposing that two millions of men were all at once to be drawn from industrial pursuits, to the great injury of industry, and drilled for a year, at a cost of from fifty to one hundred millions. He never proposed anything of the kind. It was quite possible to take 100,000 men a-year, and when they were thoroughly instructed in their duties, replace them by a fresh detachment, and at the end of twenty years they might have spent, perhaps, fifty millions, and to that there would be no objection. Then again, the bugbear had been brought up by Sir William of all the young men of the country being taken away from their employment and their sweethearts, but this was disposed of in the same way. They would not be taken away—and it was to be seen that training one in thirteen of the population would not be more damaging to industry in England than it was in Switzerland, where, as he had said before, everybody learns to read and write. Another error into which Sir. W. Denison had fallen was this. He had represented him (Mr. Cole) as proposing to at once disband a standing army of 130,000 men, and his comment was that there would be an army of paupers at once. Again, he said, he had not proposed anything of the kind, but on the contrary had stated that the system would take at least seven years to introduce and work out; but what a satire was this on the present standing army, to say that they would at once become paupers! He did not believe that such would be the case, though, perhaps, some would turn thieves, if ever such a foolish proceeding were adopted. Allusion had also been made to a universal system of drilling interfering with the national industry, but, on this point, he would quote a passage from a letter addressed to himself by a very large employer of labour, having works in the midland and northern counties, who was a Member of Parliament, and his son also was a member, both gentlemen occupying a high industrial position. He said:—"I should like to tell you that I heard the opinion expressed by many manufacturers in France and Germany, and more especially by Monsieur Lorsbach, the Director of Krupp's works, that a short term of military service greatly increases the usefulness of young men working in large factories. They become punctual, ready and amenable to discipline." One part of his argument throughout was, that if the things were properly adjusted, so far from interfering with the industry of the country, by taking a man away for say 20 days and drilling him, his industrial power would be much increased, and if they began with young children the advantage would be still greater. With regard to the colonies, he deemed it quite possible to keep troops there, but he saw no reason why they should not be treated in the same way as the mother country. He did not want to turn the colonies adrift, but for them to undertake their proper share in the business of defence. Why should not a colony like Australia, with a population which would soon exceed that of England, provide the main body of her own soldiers? As to India, that would form an admirable subject for discussion on a day specially appointed, but for the present he must pass it by. There was no doubt that Mr. Spencer Walpole, Colonel Ewart, R.E., and one or two other speakers had hit the mark when they said the question was whether it would be better to engage and train only a small number of soldiers as a standing army, which was against the constitution and common law, or to put our military forces on a footing more proportionate to that of other European nations, and to engage, under some arrangement the most convenient possible to all parties concerned, the whole of the population in self-defence? That was the gist of the whole question. If the public really preferred an

extension of the present costly system, including the publication of such returns as he had quoted, the grand result being that each man cost about as much as three French soldiers, then he had been preaching in vain; but he did not think such an opinion would prevail when the question was thoroughly understood. He would quote from the preamble to the "Mutiny Act" for last year—"Whereas the raising or keeping a standing army within the United Kingdom of Great Britain and Ireland in time of peace, unless it be with the consent of Parliament, is against law." Every year a sanction to breaking the law was necessary, and he contended, therefore, that it was at all times open to Parliament, and especially a new Parliament, to reconsider the whole question. The standing army, as it at present existed, was the creation of the last 200 years, a great part of which, certainly 100 years, was without exception the most inglorious period of English history. We had spent 400 millions of money, the burden of which would hang perpetually upon the industry of England, in order to prevent anyone bearing the name of Napoleon ever sitting on the throne of France; and what was the result? We had a good friend to Arts, Manufactures, and Commerce on the throne of France now. If we saved seven millions annually for fifty years we should nearly pay off the National Debt incurred for that stupendous folly. There had been changes and reforms in every department, both of Church and State, and why was the army alone to be held sacred? During this time the cultivation of fine arts had so degenerated that the English were described as having the worst taste of any people in Europe, and it was thought necessary to have a South Kensington Museum to remedy the disgrace. We had now done away with rotten boroughs, though when the standing army was first established Old Sarum returned two members to parliament by the voices of three electors; Roman Catholics were persecuted, and the corn laws were in force; all these corruptions or solecisms had been got rid of, and why should not the standing army follow in their train? He must apologise for having in the paper recommended a standing army of 16,000 men—there ought to be no standing army at all; and, in order to prevent mistakes, he would say what he considered there ought to be. In the first place, he would assume that, for the present, there should be the same proportion as at present of artillery, cavalry, engineers, &c., with the officers commanding these branches of the service. Next, he proposed to have, in the course of the next three years, 200,000 men ready to bear arms, with the same proportion of officers, artillery, &c., as at present, and all this could be provided at a cost of about £2,500,000, according to the plan which he had shadowed forth in the paper. He would, of course, have the requisite number of well-disciplined militia and volunteers put on a proper footing, and the police also, according to Mr. Chadwick's idea, might be made available if necessary; and it must not be forgotten that the boys were to be trained at school. The figures just quoted had been worked out for him by an able officer of the Royal Engineers, and he had no doubt of their accuracy. He did not intend that the boys should be drilled on their half-holidays, which would be simply a bore, but in the ordinary routine of their duties. The soldiers should be allowed to work, instead of committing suicide from sheer idleness, and of course the militia would be thoroughly reformed. In conclusion, he had only to say that he intended to move for a committee, to be, of course, composed principally of military men, though he hoped the presence of a civilian or two would not be objected to, to inquire what could be done for eight millions. Of course, if the suggestions were good, they would bear scrutiny, and if not, they would go to that place which is "paved with good intentions."

The Chairman said it would be presumptuous in him, as a civilian and manufacturer, to detain the meeting by attempting to give a *resumé* of all the arguments which had been advanced during the discussion, but there were a few practical matters which had come under his own notice which he might mention. There was no doubt that the two main questions now occupying the attention of the country were economy and education. With respect to economy, he was of opinion that, without reducing a man or a gun, or changing the present system in the least, there was immense scope for retrenchment in both army and navy. He was doubtless somewhat in the position of the oft-quoted tailor, but at least he understood tailoring; in other words, as a business man he understood business. In saying this, it must be understood that he had the highest possible opinion of the men of both services, but the administrative departments were a disgrace to the nation. It was confessed that at the Admiralty, without touching a man or a gun, Mr. Baxter had already saved a million of money. The grossest jobs were constantly perpetrated in both services, both on the part of those who purchased on behalf of the Government and the contractors. He had seen soldiers robbed in a manner perfectly cruel, by the mode in which the contract system was conducted. For instance, he had known such a thing as this, which he had brought under the notice of the authorities of the War Office—cavalry drawers were made at Nottingham, sold to a commission agent in Dublin, re-sold to a wholesale house in Dublin, again sold to an army tailor in London, and sent into the War Office in Pall Mall, at an advance of about 33 per cent. on the original price, and then the soldier was charged with these articles as necessaries. He believed that at the present moment the corruption in the contract departments was a disgrace to all parties connected with it. Then again, too, there was the perpetual conflict between the War Office and the Horse Guards, which led to the greatest possible confusion. What the civilians attempted to do, the professional men tried to undo, so that, he believed, chaos itself could hardly be worse than the War Office at the present moment. He believed that Her Majesty's Government were honestly desirous of putting the army and navy in the best possible state of efficiency, and all were agreed that economy was desirable. The more they got for the money of course the stronger would the nation be, and the better prepared for any emergency that might arise. He felt very strongly on the question of education, and having had opportunities of comparing educated with uneducated soldiers, he believed it was impossible to over-estimate the value of education to the soldier. The year before last he had spent a few weeks with a noble lady who lived in a village on the frontiers of Bohemia, where the Prussian troops passed on their way to Sadowa. For seven weeks she had officers quartered in her house, and the neighbourhood was crowded with soldiers, and yet, during the whole of that time she never heard an offensive word, nor did she or her neighbours miss the value even of a chicken. This lady had been brought up at the Court of Vienna, and her prejudices were naturally in favour of the Austrians, but yet she said she was positively ashamed when the Austrian prisoners were brought in, for there was immediately robbery and disgrace all around. Last year he was speaking to a Saxon colonel, who told him he was quite shocked one day to find that there were two men in his battalion who could not read nor write. He called his men together, told them such a thing was disgraceful, and that they must teach these two men at once. These men fought as well as soldiers could fight, and were called wherever they went, "the amiable giants." Many of these men were taken from his own looms, for he had an establishment in Saxony, and for eight years he had never met with a working man in that country who was not able to correspond with him well upon any matter connected with his own business. He did not think Mr. Cole's plan was quite so revolutionary as was supposed, for it came simply to this—increasing the proportion

of volunteers and decreasing that of the standing army; and, to show what might be done to make volunteers realities, he might narrate his own experience. He was one of five in the town of Nottingham who resolved on raising a volunteer corps, and at the commencement he remarked that he was too old to *play* at soldiering, and, if it were done at all it should be done in thorough earnest. Accordingly they started the corps of "Robin Hoods," which had now attained something of a reputation. They got an old Indian officer, who ultimately became adjutant, and from the first they determined not to have a non-effective man in the ranks, which resolution they kept. He was himself captain for some time, and they had as fine a regiment as could be desired, but there was no reason why others should not attain the same excellence. The men did not neglect their business, but learned their drill in their spare time, and were all the better for it. The result was that last year the adjutant told him they were a thousand strong, in better condition than ever, and there were plenty of men waiting to join. There was not a man non-effective, 997 were extra efficients, and the remaining three, who were merely efficients, were the Duke of St. Albans (the Hon. Col.), the chaplain, and a little bugler who was not strong enough to hold his rifle quite straight. They had been repeatedly complimented by military men, and told that they were equal to any regiment in the service, and there was no reason why all volunteers should not reach the same point. The men were only drilled after work hours, but they commenced on a good system, and were well looked after, and there soon sprang up an *esprit de corps*, which continued and kept alive the good work which had been begun. In his own company he had 87 per cent. marksmen, a thing which was unknown in the regular service; and this showed, therefore, in his opinion, the advantage of having a higher class of men to deal with. Nor were these men in any way disqualified for their ordinary occupations; many of them were employed in his own warehouse, and the improvement in their appearance and demeanour was most striking. If he met any of them in the street, instead of slouching along, and looking at the wall because they did not know how to recognise his presence, they now stood upright, and gave the military salute, not servilely but civilly, and he was convinced that their efficiency in work was much increased by the exercises they performed. He saw no reason why there should not be an immense development of the volunteer force, for, in his opinion, Englishmen were full of military spirit, if it were only properly brought out. He would not say that all Mr. Cole's wishes would be accomplished, but even Sir Wm. Denison would agree that a much greater development of the volunteer force was both desirable and possible, coupled with extensive reforms in the administration of the army. He agreed with Mr. Campbell that it was necessary to keep a considerable European force in India, but he was also convinced that the present term of service was too long. Many evils arose out of this system which had been alluded to, and though it might be difficult to draw the exact line as to what was the proper term, short service was, in his opinion, undoubtedly preferable to the opposite system. A man who had been in the army for many years was too old to turn readily to civil employment, or to re-learn the trade which he had formerly practised; whilst the young soldier returned to civil life invigorated and improved by the discipline he had undergone. In conclusion, he proposed a cordial vote of thanks to Mr. Cole, whom he had known for many years, and whose administrative abilities, which he had had opportunities of observing, were equalled by few. The paper he had read had produced a most interesting discussion, and he hoped would lead to some practical results.

Sir Charles Trevelyan said he understood it was not the practice to pass a vote of thanks to the chairman, but he might take the opportunity of remarking that hardly anyone could have been selected more fitted to preside over such a discussion, he being a large employer of labour, not only in England but abroad. He understood that the present assembly had been called in ridicule "King Cole's Parliament;" but, for his own part, to his dying day, he should be proud of having taken part in its deliberations, and desired to add his tribute to the merits of the Council of the Society of Arts, the gentlemen who had summoned it.

Sir. William Denison desired to support the vote of thanks to Mr. Cole, for whom he had the greatest possible respect, although on the present occasion he believed he had made a great mistake.

The vote of thanks having been passed unanimously,

Mr. Cole briefly replied, and referred to an article in the *Times* of that day, the concluding lines of which he quoted, to the effect that in a vast extension of our reserved forces lay the only true means of providing efficiently for self-defence.

Thirteenth Ordinary Meeting.

Wednesday, March 3rd, 1869; Lord Frederick Cavendish, M.P., in the chair.

The following candidates were proposed for election as members of the Society:—

Allender, G. Mander, 6, Dawson-place, W.
Berrington, Arthur, Pant-y-goitre.
Perdicaris, Ion, 2, Heathcote-villas, St. Margaret's, Twickenham.
Portman, Hon. Edwin B., 3, King's Bench-walk, Temple, E.C.
Sooby, Thomas Hill, 12, Lansdowne-terrace, Kensington-park-gardens, W.
Stokes, Thomas N., the Priory, Totteridge, Herts.
Worthington, Robert, Salmon Pool-lodge, Island Bridge, Dublin.

The following candidates were balloted for, and duly elected members of the Society:—

Dermer, Edward C., 3, Barnes-villas, Barnes, S.W.
Fentiman, John W., Devonshire-cottage, Balham, S.W.
Gassiot, John P., jun., 6, Sussex-place, Regent's-park, N.W.
Harrison, Peter, Keswick.
Helme, Robert, The Forest, Walthamstow, N.E.
Hocombe, James B., 13, Bedford-row, W.C.
Hyam, Frederick, 109, Westbourne-terrace, W.
Leslie, Francis Simon, Ealing, W.
Lloyd, Frederick George, The Winns, Walthamstow, N.E.
Matthews, George Kelly, St. John's-lodge, Beckenham, Kent.
Maude, Colonel Francis Cornwallis, 75, Onslow-square, S.W., and Army and Navy Club, S.W.
Robertson, William Wybrow, 1, Whitehall, S.W.
Williams, Morgan B., 15, Hyde-park-gate, Kensington-gore, W.

The Paper read was—

ON THE ADAPTATION AND EXTENSION OF PRESENT MEANS FOR SCIENTIFIC INSTRUCTION.

By Henry H. Sales, Esq.

The amount voted for the service of the Department of Science and Art for the year ending March 31st, 1868, was £144,158 19s. 6d. Of this sum only £18,900 was expended upon science schools, including payments to teachers upon results, prizes of books, grants for examples, local secretaries for examinations, and scholarships. The number of persons under instruction in science schools in May, 1868, was 14,600. Of this number only 8,763 passed the examinations of the Department, 4,460 were plucked, and 2,377 did not present themselves at all. At the Oxford local examinations, held June, 1868, 1,109 juniors and 397 seniors were examined. Only

94 juniors took the papers in mechanics and mechanism, 67 being successful, and 68 ditto in chemistry, 35 being successful. 45 seniors were examined in electricity, &c., and 25 successful; 33 ditto in chemistry, and 22 successful. At the Cambridge local examinations, held December, 1868, of 1,164 juniors only 79 were examined in mechanics, and 56 in chemistry, and of 218 seniors, 12 presented themselves in chemistry, and 7 in electricity. With these figures before us we may readily adopt the words of a writer in the *Edinburgh Review*, and say "That no country in the world approaching to England in manufacturing eminence is so radically deficient in special industrial education. Broadly viewed, the whole system of technical education has, at this late date, to take root and grow in our soil."

Continental procedure in education in no respect contrasts so strongly with English action as in the results evidenced by the general intelligence of their manual labour population compared with our own. A commentary upon continental primary education would to-night be foreign to my purpose. I only allude thereto in order to justify the opinion I hold respecting the first duty of the present promoters of scientific instruction. The rapid means of communication that now exist, not only between the principal towns of Great Britain, but between those towns and the chief seats of manufactures on the continent, render the general establishment of science colleges for persons in easy circumstances, who intend their sons to be engaged in scientific pursuits, not the first matter of pressing importance. But science for the million is the present desideratum. In entering upon the consideration of the best means for its promotion, a general survey must be taken of the present condition of primary education, and of the results produced in the State-aided schools.

On May 4th, 1868, an educational return was presented to the House of Commons. It contains the following figures:—

Average number of scholars in attendance in day schools	836,395
Ditto night schools	43,017
Ditto day schools not receiving annual grants	125,383
Ditto night ditto	11,293
Total	1,016,088

Total per-centage on population of average number in attendance, 5·36.

Confining our attention to the 836,395 scholars in average attendance in the State-aided day schools, let us note the reports upon them by Her Majesty's Inspectors of schools for the years 1867 and 1868.

Rev. J. R. Blakiston, M.A, on Schools inspected in Leicester, Northampton, and Rutland:—"Arithmetic is at a low ebb throughout the great mass of the schools which I have inspected. If questions be put demanding the least thought on the children's part, they are found utterly at a loss. Even in subtraction sums, if the less number be given out first it very often remains uppermost, and has the greater number taken from it."

Rev. W. Campbell, M.A., on Schools inspected in Middlesex and Surrey:—"The reading of the older children, although perhaps fluent enough, wants that intelligence and expression which result from a clear knowledge of the meanings of the words employed, and a fair appreciation of the general sense of the passage. This I believe to be caused by the teacher having been content to arrive at nothing more than a mechanical readiness of utterance, which he supposes to be all that is required to ensure a 'pass' mark to the reader. I am afraid that the old custom of questioning upon the passage read, and explaining the force and meaning of the words of which it consists, prevails but too little in the very best schools. At least, I have asked in such schools the meaning of the words 'similar,' 'diminution,' 'numerous,' &c., but without success."

Rev. W. J. Kennedy, M.A., on Schools inspected in South Lancashire:—"I can scarcely imagine anything worse than the reading of poetry in the 5th standard generally is. It is, with very few exceptions, thoroughly defective, and I pass the children only because they are nearly all bad alike; and I am compelled to acquiesce in a very low standard of merit."

Rev. G. R. Moncrieff, M.A., on Schools inspected in Kent:—"I have been very much struck with the inability of boys in the upper standards to think out a simple practical question in the rules of arithmetic belonging to their year. The reading of standards 4 and 5 is seldom satisfactory. Most of it passes; little of it approaches being good."

Rev. J. C. Robinson, M.A., on Schools inspected in Buckingham and Hertford:—"I conclude from the facts of the past year that the state of elementary education in the two counties remains without noticeable alteration since I reported to your Lordships two years ago. I had at that time to point out in various particulars the deterioration which had taken place in most of the schools under inspection. The permanent quality and value of the education given had appreciably fallen; and further experience has not modified in any sensible degree the conclusions at which I then arrived, although in the separate details of school management varied conditions are year by year observed."

Rev. W. Warburton, M.A., on Schools inspected in Hampshire:—"The elements of reading are certainly imparted with more method, rapidity, and success than formerly, but it never seems to get beyond a certain point of excellence; as the children rise into the higher standards they are able to read longer and harder words, and that is all. I do not remark a progressive improvement in intelligent and expressive reading in proportion as children are longer under instruction. The inspector can hardly refuse to pass boys and girls who glibly read off, and correctly articulate, words of four and five syllables, however evident it may be that they have no conception of what the author meant to convey; and though they read the whole in one note, or only dropping the voice at certain mechanical intervals, as if trying to read on the principle of a Gregorian chant, with a total absence of feeling, emphasis, and undertone."

Rev. F. Watkins, B.D., on schools inspected in Lincoln, Nottingham, and York:—"Of the 11,410 children examined under the code from the day schools—

10,427, or 91½	per cent.,	passed in	reading.
9,719, or 85	,,	,,	writing.
8,624, or 75½	,,	,,	arithmetic.

"Of the children examined, 91 per cent. can read sufficiently well in their different tests to satisfy the demands of the code. But the children examined are not quite half of the whole number in attendance; so that the per-centage drops at once from 91 to about 45, and this latter number represents the per-centage of children in a school who can read passably. By this term I understand fluently, correctly, and with proper observance of stops; but I have never held it to require expressiveness in reading, which alone shows intelligence of the subject-matter, and is of any real use to the reader. I must record my conviction, from two more years' work, that the character of reading required under the code, and obtained by it, is altogether insufficient and almost illusory. It does not convey the idea that the reader is interested in his book, or hold out the hope that he will voluntarily take to it when he is his own master in life. The meaning of any but the commonest words is generally unknown to him, and allusions to other matters—places, persons, things—are for the most part thrown away upon him."

J. G. Fitch, Esq., M.A., on British and other Protestant schools in Yorkshire.

Mr. Fitch has made an elaborate calculation "in order to estimate approximately the number of those who, in

the present system, may be expected to be classed in the higher standards before leaving school." His results show that 77·4 per cent. of those examined will ultimately reach the fourth standard; 34·2 per cent. of the whole will reach the fifth; and 11·4 per cent. will reach the sixth. Mr. Fitch remarks—"Considering that to pass in the sixth standard requires no higher attainments than the power to read from a newspaper with moderate fluency, to write a sentence from dictation, and to work sums up to practice, this result is not one which justifies much boastfulness. It is quite possible for a boy to attain this point without receiving much intellectual stimulus or exercise; and it is to be feared that even his education, unless supplemented by the evening class or the people's college, by the Christian institute or by reading habits, will remain miserably incomplete. Yet anything short of this standard is still more unsatisfactory; and in view of the demand now so loudly made for workmen of higher technical skill, it is melancholy to record that nearly 90 per cent. of our present scholars leave the primary school not only uninstructed in the elements of science, but also destitute of that rudimentary knowledge, without which all future teaching of science, even if it were offered to them, would be well-nigh unintelligible."

In a memorial presented last month to the Lord President of the Council, by the London Church Schoolmasters' Association, and from other friends of education, residing in and around the metropolis, is this noteworthy statement—"The experience not only of teachers, but of almost every one engaged in popular education, proves conclusively that the revised code has had generally a disastrous influence. It imposes an unfair test of results; it has given a mechanical character to the instruction in our elementary schools."

The conclusion to be drawn from these reports is unmistakable. About one million and a quarter of children are under instruction in State-aided schools. It may fairly be assumed that the standard of attainments is at least equal to that in other schools for the same class of the manual labour population. From these schools boys go forth to a life of labour, which is for the most part skilled labour, deplorably deficient in the rudiments of education, and with the inherent intelligence of their race undeveloped. Fortunately, we can place our hands upon one great cause of the present low state of primary education in our best elementary schools. There can be no doubt that the present system of instruction, necessitated by the requirements of the revised code, does not develope the intelligence of school-boys, and is producing merely mechanical results. Mr. Matthew Arnold reports, "The mode of teaching in the primary schools has certainly fallen off in intelligence, spirit, and inventiveness during the four or five years which have elapsed since my last report. It could not well be otherwise. In a country where everyone is prone to rely too much on mechanical processes, and too little on intelligence, a change in the education department's regulations, which by making two-thirds of the Government grant depend upon a mechanical examination, inevitably gives a mechanical turn to the school teaching, and a mechanical turn to the inspection is, and must be trying, to the intellectual life of a school. In the inspection the mechanical examination of individual scholars in reading a short passage, writing a short passage, and working two or three sums, cannot but take the lion's share of room and importance, inasmuch as two-thirds of the Government grant depend upon it."

The present condition of the State-aided schools was foreseen by all practical teachers when the Revised Code was first propounded. That I may not weary you with extracts from innumerable speeches and publications, I will only refer to a small pamphlet on "Public Education," written in 1861 by Mr. J. G. Fitch, M.A., then Principal of the Normal College, Borough-road. After giving a number of quotations from the reports of Her Majesty's Inspectors for the preceding year, commendatory of the intelligence of the children, Mr. Fitch writes:—"The Inspectors are aware that good reading, such as gratifies the enr of an educated man, is one of the rarest accomplishments; that it is seldom attained, even among the upper classes of society; that it cannot be got by persistent mechanical teaching of the art of reading as an art, but that it comes with culture and thoughtfulness, and is rather the result of intelligent teaching in other subjects. . . . . The Inspectors have no interest in hiding the deficiencies of the schools. They have brought them to light, from time to time, in the most unsparing way. But the whole tenour of their evidence proves conclusively that the reading, writing, and arithmetic are steadily and rapidly improving from year to year, and that judicious intellectual instruction in other departments acts favourably on the understanding of these rudiments. It is also remarkable that imperfect instruction in reading, writing, and arithmetic is found in the worst schools—not in those in which higher instruction is given. Where the master has received the best training, and the higher classes are most intelligently taught, there the teaching of reading, writing, and arithmetic in the lower classes is invariably the soundest and most effective. If it were not so, the Committee of Council has the remedy in its own hands. It has steadily directed the attention of its Inspectors to the importance of looking after elementary subjects; and it has done this with the happiest results. By continuing to do this, it will still further check all tendency to pretentious and unsound teaching. But to deprive an earnest teacher of alll sympathy and recognition in relation to his plans for imparting a love of study and inquiry to his scholars, will only have the effect of giving him meaner notions of his duties, and reducing the work of the whole school to a mechanical level."

The Committee of Council have given a sign of their consciousness that educational "results" are other than mechanical reading, mechanical writing, and mechanical arithmetic. The rigidity of the Revised Code has been slightly relaxed. By a minute of Council, dated February 20th, 1867, provision is made for an additional grant of 1s. 4d. per pass in reading, writing, or arithmetic, up to a sum not exceeding £8 for any one department of a school, on condition that at least one-fifth part of the average number of scholars over six years of age pass a satisfactory examination in one or more specific subjects beyond those prescribed by the code. The Rev. R. Temple, M.A., in his report on Cheshire, writes:—"The minute of the 20th February, 1867, so entirely coincides in its aims and methods with the views which I ventured to express two years ago, with regard to the necessity of instruction in the higher subjects of history, grammar, geography, &c., for the purpose of calling out the intelligence of the scholars, that it would be presumptuous in me to say as much in its praise as I think it deserves. I cannot, however, help feeling a little triumph at the fact that the teachers of my district, who have, I know, been inclined to think me rather unreasonable in my demands for the higher subjects, are now reaping the benefits of my mode of examination, as their scholars were in most cases prepared to satisfy the tests of the new minute at once, and so the schools in my district have generally obtained the additional grant in the first instance." Here, however, our commendation of the action of the Committee of Council on Education must cease, for, in accord with the incongruity that has hitherto pervaded the action of "My Lords," and to which educationists must submit until a Minister of Public Instruction unites the two departments of education in a symmetrical whole, it is provided that while any branch of science may be taught as one of the secular subjects, yet the science system of the Science and Art Department shall not be recognised during the three attendances of an elementary school receiving aid from the Educational Department, Whitehall.

We now arrive at the first adaptation of present means for scientific instruction. The intelligence of the children in the State-aided schools is undeveloped by the mechanical teaching enforced by the revised code. The Committee of Council acknowledge the evil, and desire to stimulate instruction in higher subjects. Instruction in the rudiments of science, while of great value as forming the alphabet of technical education, is also a powerful means for developing the intelligence of school-boys. Then remove the restrictions that now bar the science system of the Science and Art Department from schools under the Educational Department, Whitehall, and the rudiments of science will become a part and parcel of primary education. Mr. Henry Cole only expressed the opinion of most persons who have studied this subject when, in his letter to the Vice-President of the Council, published in the Appendix to the Report from the House of Commons Select Committee on Scientific Instruction, he wrote:—"I recommend that the managers of elementary schools be free to establish classes for teaching science through certificated teachers, and that payments on results be made to them, and that all fears of competition with elementary education be ignored." Further, in a paper handed in to the same Committee by Captain Donnelly, entitled "Memorandum of suggestions for enlarging the system of State-aid to Scientific Instruction, drawn up in accordance with the instructions of the Lords of the Committee of Council on Education," is the following important passage:—"To meet the wants of the younger artisan class, it appears to be only necessary to remove some existing restrictions which prevent payments being earned for instruction in science given during the three attendances of an elementary school receiving aid. This restriction was imposed when the schools were aided under the whole system, which it was considered justified and required some check of this kind. If teachers of elementary schools were permitted to earn payments for the instruction in science, as in drawing, of the more advanced students in these schools, the results of the present science system show conclusively that they would very soon form such classes, and would induce a considerable per-centage of the parents to allow their children to remain longer at school. Probably it would be advisable that the payments should be made through the Education Department, who would then have full control of the matter. The Science and Art Department, acting according to its present system, would simply have to make a return of the results of the examination to the Education Office. To meet the requirements of these schools, it would be advisable to have a sixth standard of examination below the present fifth class, and make a payment of 10s. on passing it. Whether it would be advisable to make any restriction as to the subjects of instruction or not, is doubtful. It is generally better to leave this to work itself out."

The Council of the Yorkshire Board of Education, seeing the necessity for early instruction in the rudiments of science, and conscious of its importance to the manufacturing community, have decided to do their part in hastening its introduction into primary schools. A systematic extension of the system of professorial lectures, based upon the scheme introduced by Dr. Bond into the Hartley Institution, Southampton, has been resolved upon. A course of thirty lectures will be given on the Elements of Chemistry as applied to Manufactures in each of the following towns:—Bradford, Halifax, Huddersfield, Leeds, and Wakefield. The lectures will be delivered weekly, during the session commencing October 4th, 1869. All pupils in the primary schools who are at least eleven years of age, and who have passed the Government examination of the fourth standard of the Revised Code, and paying an entrance fee of one shilling, are to be admitted to the lectures. No other charges to be made. Each pupil must undertake to present himself for examination, at the examinations of the Department of Science and Art, May, 1870. Pupils who are members of an ordinary science class taught by the master of the day school to which they belong, will be examined in connection with the said class, and as members thereof. Other pupils will be examined as members of the central class. The schoolmasters of these pupils shall receive from the General Council the sum of 30s. for each successful candidate of the first class; 20s. ditto of the second class; and 10s. ditto of the third class; provided that one lesson of not less than one hour in length, on the subject of the central lecture, be given by them weekly during the session; and that the General Council have the power to certify themselves, in any way they may deem desirable, that such instruction has been duly given. It is intended that the expenses of the central lectures, estimated at £250, shall be defrayed from a special fund raised for that purpose. Respecting this scheme, the *Times*, in a leading article, of November 9th, 1868, remarks:—"The Board is endeavouring to supply the link which will be necessary to connect elementary education with the higher grades of instruction. They propose to establish professorial lectures for the elder pupils of primary schools, which will supplement the lessons of the masters. The boys will assemble weekly for this purpose in convenient centres, and it is hoped that a basis may thus be afforded for trade schools in our chief manufacturing towns. One of the wishes Mr. Whitworth expressed, was, that the Government would assist in providing professors of mechanical science throughout the country; and, if this design could be carried into execution, it would exactly fall in with the plan proposed in Yorkshire. If the scheme thus sketched be completed, it is evident that a complete and graduated course of scientific instruction will be established; and it will have been provided in the only satisfactory way—by local efforts, supplemented and guided by the Government."

There is another serious impediment to the present introduction of scientific teaching into primary schools, beyond the Whitehall restrictions. The great bulk of the schoolmasters now annually sent out of the training schools are ignorant of the first principles of science. Here again is made manifest the short-sighted policy that guided the abrupt and ill-fated movements of the authors of the revised code. Taking alarm at the manufacture of "fine razors to cut grindstones," for so the Right Hon. R. Lowe spoke of the students in training for elementary schools, the curriculum of study in training schools was by the action of the code cleared of all the subjects that were not immediately connected with rudimentary knowledge. Prior to the introduction of the code the syllabus of subjects in which students in training-schools were annually examined included algebra, mechanics, physical science, and higher mathematics; to these were added experimental science (especially as applied to manufactures and agriculture), for those students who remained a third year at the school. Now all these subjects have disappeared from the syllabus. In order to stimulate the employment of competent scientific teachers for the instruction of the training-school students, special grants of £100 per annum were made to lecturers on physical science engaged by the managers. This grant has also disappeared. The Whitehall restriction that fetters the action of South Kensington, to which I have directed attention in connection with the elementary schools, does not, however, apply to the training schools, and accordingly the authorities of some of the training-schools are, on their own responsibility, reintroducing scientific instruction, and receiving payment on results from the Science and Art Department; but that which is optional should once more be made compulsory, so that every trained schoolmaster should be certified as a teacher of the rudiments of science.

The study of science being introduced into the State-aided day schools, and supplemented by the evening science classes, organised in connection with the Science

and Art Department, the general intelligence of the manual-labour population will be developed, and sufficient scientific knowledge will be at their command to enable English manufacturers to compete with their Continental rivals on terms of equality, so far as the education of the ordinary mill-hand and factory operative is concerned. There still remains a stationary manufacturing population for whom adequate provision would not be made by the realisation of the system of scientific instruction I have described. From the ranks of the mechanics and artisans are rising, not only the foremen, overlookers, and heads of departments, but also the manufacturers and employers of labour. It has been estimated that more than two-thirds of the masters and employers of labour in Bradford have sprung from the working class, or are only removed from that class by one generation; and the same remark, more or less, applies to all the manufacturing district of the West Riding of Yorkshire. It is, therefore, needful that provision should be made for the instruction of the children of the men who are emerging from the class of the employed into that of the employers. As a rule, these children are not sent away from home to school, the exceptional cases, for the most part, become inmates of the small private boarding schools, whose limited resources cannot supply the education requisite for them. For the due and proper education of this class the Bristol Trade School is a model that may guide the action of educationists. This school is so well known that it is unnecessary to enter into details respecting it. Speaking in a general manner, it may be said that the school was established for the sons of the higher artificer class, and the small tradesman class. Its object is to teach the pupils science as applied to industrial pursuits. It consists of two departments, a lower school and an upper school. In the lower school the instruction is confined to the rudiments of elementary knowledge. Pupils who are twelve years of age are admitted to the upper school if they are well grounded in reading, writing and arithmetic. The subjects taught in the upper school comprise chemistry, theoretical and applied mechanics, experimental physics, machine drawing, building construction, and mathematics. Fifteen shillings per quarter per pupil, paid in advance, is the school fee. Exhibitions have been founded in connection with the school. Each subscriber of three pounds per annum has the power of nominating a boy to the school without the payment of fees; annual subscribers of two pounds and one pound can relieve the personal payment of the school fees to the respective amounts of their subscription. After passing through the upper school the pupils carry on their education in the evening science classes.

The strict imitation of this model cannot be expected, neither would it be desirable. The principle being preserved, local exigences must determine the form the school shall assume. In some cases more complete work may be done than is accomplished in Bristol. Upwards of fifty years ago was commenced the formation of Mechanics' Institutes for the express purpose of imparting scientific instruction to the manual labour population. Called into existence before surrounding circumstances necessary to their well being were propitious, they have passed through strange vicissitudes. Nevertheless, in our manufacturing districts they have, through evil report and good report, at one time spoken of as the panaceas for all the evils of humanity, at another held up to derision as miserable failures, still gone on increasing in numbers, and in Yorkshire alone during the last twelve months more money has been contributed for their erection or enlargement than at any other corresponding period of their history. But far more gratifying than the bricks and mortar extension is the earnest educational spirit that is being manifested by their managers. For the most part these institutions are thoroughly adapted for the purposes of scientific instruction. An illustration will be far more explanatory than mere assertion. The town of Keighley, in Yorkshire, situated in the valley of the Aire, is fast rising in manufacturing importance. The chief manufactures are woollen goods and machine making. Its population is about 60,000. By its situation it is easily accessible to the inhabitants of the surrounding manufacturing towns and villages, *e.g.*, Bingley, Skipton, Saltaire, Wilsden, and Cottingley. Its Mechanics' Institution has the honour of being one of the first established in England; it is reputed to be the third in order of time. It is unnecessary to say that the building, which was erected in the infancy of the town, is unsuitable for modern requirements. Its days are numbered, and a successor, designed on an elaborate scale, is being erected. Externally the building will form a handsome Gothic structure, and will be a conspicuous and artistic addition to the buildings of the town. The School of Art, placed on the upper floor, will comprise an exhibition room, mechanical room, painting room, modelling room, casting room, and the usual accessories. On the first-floor will be the library, reading room, conversation room, and offices. The ground-floor will be devoted to scientific instruction. A lecture-hall to seat nearly one thousand persons forms an addition to the building, and will be used in common by every department of the Institute. The estimated cost is £12,000. From this short description it will be seen that the Institution is designed as an industrial college for the Keighley district; and, so far as the architectural arrangements are concerned, is admirably adapted for its object. The plan of operations under the consideration of the directors is equally commendable. It is suggested that a school be established, upon the Bristol model, in the rooms allotted to the School of Science, and that, in combination with the Evening Classes and the School of Art, a complete system of instruction in science and art be organised. It need not be pointed out how readily this scheme will be available for the whole of the district. At Bingley, Saltaire, Skipton, Wilsden, and Cottingley ordinary evening science classes are either in operation, or will be established prior to the ensuing autumnal session. From these classes the most successful students can be passed on to the more advanced instruction that can be given at the Keighley Institute, while the distance from the Trade School is not great enough to prevent the daily attendance of lads whose parents desire for them a higher education than can be obtained in the day schools of the respective townships. Let what is proposed to be done at Keighley be done in every centre of industry, and the English system of technical education will bear comparison with any Continental scheme. If public opinion can only be aroused so that the directors of Mechanics' Institutes may be encouraged in their action, the day is not far distant when such comparison may be instituted. The need for technical education is acknowledged, the machinery is ready, local funds can be had if asked for, the will has only to be exercised, and the work is begun.

So far I have treated of the extension and adaptation of existing means for the rudimentary education in science of the manual labour population, and of the secondary education of the higher artificer class. Next in order of advancement is the provision that it is necessary should be made for the special education in science required by the embryo manufacturers and managers of factories. For this work it appears necessary that a few central colleges of industry should be established. I said at the outset that these colleges are not so pressing a necessity as the general diffusion of elementary scientific knowledge, nevertheless no system of technical education can be complete without them. To-night I do not purpose to raise any question of detail on this part of my subject. As regards the establishment of these special colleges, I am of opinion that local subscriptions, aided largely by Government grants, should be the basis of operations. Once established, the pupils' fees, supplemented by special annual grants from the Parliamentary vote for education, would make the colleges independent of eleemosynary aid. The chief bar to the establishment

of these colleges is the difficulty connected with their foundation. Here and there an isolated effort may be made, and wealthy men may come forward and promote their foundation, but a general movement seems far distant. In examining the sources of local agency that might be used for the promotion of a central college movement we light upon a rich source of wealth. An annual income of half a million, for the most part derived from educational endowments, is either unappropriated or scandalously wasted. The utilization of this revenue is a work worthy to be undertaken by any man who desires to earn an immortal name as an educational reformer. The impediments to be removed, and the vested interests to contend with will make the work most difficult, and, therefore, its accomplishment most satisfactory. In the meantime there is a class of educational institutes that may be utilised as central colleges, and with regard to which only sentiment, and not vested interests, can be opposed to their transformation. Scattered throughout the country are normal schools or training colleges for schoolmasters. In the desire to maintain these institutions as the source of supply of trained teachers, it is to be feared that attention is withdrawn from much concerning them that deserves careful consideration. The following facts will enable us to deduce some practical observations. In the subjoined table is given a list of the male training colleges in England, with the number of students for whom accommodation is provided, and the number in residence at the date of the last returns, in February, 1868:—

	No. of students for whom accommodation is provided.	No. of students resident in February, 1868.
Cheltenham	106	65
Peterborough	46	29
Battersea	107	80
Chelsea	106	89
Carmarthen	60	18
Carnarvon	43	20
Chester	70	13
Culham	100	39
Durham	52	30
Exeter	48	28
Saltley	125	52
Winchester	56	30
York	80	40
Southwark	100	69
Bangor	41	30
Westminster	72	62
Hammersmith	70	34

The certified expenditure of these institutions for the last year, exclusive of the cost for the practising schools and any extraordinary expenditure, was £44,832 18s. 4d. To meet this expenditure, the Committee of Council contributed the sum of £32,469 17s. 10d., and the parents of students £3,533 15s. 2d., leaving only £9,829 5s. 11d. to be provided by diocesan boards, private subscriptions, and investments. The total number of students in residence in February, 1868, was 728. As the course of training extends over two years, one-half of this number —*i.e.*, the second year students—left the colleges last Christmas, the annual cost to the State, for the supply of 400 trained teachers, is upwards of £80 per head.

The teachers thus supplied to the country were certified as having passed a satisfactory examination before Her Majesty's inspectors in religious knowledge, reading, repetition from memory of 300 lines of poetry or 200 lines of prose, penmanship, arithmetic (including questions which involve the solution of simple and quadratic equations), school management, grammar and composition, geography, English history, so far as to be able to answer questions after a perusal of any one of the standard histories of England, Euclid, books I. to II., with simple deductions, elementary questions in political economy, based upon the fourth reading book of the Christian Knowledge Society, or that of the Irish Commissioners, vocal music, and elementary drawing. It must be borne in mind that this miserably low standard of knowledge, supplied at an annual cost of £80 per head, is required of men who, for the most part, have spent five years as pupil teachers, and at the end of each year have been subjected to an examination by Her Majesty's inspectors, after having received, in addition to daily employment in an elementary school, five hours' instruction per week from a certificated teacher.

From the foregoing statistics it will be seen that there are seventeen distinct institutions called training colleges in England. Accommodation is provided in these colleges for 1,282 students, but by the last returns only 728 students were in residence. The instruction now given is of the most elementary character. These colleges are almost entirely supported by grants from the Committee of Council on Education, at an annual expense to the country of upwards of thirty-two thousand pounds. In addition to the Government grant, upwards of two thousand five hundred pounds is paid by the students in fees, the trifling balance being defrayed by private subscription. These colleges are, therefore, entirely State institutions, and, consequently, there can be no reason why they should not become the subject of criticism with the view to their adaptation to present educational requirements. Here let me remark that the question of trained *versus* untrained teachers does not present itself. Very few persons will assert that it is unnecessary to train persons for the office of schoolmaster, and we may assume that training colleges *per se* are State necessities. But, after it is admitted that training colleges are an integral part of any system of national education, it is still a subject for discussion whether, as now constituted, they are doing all the benefit to education they are competent to do, and whether the lavish expenditure of the State is producing sufficient results.

I have already spoken of the introduction of scientific instruction into the primary schools as a matter of urgent necessity, in order to counteract the mechanical teaching prescribed by the revised code, and the consequent need for the compulsory introduction of science into the training college. Now by contrasting the expenditure of the training colleges for tuition in 1857, when algebra, higher mathematics, industrial mechanics, and physical science were carefully taught therein, with the expenditure of the same colleges in 1867, with a course of study that would not qualify the student to pass the honours' examination for juniors in either of the universities local examinations, it will be seen that the re-introduction of scientific instruction would not entail any additional expenditure for tuition. In the following table I have inserted the colleges whose expenditure for tuition is given in the minutes of the Committee of Council for the years 1857 and 1867:—

	1857.			1867.		
	£	s.	d.	£	s.	d.
Battersea	1,334	0	0	1,075	0	0
Carnarvon	495	4	0	440	0	0
Carmarthen	540	0	0	446	0	0
Chelsea	1,435	0	0	1,275	0	0
Cheltenham	1,051	16	0	1,415	0	0
Chester	598	0	0	630	0	0
Durham	72	9	3	667	19	1
Exeter	424	4	0	639	4	0
Culham	560	0	0	732	15	0
Winchester	430	0	0	447	15	3
Saltley	546	0	0	1,207	0	10
Total	7,486	13	3	7,975	14	2

The gross amount of expenditure for tuition for a lower standard of attainments is not only greater in

1867 than in 1857, but the number of students has considerably diminished. In 1857 there were in the above colleges 640 students, in 1867, 512; the average cost for tuition has thus increased from £11 10s. per student to £15 10s. ditto. It is therefore evident that no financial difficulty interferes to hinder the replacement of scientific instruction in the course of study prescribed by the Committee of Council for Normal Students.

So far then as relates to the provision of duly qualified science teachers for elementary schools and for the ordinary evening science classes, the training colleges could, without additional outlay, by a simple adjustment of the teaching staff, meet present requirements. But the training colleges are not more than half filled with students, and as the supply of trained teachers is equal to the demand, should accommodation afforded by them be left unused, or could it, without interference with the primary object of the colleges, be made available for the purposes of higher scientific education until such time as central science colleges become national institutions?

A course of study ranging over two years might be arranged, whereby private students, the sons of manufacturers, and heads of factories, might obtain a higher scientific education, similar to that given in the Continental Polytechnic Schools. A portion of this course would be available for the students in training for the masterships of elementary schools, who, so far as that portion is concerned, would receive their lessons in common with the private science students.

The course of study pursued at the Royal Polytechnic School at Munich, and the Polytechnic School at Nuremberg, fairly indicates a course that might be introduced into our training colleges. The instruction in these schools is distributed over a period of three years, arranged as follows:—

First Course.

Mathematics, viz., trigonometry, analytical geometry, &c.
Physics, viz., gravity, light, heat, electricity, &c.
Machine drawing.
Descriptive geometry.
Ornamental drawing.

Second Course.

Analytical mechanics, viz., statics and dynamics of solid bodies.
Machine drawing.
Chemistry, pure and applied.
Differential and integral calculus.
The doctrine of construction in building and building materials.

Third Course.

Applied mechanics.
Machine drawing.
Analytical chemistry.
Composition in the art of building.

In the introduction of a similar scheme of technical education into the training colleges, no elaborate preparation or expense is required. The principal colleges have already laboratories connected with them, and are also fairly supplied with scientific apparatus. The present annual outlay for tuition added to the Government science grant for the ordinary students in training, who all come under the departmental regulation of poor students, is sufficient to include the remuneration of competent scientific professors. It must also be borne in mind that the private science students would entail no expense upon the authorities of the colleges, for the cost of maintenance and tuition would either be defrayed by the students themselves, or from the proceeds of scholarships other than those now attached to the colleges. The present total annual cost for tuition, board, lodging, and permanent establishment charges, averages £57 per student. I have already shown that almost the whole of this amount is defrayed by the State. As nearly one-third of the total cost is expended in tuition and other expenses of instruction, which would not be increased by an enlarged number of students, it follows that the cost per head for the maintenance and instruction of the private science students would be less than the present average cost per normal student.

Here, then, by the adaptation and extension of present means, may be provided high scientific instruction for a class now without due provision. Board, lodging, and appliances for instruction are all ready to hand; and it only remains for the Committee of Council—by whose grant the training colleges are now maintained, and to whom the country is looking for initiatory measures for the further promotion of scientific instruction—to make such regulations as shall render these institutions available as science colleges, and at the same time justify the enormous grant now annually made for their support.

It is unnecessary, for any practical purpose, to extend the subject under consideration any further at present. Notwithstanding all that has been said respecting the need for advanced scientific instruction, it is unmistakably evident that there is not yet a science constituency ready to take advantage of more elaborate means for technical education. Twelve months since Dr. Lyon Playfair, speaking in this room on the establishment of advanced technical schools, said—"These technical schools will not be fed unless we spread a taste for science and art. We have got some of them at present. There is an admirable technical school in Jermyn-street, the School of Mines, but the number of its matriculated students is very small; not from any want of efficiency in the conductors—the professors are of the highest position, and its education is excellent—but the large field of mining industry cannot supply twenty men capable of receiving the systematic instruction which is there given. We want, before we found these technical schools, to create the taste, and then our technical schools will be well filled." Professor Huxley, on the same subject, remarked that the smallness of the attendance did not arise from any defect in the teaching, but "it was because the great mass of the manufacturing interest did not, even at the present moment, understand that such instruction in the groundwork of technical knowledge was what they wanted to prevent their manufactures from going to ruin."

Because my daily experience confirms these statements, I have restricted my remarks to the adaptation and extension of present means for scientific instruction, trusting that, by the concentration of action thereupon, a taste for scientific knowledge may be generated in the great mass of the population, so that our successors may have prepared for them a body of students willing and able to avail themselves of the best means for the advancement of technical education.

DISCUSSION.

Mr. F. S. Powell quite agreed with the observation made in the paper that one of the great difficulties at present was the formation of what was termed a science constituency. It was impossible for anyone who had watched the progress of educational measures in the House of Commons and elsewhere, not to be aware of the fact that, when there had appeared a desire on the part of the Government to advance, before many years had elapsed the current had set in the opposite direction. He thought, however, that rather too gloomy a view had been taken of the operations and results of primary schools, and although it was based on the reports of the inspectors, he thought very possibly other passages in those reports might be found which would tend to greatly brighten the picture. He hoped the friends of education would make it more of a practice to visit these primary schools, and judge for themselves of the quality of work which was accomplished therein; but in relation to the results, the influences under which the children were placed at home should always be borne in mind. It was very easy to say

that the meaning of ordinary words and phrases was not understood, but they must recollect that expressions in ordinary use amongst educated people were seldom heard and never used by the parents of these children. It would require at least one generation, when the children now being educated should have grown up and had children of their own, before much progress could be expected in the general education of the country. He did not wish to enter into the question of how many children there were at present under instruction, though he believed the proportion was not so unsatisfactory as was often supposed, but the main object should be to raise the standard and quality of the education which was provided. The *Pall-mall Gazette* of that evening contained some statements taken from the Report of the Council on Military Education, just issued, from which it appeared that out of a total number of men in the army of 169,214, 135,280 were able to read and write, while 10,357 were described as having a superior education; and not long since it had been stated in the House of Commons, by an officer in the Guards, that only two or three men in his battalion were unable to read and write. With regard to the Revised Code, it was undoubtedly the fact that in some respects it had acted prejudicially on education. It might be fairly described as having cut off the tops of the plants, and whether it had given greater vigour to the roots was an open question. Having been a member of the committee of the House of Commons which had recently sat on the subject of technical education, he might say a word or two on that point. The substance of the evidence given, both by employers and intelligent workmen, was, that the system hitherto chiefly pursued in English arts and manufactures was that vulgarly known as the rule of thumb, and that if the same thing were allowed to continue we should fall behind other nations, who were much better provided with scientific education. One of the witnesses examined was a man who had spent a considerable portion of his time in America, and he stated that the great difference between the British and American workman was that the former generally seemed jealous of his master, while the latter did all in his power to co-operate with and advance his interests. That statement might or might not be true in its full extent, but at any rate, if they were to teach the English workman to co-operate with his employer, one of the first steps must be to give him a practical scientific education. Being on the Council of St. Mark's Training College, he was in a position to say that Mr. Sales was not quite correct in saying that Government bore all the expense of these institutions, for, in fact, Government assistance was limited to 75 per cent. of the total amount, and the apparently high cost per student was partially accounted for by the fact that at present these institutions were not nearly filled. The reason why the course of instruction had been limited was that complaints were made that the teachers of national schools were receiving, at the public expense, too high an education, and quotations were given in the newspapers from the examination papers. The result was that the course of study was restricted, which he, for one, very much regretted. He had lately had the honour of introducing to the Lord President of the Council a deputation of Church schoolmasters, who desired that a higher education should be afforded in these training colleges, and that those who had profited by it should be able to exercise their talents in middle-class education, and he sincerely hoped that these desires would be acceded to.

Mr. Paterson could not agree in the view that they must wait for the next generation to see any great results from improved education; before that time the present means, which were the subject of the paper, might probably be replaced by others, and if we were to keep our place in the commerce of the world, we must do something immediately. He was himself a workman, and consequently knew the feelings of working men, and he believed that a great deal of the so-called failure to introduce scientific education amongst this class of the population had arisen from not taking into account their wishes and circumstances. Taking for illustration the School of Mines, in Jermyn-street, it was said that with regard to the system of instruction, and high character of the professors connected with it, it would bear comparison with any institution in the world, but that the number of students was very small. The reason was that the instruction was given at a time when working men could not attend, and at a cost which working men could not afford. An experiment of a popular kind had been tried there, courses of evening lectures being given at the cost of sixpence for the course, and the result was that at the time when the tickets were to be obtained the rush was similar to that at the door of a theatre on the first night of a new drama; and he had known instances of individuals who had not been able to attend or get tickets purchasing them at a high premium from those who had been more fortunate. If the same facilities were afforded on a larger scale, it would be found that amongst the working classes there was a very large constituency who were desirous of obtaining scientific instruction, and every one of these would act as a missionary in spreading the desire for knowledge among his fellows. There was no doubt that the excellence of foreign workmanship, especially in some particular branches, was owing in great part to the superior education of the foreign workmen, though he believed this was often over estimated, but the fault did not lie altogether with the English workman. It had been said that in many instances Mechanics' Institutions had proved failures, but this very often happened because the instruction afforded was not by any means up to the mark. From his own experience, he was able to say that the London Mechanics' Institution, so long as its founder, Dr. Birkbeck, was able to give his personal attention to it, was thoroughly appreciated by working men; and it was not until the quality of the instruction deteriorated that the attendance fell off. If such institutions as that in Jermyn-street could be popularised and multiplied throughout the country, he was satisfied that they would be well supported; or at any rate the influence of those who appreciated their advantages would soon leaven the body to which they belonged. With regard to the education of children, it would always be difficult to carry it beyond that point which the parent considered desirable, and therefore adult education must go hand-in hand with that of the rising generation. He might mention, in conclusion, that at a meeting of working men, held not long ago, a committee had been appointed for the purpose of carrying out a system of technical instruction; a similar committee had been formed at Birmingham, which already had four science classes at work, and before long he believed there would be a similar committee in every large town in the kingdom. When this was the case, it could not be said that there was no demand for scientific instruction.

Mr. E. A. Davidson had been much pleased in listening to a paper of so practical a character, though it would not become him to say much in its praise, inasmuch as he had himself expressed much the same views in the paper which he read in the same place in the month of December, 1867, particularly with regard to the use which might be made of the training colleges. In order, however, to make any general and lasting impression on the education of the country, they must begin at the beginning, with the national schools. He believed that one great cause of the diminution in the number of students at the training colleges was the pupil-teacher system, which became so general, simply because it enabled the schoolmaster to earn a living. There was no reason why the rudiments of natural science should not be taught in national schools, provided it were done in a practical manner. According to the returns of the Science and Art Department, 29 science schools had failed during the past year; and he maintained that the principal cause was a want of interest,

not in those who were to be taught, but in those who were to form the managing boards and conduct these science classes, and thus proper advantage was not taken of the facilities offered by the Department. If this apathy continued there could be no doubt that the prophecy would soon be realised, that foreign nations would outstrip England in arts and manufactures. It must not, however, be supposed that the want of scientific instruction was confined to working men; there was the same need amongst all classes, from the highest to the lowest—from the university even to the ragged school.

Mr. Shaw (Burnley) said that as a practical science teacher he had visited the French Exhibition of 1867, with a view of making a report to the Science and Art Department; in that report were included recommendations that the science teaching, which, since the introduction of the Revised Code, had been discontinued in elementary schools, should be re-established; that science should be taught in training colleges; and that schools should be established on the plan of the Bristol Trade School. He was at present engaged in the East Lancashire Union of Institutions, having under his superintendence, more or less directly, 3,000 evening scholars, whilst he had the immediate care of 14 science classes, numbering from 200 to 250 pupils. The result of his experience was that there was a great lack not only of scientific or technical education, but also of elementary, for he found that many of the young men attending the evening classes were anxious to become acquainted with various departments of natural science, but were prevented for want of elementary knowledge. If, therefore, they wanted a sound system of education, they must begin with the day school; and if only the bare rudiments of natural science were therein communicated, the science teacher in his evening classes would have an opportunity of extending his course of instruction far beyond what was at present possible. The evil results of the Revised Code could be easily shown in this way: before its introduction there was a regulation under which teachers of primary schools could obtain what was called "apparatus grants," for the purpose of teaching various branches of science, and the result was that in many schools might be found a small chemical laboratory, a collection of physical apparatus, or of natural history specimens. All this was swept away by the Revised Code, and when, in 1868, the Science and Art Department offered prizes of certain scholarships for pupils in primary schools who passed a prescribed examination in such subjects, it was found that the machinery which would have created students eligible for these prizes had been destroyed. He hoped Mr. Sales's views with regard to the training colleges would be carried out, and from a somewhat lengthened experience in connection with evening classes, he believed it was almost impossible to estimate the benefit which would arise from a general diffusion of scientific knowledge by their means.

Mr. Thomas N. Day was much pleased to find both the paper and the discussion so practical in character. This subject had been under discussion for the last 20 years, and as yet little progress had been made, as he believed, because they had not begun at the right end. It was all very well to say that working men should have scientific instruction—so they should, but no general improvement would be effected in that way unless the rising generation were properly educated. Some years ago things appeared to be taking a more favourable turn, but the Revised Code came in and spoiled all. Before that time schoolmasters endeavoured to give their pupils an *education*, but it was not so now; they gave a mere mechanical drilling in those subjects which were paid for. Reading, writing, and arithmetic did not constitute education, which meant the development of the intellectual powers. Nothing was more fallacious and misleading than statistics as to the number who could read and write; children might pass that test, and yet have no taste at all, but rather a dislike for further instruction, and this was the tendency of the Revised Code, unless the teacher rose above it. He was not so foolish as to want to teach science to children under twelve years of age, for, as a general rule, until about that age, although the memory might be stocked, the reasoning faculties were not capable of exercise, but in every primary school there should be an upper class for those who remained beyond that age, who should be taught the rudiments at least of natural science. He should be sorry to see the training colleges diverted from their original purpose, because he believed there was quite work enough for them in training teachers for elementary schools. The whole principle of the Revised Code, payment by results, he believed to be absurd. Could anything be more ridiculous than to complain that schoolmasters were being over-educated, or, as was said by Mr. Lowe, that it was not necessary for men with any ambition to enter the profession? He hoped and believed that the meeting would be unanimously of opinion that if scientific instruction was to make any satisfactory progress, it must be taught to the upper classes in all elementary schools.

Admiral Ommaney, F.R.S., would like to know whether the school inspectors were men of any scientific knowledge. He feared that the contrary was the case, generally speaking, many of the inspectors being clergymen who were not familiar with science. He had listened to the paper with great pleasure, and concurred in the suggestions which it contained, but he hoped the point he had referred to would not be forgotten in future appointments.

The Chairman said he could not entirely pass by the remarks which had been made during the discussion, lest it might be supposed that he agreed with all that had been said, for, on the contrary, he could not by any means concur in the total condemnation of the Revised Code, which seemed the general feeling of the meeting. It was quite possible that improvements might be made in it, but it must be remembered that it came into operation after one of the ablest commissions that ever inquired into any subject had reported that a very large proportion of the children who attended the elementary schools, assisted by Government, left at the age of ten years with scarcely any knowledge of reading, writing, or arithmetic. Government thereupon determined, as he believed, with great propriety, that they would no longer pay for such children, and that whatever might be taught, no school should receive assistance which did not produce some practicel results in the way of these absolutely necessary branches of knowledge. He contended, therefore, that in principle the Revised Code was right, though he should like to see some better provision made for teaching elementary science to the more promising scholars who remained longer at school. Having been, with Mr. Powell, a member of the Committee of the House of Commons which inquired into the subject of technical instruction, he was able to state, on the authority of Professor Tyndall, who had carefully examined the papers of those who had passed the examination of the Department in connection with evening classes and Mechanics' Institutes, that the amount of knowledge acquired by the students was really such as would be of practical benefit to them, and he believed it was to these means they must look for really diffusing scientific instruction. At the same time he admitted that this was not enough; there were a certain number of youths of more than average abilities, whose desire for knowledge could not be satisfied with mere evening instruction, and he believed the right way to provide for them was that which Mr. Sales had briefly alluded to, viz., restoring the endowed grammar schools to the purposes for which they were originally intended. That question was now being grappled with by a gentleman who was not likely to fail for want of energy—his friend Mr. Forster—who, acting upon the recommendations of the Middle Class Schools Inquiry Commission, had brought in a measure which, if it could only be passed in the face of the strong opposition which it would

be certain to encounter, would do more good in this matter than could be anticipated. He proposed that a small paid commission should give their entire time and attention to this subject, having unlimited power under the sanction of Parliament and the Privy Council, to re-arrange the whole of the endowed grammar schools, and he hoped many would be re-arranged somewhat on the model of the Bristol Trade School, to which allusion had been made; whilst the many small endowments which were now absolutely useless might be converted into exhibitions to be given to those promising lads who should pass the requisite examination. By this means he hoped provision would be made for so educating their future Stephensons that their country might receive the full benefit of their talents. In conclusion, he proposed a vote of thanks to Mr. Sales for his able and interesting paper.

The vote of thanks having been carried unanimously,

Mr. Sales said he had hardly any observations to offer in reply, inasmuch as the whole of the criticisms had been of a favourable character. He might say, in reference to what fell from Mr. Powell, whom he claimed as a colleague in the good work, that his (Mr. Sales's) statements as to the results of elementary teaching were taken from sources which ought to be trustworthy—Her Majesty's inspectors and the schoolmasters themselves—and if he had exaggerated the amount of Government support given to the training colleges, he had been led astray by the figures in the Blue Book, which gave the amount of Government assistance at £32,000, as against a total of £40,000. His object had been, not to introduce any new scheme, but to point out how existing means might be utilised; and he would again express his opinion, that to do any general and lasting good they must begin at the beginning, and teach the alphabet of scientific knowledge in all elementary schools. His principal fear was that while they were arriving at and planning some grand educational edifice for carrying on scientific instruction, the absolute present necessities of those who were to inhabit it would be overlooked. As a practical man, he believed the best thing was for all to put their shoulders to the wheel, and make the best of existing means.

Fine Arts.

Great Art Prize in France.—In the month of August is to take place the first award of the great prize of 100,000 francs, instituted by the Emperor Napoleon III., to be voted by the Academy of the Beaux Arts and the Institute of France to the French artist, painter, sculptor, or architect who shall have produced, and entirely completed within the five years preceding the time of the award, a work of great excellence. The jury is to consist of thirty members—ten sculptors, ten painters, and ten architects. In case any of the members of this jury should become candidates for the prize they will retire from it, and their places will be filled up by the Academy.

Manufactures.

Manufacture of Beads at Venice.—The value of the exports of glass beads from Venice during 1868 were as follows:—To Bombay, Calcutta, Singapore, to the value of 1,860,000 francs; England, 1,470,000 francs; Zanibar and eastern coast of Africa, 650,000 francs; North America, 570,000 francs; Germany, Denmark, and Sweden, 560,000 francs; West Coast of Africa, 520,000 francs; France, Belgium, and Holland, 467,000 francs; South America, 430,000 francs; Constantinople and the Black Sea, 425,000 francs; Egypt, Tripoli, and Morocco, 375,000 francs; Russia, 280,000 francs; Italy, 78,000 francs; Spain and Portugal, 75,000 francs; Java and Sumatra, 70,000 francs; making a total value of 7,830,000 francs (£313,200).

Exports and Imports of Machinery in the Zollverein.—Amongst the industries which, during the last twenty years, have made the greatest progress in the Zollverein, the construction of machinery, perhaps, is the most important. Formerly all the steam-engines were imported into these states, principally from England, the United States, and Belgium; now a large quantity of machinery is not only made in the Zollverein, but exported to other countries. The following are the exports and imports of machinery in 1866 as compared with those of 1867:—

	Exports.	Imports.
1866	144,157 cwt.	226,045 cwt.
1867	209,129 ,,	226,914 ,,

The imports of locomotives, tenders, and boilers in 1867 amounted to 25,599 cwt., of which 13,901 cwt. were imported from Austria, 3,464 cwt. from France, 4,948 cwt. from England, and 1,430 from the Netherlands. The exports of this class of machinery during the same year were 42,648 cwt. to the Netherlands, Russia, France, Belgium, and Austria. The imports of machinery constructed chiefly of wood amounted to 22,069 cwt. from Holland, Switzerland, England, France, and Belgium; and 14,678 cwt. were exported principally to Austria, Russia, Holland, and Belgium. The largest trade was done in machines consisting principally of cast-iron, the imports being 146,476 cwt. from Switzerland, England, France, Belgium, Holland, and Austria, against 110,895 cwt. exported to Russia, Austria, Switzerland, Holland, Belgium, and France. Machinery of wrought-iron and steel, amounted to 31,156 cwt. imported from Holland, England, Belgium, and Switzerland, and 30,382 cwt. exported to Austria, Russia, Hamburg, and Belgium. The imports of machinery made of other metals amounted to 1,614 cwt., against an exportation of 9,526 cwt.

Commerce.

Shipping at Palermo.—The number of ships belonging to the maritime division of Palermo at the beginning of the present year was as follows:—

	No.	Tonnage.
Sailing vessels	1,311	19,616
Steam vessels, screw or paddle	16	5,042
Lighters and vessels for harbour purposes	574	1,978
Total	1,901	26,636

The movement of shipping in the port of Palermo during 1868 was:—

	No.	Tonnage.
Arrivals	37,04	511,520
Departures	35,44	512,921
Total	7,248	1,024,441

Railways in Switzerland.—The following are the kilometrical receipts of the principal Swiss lines during 1868, as compared with those of the previous year:—

Railways.	1867. Frs.	1868. Frs.
Western Swiss	18,459	19,024
United Swiss	14,025	14,314
Central Swiss	28,030	29,838
Bernese	9,563	10,070
Ligne d'Italie	6,325	6,080
Zurich and Lucerne	11,332	12,159
Jura Industrial	13,891	14,503
Bülach and Regensberg	3,840	4,298
Bulle and Romont	—	6,780
Average	19,254	20,340

Colonies.

State of Agriculture in New South Wales.—Considerable attention is now being paid in this colony to the statistics of agriculture, and at a meeting of the Royal Society of New South Wales Mr. Christopher Rolleston read a paper on the results of wheat culture in the colony during the last ten years. Mr. Rolleston divided the colony into five districts—southern, western, northern, midland, and pastoral, and gave the number of acres under cultivation, the yield per acre, the value per bushel, and compared the results of the successive periods. He found that in the first five of the past ten years there was an annual breadth of land laid down in wheat for grain of 114,204 acres, with an average yield of 1,482,998 bushels, being at the rate of 13 bushels per acre, whilst in the second five years the average annual breadth of land laid down in wheat for grain was 132,864 acres, with an average yield of 1,345,814 bushels, being at the rate of 10 bushels to the acre. Such results were not encouraging to the prosecution of this branch of agriculture, but he showed that, in 1867, there was a considerable increase upon the average of the previous five years, the average yield being rather under 12½ bushels. In Cumberland and the Northern districts there had been such a diminution of the yearly produce of wheat as to lead to the conclusion that these districts would prove unsuited to wheat culture, while the returns from the West and Southern districts were such as to warrant the expectation of large and permanent supplies of wheat from those districts. There is no doubt that the latter circumstance is caused by the increased facilities which the progress of the railway lines offers to the producers to bring their grain to market. But, notwithstanding the palpable decadence as exhibited by the return from the North, it is satisfactory to learn that the harvest prospects of these districts are so promising as to lead to the assumption that prices of foreign importation will be materially affected.

Notes.

Academy of Inscriptions, Paris.—M. Max Muller, of Oxford, has been elected a Foreign Associate of this Academy in place of the late M. Welcker, of Bonn.

Emigration from Europe in 1867.—According to the statistics published by the Bavarian Government, it appears that the number of emigrants that left Europe in 1867 was 242,025, of which nearly half were from Germany. The following show the number of emigrants from each country:—Germany, 117,591; Ireland, 65,134; England, 33,712; Scotland, 6,315; Sweden, 4,843; Switzerland, 3,985; France, 3,204; Holland, 2,156; Belgium, 1,623; Denmark, 1,372; Italy, 1,032; Norway, 309; Poland, 268; Spain, 203; Russia, 185; Portugal, 79; Greece, 8; Turkey, 6.—Total, 242,025. The greatest emigration was to the United States; and the preference was given to the Bremen and Hamburg routes to those *viâ* Havre, Liverpool, or Antwerp. The number of Bavarian subjects that emigrated in 1867 was 3,294, taking with them capital and outfits to the value of 1,116,000 florins.

Correspondence.

Porpoise Oil.—Sir,—The Society of Arts, it appears by the *Gentleman's Magazine* for 1799—offered one premium of thirty pounds for the greatest number of porpoises, not less than 30, which might be taken on the British coasts before the end of that year. This Society also offered a similar premium for the manufacturing of the greatest quantity of oil from porpoises taken on the same coasts in that year, not less than 30 tons, and an additional premium of £15 for not less than 15 tons of oil so extracted. But these premiums were offered before the valuable discovery of gas, in lieu of oil, and it might not now be desirable to encourage the destruction of porpoises for their oil, nor to expend public money towards decreasing the number of bottle-nosed whales, according to the plan recently suggested in letters sent to the Board of Trade, and published in the *Times*, &c.—I am, &c., Chr. Cooke.

London, February 19th, 1869.

MEETINGS FOR THE ENSUING WEEK.

Mon.....R. Geographical, 8½. 1. Dr. W. A. Bell, "On the Colorado and Great Basins of North America." 2. Mr. R. Brown, "On the Formation of Fjords, Canons, and River Terraces."
Medical, 8.
Victoria Inst., 8.
London Inst., 6.

Tues ...R. Medical and Chirurgical, 8½.
Civil Engineers, 8. Mr. Zerah Colburn, "American Locomotives and Rolling Stock."
Photographic, 8.
Ethnological, 8½. Special Meeting on "The Ethnology and Archæology of India."
Royal Inst., 3. Rev. F. W. Farrar, "On Comparative Philology."

Wed ...Society of Arts, 8. Mr. N. P. Burgh, "On the Screw Propeller."
Geological, 8. 1. Mr. J. W. Judd, "On the Origin of the Northampton Sands." 2. Mr. M. H. Coquand, "On the Cretaceous Strata of England, France, and Algeria." Communicated by Mr. J. W. Flower.
Graphic, 8.
Microscopical, 8. 1. Mr. George Gulliver, "On the Fibres of the Crystalline Lens." 2. Mr. Alfred Sanders, "On Zoospores of Crustacea."
R. Literary Fund, 2. Annual Meeting.
Archæological Assoc., 8.

Thur ...Royal, 8½.
Antiquaries, 8½.
Zoological, 8½.
London Inst., 6.
Royal Society Club, 6.
Mathematical, 8.
Society of Fine Arts, 8. Exhibition of Works of Art. A Paper by Mr. Henry Tidey.

Fri .....Astronomical, 8.
Royal Inst., 8. Prof. Abel, "On Naval and Military Applications of Electricity."

Sat .....R. Botanic, 3¾.
Royal Inst., 3. Prof. Odling, "Hydrogen and its Analogues.'

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb.

Delivered on 20th February, 1869.

1. Bill—Contagious Diseases (Animals).
4. ,, Hypothec Abolition (Scotland).
2. (4.) Railways Abandonment—Warrant.
6. Public Works (Manufacturing Districts Acts, 1863-64)—Report.
13. Treasury Board—Treasury Minute.

Telegraphic Communication (Europe and India)—Convention.
Oyster and Mussel Fisheries (France)—Report.
Railways (Ireland)—Second Report of Commissioners.

Delivered on 22nd February, 1869.

2. Bill—Admiralty Jurisdiction (County Courts).
5. ,, Sunday Trading.

Delivered on 23rd February, 1869.

7. Bill—Election Expenses.
8. ,, East India Irrigation and Canal Company.
9. ,, County Courts Proceedings.
4. Post Office (Brazil and River Plate Mails)—Contract.
10. Unions, Pauperism, &c. (Metropolis)—Return.
22. Police (Counties and Boroughs)—Reports.
25. Charitable Funds—Return.

Session 1868.

344. (A vii.) Poor Rates and Pauperism—Return (A).
501. Navy (Turret Ships)—Opinions of Naval Officers.

Delivered on 24th February, 1869.

13. Bill—Ecclesiastical Titles.
14. ,, Revenue Officers.
3. National Gallery—Annual Report.
14. Military Reserve Funds—Account.

Manufactures, Commerce, &c.—Reports by Her Majesty's Secretaries of Embassy and Legation (No. 1, 1869).
Public Petitions—First Report.

Delivered on 25th February, 1869.

6. Bill—Party Processions (Ireland).
10. ,, Permissive Prohibitory Liquor.
14. ,, Revenue Officers (corrected copy).
16. ,, Money Laws (Ireland).
15. Irish Reproductive Loan Fund—Accounts.
38. Civil Services—Supplementary Estimate.

Delivered on 26th February, 1869.

18. Bill—Poor Law (Ireland) Amendment.
27. Drogheda Election—Minutes of Evidence.

Delivered on 27th February, 1869.

19. Bill—Annuity Tax (Edinburgh).
17. Army (Manufacturing Departments)—Return.
20. East India (Revenues)—Return.
21. East India (Loan)—Return.
40. Navy—Estimates.
Naturalisation and Allegiance—Report of the Commissioners.
Public Petitions—Second Report.

Delivered on 1st March, 1869.

17. Bill—Libel.
5. Dublin Port and Docks Bill—Report of the Board of Trade.
8. Norwich Election—Minutes of Evidence.
9. Bewdley Election—Minutes of Evidence.
28. Bradford Election—Minutes of Evidence.
39. Army—Estimates.
41. Army (Variation of Numbers, &c.)—Statement.
42. Army (Colonies)—Statement.

Patents.

From Commissioners of Patents' Journal, February 26.

Grants of Provisional Protection.

Adhesive stamps—485—W. E. Newton.
Animal substances, &c., preserving—469—L. N. Legras.
Artificial leather—477—F. Walton.
Beer, &c., apparatus for preserving, &c.—381—L. Strauss and A. Seckbach.
Benzole, &c., obtaining—488—W. R. Lake.
Boats, righting when upset at sea—295—K. C. Watson.
Boilers—401—G. F. G. Desvignes.
Boots—436—T. A. Collinson.
Boots and shoes—463—S. Shaw.
Boots and shoes, cutting to shape the soles and heels for—395—J. and G. W. Dennell.
Bottles, cases for packing—445—W. Summers.
Brewers' vats, &c., metallic bungs for—470—V. A. Houdaille.
Brick-making machinery—472—B. J. B. Mills.
Bricks, &c.—331—F. Vauderaey.
Broughams, &c.—478—H. Mulliner.
Carriage wheels—475—A. McNeile and J. Slater.
Carriages—441—G. H. Morgan.
Carriages, &c., bearing springs of—359—W. Adams & W. G. Beattie.
Casks, machinery employed in constructing—464—T. Bond.
Clipping and shearing apparatus—369—J. S. Offord.
Cloths, double texture—418—G. Broadhurst and J. Kershaw.
Cocks, taps, and valves—371—R. Snook.
Copper, extracting from its ores—460—A. H. Lewis.
Corn, seed, and manure drills—377—T. Harrison.
Damasks, &c.—253—H. Barcroft.
Ejector condensers—456—A. Morton.
Electro-magnetic apparatus—391—W. A. Lyttle.
Explosive compounds—442—W. E. Newton.
Fans—389—H. J. Richman.
Fire-arms, breech-loading—446—C. Gordon.
Fluids, &c., vessels for warming, &c.—484—E. Round.
Food, preserved—434—H. Edwards.
Furnaces—341—T. Parkinson.
Furnaces—345—E. Lord.
Furnaces—476—J. Fletcher.
Furnaces of gas retorts—444—F. C. Hills.
Gases, &c., measuring the pressure of—429—J. Young.
Glass, &c., producing designs on—393—G. Rees.
Gully traps—344—T. Pankhurst, sen., and T. Pankhurst, jun.
Harness buckle and loop combined—457—W. H. Taylor.
Heating apparatus—449—W. E. Newton.
Heating and ventilating apparatus—403—J. H. Johnson.
Horses, &c., apparatus for giving medicines, &c., to—373—J. T. Edmonds.
Knitting machines—387—W. R. Lake.
Locks for bags, &c.—415—F. J. Knewstub.
Looms—438—W. H. Hayhurst.
Looms—458—W. R. Lake.
Metallic bedsteads, &c.—483—J. Atkins.
Metallic tiles for roofing purposes—399—L. A. C. St. Paul de Sinçay.
Mules for spinning yarns—363—A. Clark.
Muslins, &c., stretching, &c.—347—R. W. Knowles and G. Green.
Nets for ladies' hair—467—T. Billyeald.
Ordnance, mounting and working—361—J. H. Johnson.
Paper fasteners—353—G. and E. Ashworth.
Photographing printing process—417—W. H. Fischer.
Photographs—385—O. Sarony.
Pianofortes—427—P. J., F. W., & H. G. Smith & A. Pappenberger.
Ploughs—339—J. Howard.
Ploughs—450—D. Hanton.
Pumps—411—S. Mellor.
Purses, &c., fastening for—466—H. Posen.
Railway carriages—325—J. Slater.
Railway chairs—435—W. J. Horton.
Railways—486—F. H. Collins.
Reaping machines—431—C. Thomas.
Rocking chairs, &c.—400—G. Critchley and H. B. Fox.
Rotary engines—443—A. V. Newton.
Saccharine solutions, &c., filtering—333—W. Lister.
Sash holders—448—J. Holmes.
Saws—455—B. Hunt.
Screw propellers—440—T. V. Trew.
Seed and manure drills—452—S. W. Campain.
Signal bells—380—T. Nichols and J. Parr.
Spades, shovels, &c.—479—J. W. Yates.
Spindles and flyers—461—T. Hattersley.
Spring bedsteads—474—H. Tylor.
Spring couplings—465—T. Winder.
Stamps for printing on paper, &c.—367—C. S. Dawson.
Steam engines—405—E. J. A. Camere.
Steam engines—481—J., B., and R. Wood.
Stearic and oleic acids—419—P. Taysen.
Steel—3965—A. G. Cazalat.
Sulphate of iron, utilising the waste solution of—355—F. Braby.
Surgical bandages—413—S. W. Mulloney.
Timber, finishing the surfaces of—242—J. Pickering.
Tin and terne plates—349—E. Morewood.
Washing machines—482—E. T. Hughes.
Waterclosets—423—J. Carter.
Water velocipedes—425—W. R. Lake.
Wheaten flour—489—H. D. Bowyer and J. L. Norton.
Wood-cutting machinery—487—A. Ransome.
Wool, &c.—273—J. Box.
Wool, &c., operating on fibres in machinery for combing—409—J. Crofts.
Wool, &c., treating the waste of—473—C. E. Brooman.
Wrought-iron—337—L. Wray.

Invention with Complete Specification Filed.

Despatch cases, &c., fittings for—491—F. J. Knewstub.

Patents Sealed.

2661. E. Peyton.
2663. D. Smith.
2668. G. Ker.
2670. B. Corcoran & W. Dunham.
2674. E. Richardson.
2700. W. C. Holmes.
2703. E. Jobson.
2704. W. R. Lake.
2708. J. Adams and H. Barrett.
2713. J. Evans.
2714. J. I. Campbell.
2715. T. Forster & J. Heartfield.
2744. T. Wilson.
2761. J. Jones.
2773. E. Johnson.
2777. A. M. Clark.
2781. J. Shand.
2795. W. R. Lake.
2796. A. C. Henderson.
2864. A. F. Campbell.
2910. W. H. J. Grout.
3227. W. K. Foster.
3233. G. T. Bousfield.
3393. G. T. Bousfield.
3511. H. D. Hoskold and G. P. Wheeler.
3528. B. Britten.
3534. C. Descat and H. Guillaume.
3565. C. D. Abel.

From Commissioners of Patents' Journal, March 2.

Patents Sealed.

2579. D. Martin, W. Small, A. Hutton, and A. Key.
2720. J. Griffiths.
2724. S. Grafton.
2728. D. Jones.
2737. J. Pickering.
2749. H. M. Lee.
2752. G. Davies.
2753. W. T. Carrington.
2770. T. E. Clarke.
2774. J. Millward.
2778. A. M. Clark.
2793. J. Oliver & C. O. McAllum.
2809. M. Henry.
2828. A. M. Clark.
2832. E. Sarjeant.
2861. J. Davey.
2863. W. E. Newton.
3032. D. West.
3105. J. C. Morgan, H. Macaulay, and F. W. Waide.
3113. R. Tod.
3425. M. H. Davies.
3814. J. Frazer and W. Naar.

Patents on which the Stamp Duty of £50 has been paid.

549. H. Bright.
582. I. L. Pulvermacher.
554. C. J. Caumon.
576. T. Spencer.
577. J. Petrie, jun.
872. A. V. Newton.
594. W. E. Gedge.
603. H. Robertson.
625. J. Young.
658. W. H. Berry.
598. H. Wilson.
614. J. B. Booth.

Patents on which the Stamp Duty of £100 has been Paid.

489. R. Waller.
617. T. H. Wood.
392. E. Green and J. Newman.

Journal of the Society of Arts.

FRIDAY, MARCH 12, 1869.

Announcements by the Council.

Ordinary Meetings.

Wednesday Evenings at eight o'clock :—

March 17.—"On the Trade and Commerce of Japan." By William Davison, Esq.

March 24.—*Passion Week.*—No Meeting.

March 31.—"On Technical Education, considered in relation to Female Schools." By Ellis A. Davidson, Esq., Lecturer on Science and Art in the City of London Middle Class Schools. The Rev. Wm. Rogers, Rector of Bishopsgate, Member of the Council, will preside.

April 7.—"On the Theory of Boiling in connection with some processes in the Useful Arts." By Charles Tomlinson, Esq., F.R.S., F.C.S.

April 14.—"Spain Commercially and Economically Considered." By E. M. Underdown, Esq., Barrister-at-law.

FINAL EXAMINATIONS, 1869.

In order to avoid holding these Examinations on the same evenings as those of the Department of Science and Art, it has been decided to hold them, in 1869, on the evenings of

TUESDAY, the 20th APRIL,
WEDNESDAY, the 21st ,,
THURSDAY, the 22nd ,,
FRIDAY, the 23rd ,,

From 7 p.m. to 10 p.m., instead of on the 27th, 28th, 29th, and 30th April, as announced in the Programme of Examinations for 1869.

In consequence of this alteration the Previous Examinations must be held forthwith, in order that the Forms No. 2 and No. 4, referred to in par. 6 of the Programme, may be sent in in time.

A copy of Form No. 2 has been forwarded to each Local Board, and should be filled up and returned to the Secretary of the Society of Arts immediately.

A sufficient number of applications from candidates in all the subjects referred to in the notice at page 9 of the Programme having been received, papers will be set in Conic Sections, Navigation and Nautical Astronomy, Mining and Metallurgy, and Italian.

Local Boards having candidates either in the "Theory of Music" or in "Elementary Musical Composition (Tonic Sol-fa System)," should communicate with the Secretary of the Society of Arts immediately.

Institution.

The following Institution has been received into Union since the last announcement :—

London. Albert Working Men's Club, High-road, Knightsbridge, S.W.

Committee on India.

This Committee has resolved that Six Conferences be held during the present Session for the discussion of the following subjects, viz. :—

Tea Cultivation in India.
Hill Settlements and Sanitaria.
Waste Lands in India.
Trade with Central Asia, Thibet, and South-Western China.
Indian Fibres.
Silk Cultivation and Supply.

The following evenings have been fixed for holding the conferences :—

Friday, March 12th.
,, April 2nd.
,, April 16th.
,, April 30th.
,, May 14th.
,, May 28th.

At these Meetings the chair will be taken at 8 o'clock, and the discussion will be opened by a paper.

This evening, Friday, March the 12th, Mr. C. H. Fielder, Hon. Secretary of the India Tea Association, will open the discussion with a paper "On Tea Cultivation in India." The subjects for each subsequent evening will be previously announced in the *Journal.*

Members of the Society interested in Indian questions are invited to attend.

Subscriptions.

The Christmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Thames Embankment Committee.

The Council have appointed a Committee to report upon the best way of dealing with the Thames Embankment, so that the opportunity may not be lost of making this noble site conducive to the embellishment and improvement of the metropolis.

The following gentlemen have been invited to serve on the Committee :—

The Archbishop of York, Vice-Pres. of the Society.
The Duke of Buccleuch, K.G., Vice-Pres. of the Society.
Lord Henry G. Lennox, M.P., Chairman of the Council.
*The Lord De L'Isle and Dudley, Vice-Pres. of the Society.
*Lord Elcho, M.P.
*Baron Meyer de Rothschild.
Rt. Hon. Russell Gurney, Q.C., M.P.
*The Hon. Auberon Herbert.
A. B. Beresford Hope, M.P.
*William Boxall, R.A.
*Sir William Bodkin, Assistant-Judge, Vice-Pres. of the Society.
Montague Chambers, Q.C., M.P.
*Hyde Clarke, Member of the Council.
*Henry Cole, C.B., Vice-Pres. of the Society.
*C. W. Dilke, M.P.
*W. R. Drake, F.S.A.
*Lieut.-Col. Ewart, R.E.

*Alderman Sir T. Gabriel.
*W. H. Gregory, M.P.
Earl Grosvenor, M.P.
Thomas Hughes, M.P.
Sir John Lefevre, K.C.B.
*John Locke, M.P.
*J. E. Millais, R.A.
*S. Redgrave, Vice-Chairman of the Council.
John Ruskin.
Alderman Salomons, M.P.
*Lieut.-Col. Scott, R.E.
*Seymour Teulon, Vice-Chairman of the Council.
*Sir Charles Trevelyan, K.C.B.
John Walter, M.P.
*Richard Westmacott, R.A.
*Joseph Whitworth, LL.D.
*Watkyn Williams, M.P.

Those gentlemen whose names have an asterisk (*) have already consented to serve on the Committee.

The first meeting of the Committee took place on Tuesday, the 9th inst., at noon. Present—Lord Elcho, M.P., in the chair; Sir Charles Trevelyan, K.C.B., the Hon. Auberon Herbert, Lieut.-Col. C. B. Ewart, R.E., Messrs. Hyde Clarke, Seymour Teulon, Samuel Redgrave, and Richard Westmacott, R.A.

The Committee adjourned till Tuesday next, the 16th inst., at 11 a.m., when it was arranged that the proposal for placing the new Courts of Law upon the Thames Embankment should come under discussion.

Fourteenth Ordinary Meeting.

Wednesday, March 10th, 1869; P. Le Neve Foster, Esq., M.A., Secretary of the Society, in the chair.

The following candidates were proposed for election as members of the Society :—

Airlie and Lintrathen, Earl of, K.T., Airlie-lodge, Campden-hill, W.
Cadogan, Earl, P.C., Chelsea-house, Cadogan-place, S.W., and Nascott-house, Watford.
Collier, Sir Robert P., M.P., Attorney-General, 1, Mitre-court-buildings, Temple, E.C.
Collyer, Colonel George C., R.E., 57, Kensington-gardens-square, W.
Croft, Sir Herbert G. D., Bart., M.P., Oxford and Cambridge Club, S.W.
Cromwell, Rev. J. G., St. Mark's College, Chelsea, S.W.
Denison, Edward, M.P., New University Club, S.W.
Dodds, Joseph, M.P., Reform Club, S.W.
Egerton, Hon. Wilbraham, M.P., 67, Lowndes-sq., S.W.
Exeter, Marquis of, P.C., Engine-court, St. James's-palace, S.W.
Forster, Charles, M.P., 15, Great Queen-street, Westminster, S.W.
Hall, Arthur, 35, Craven-hill-gardens, W.
Henry, J. Snowdon, M.P., 142, The Terrace, Piccadilly, W.
Lancaster, John, M.P., 6, Strand, W.C.
Lusk, Alderman Andrew, M.P., 64, Westbourne-ter., W.
Northbrook, Lord, Stratton-park, Winchester; and Manor-house, Lee, S.E.
Russell, Earl, K.G., F.R.S., 37, Chesham-place, S.W.
Wright, Philip, 3, Kidbrooke-terrace, Blackheath, S.E.

The following candidates were balloted for, and duly elected members of the Society :—

Cluff, William, Grosvenor-house, Hoe-street, Walthamstow, N.E.
Dickins, Thomas, Middleton, near Manchester.
Harriss, J. Fordham, 7, Twickenham-park, Middlesex.
Hewson, Henry, 2, Brighton-villas, Twickenham.
Hogarth, George, The Elms, Foot's Cray, Kent.
Jacomb, Arnold, 70, Jermyn-street, St. James, S.W.
Matthews, James, 26, Wimpole-street, W.
Paice, Bowes A., 9, George-street, Hanover-square, W.
Tulk, John Augustus, Dunster-lodge, Spring-grove, Isleworth, W.
Whitley, John R., Railway Brass Works, Bowman-lane, Leeds.

The Paper read was—

ON MODERN SCREW PROPELLERS PRACTICALLY CONSIDERED.

By N. P. Burgh, Esq.
Author of "Modern Screw Propulsion," &c.

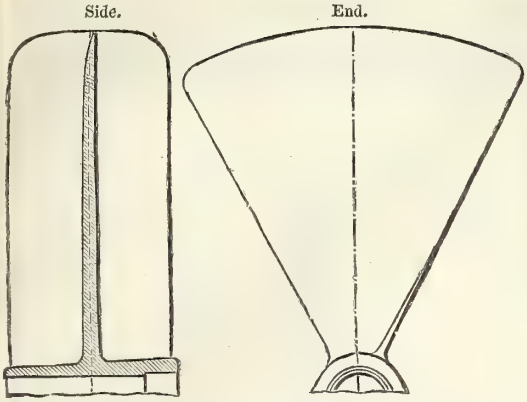
As a prologue to the paper that I shall have the honour of reading to you this evening, permit me to state that the reason why I have chosen the subject of modern screw propellers practically considered, is simply because in nearly all the published matter on that subject the practical portions on which the efficiency of the screw propeller depends have been generally omitted, and consequently the theory is so extravagantly dilated on, that it requires rather hard study to determine which end of the theory is the better to commence with in order to acquire a perception of the whole. The best proof of this conclusion results from the fact, that as within the last few years I have been in constant personal and letter communication with all the leading engineers of England and Scotland, I have found that the unpublished matter I complain of as omitted is really the actual status of their practice, and, indeed, so much so, that I shall this evening lay before you that matter which, excepting in my late work on the subject, has never been published, and I now commence my paper with a description of

The Various Shapes of Modern Screw Propeller Blades.

I need scarcely remind you that a perfect screw is but a band of any material wound completely around a cylinder, and that when the band is unwound, its extremity is the apex of a right-angle triangle, whose height equals the pitch, the length, the circumference, and the hypothenuse, the length of the helix or outside edge, so that the band is in the form of a curved inclined plane or curved wedge, and if any portion of the length is cut off it becomes a portion of a wedge, that is termed the blade of the propeller. Now if we required only one blade to the propeller we should require only one band within the pitch, but if two blades two bands, and if three three bands, and so on, as I shall show you this evening, to six bands or blades or more if desired. When the shape of the blade is a whole portion of a true screw, its outline is two apexed angles joined by an arc, whose radius is that of the screw's diameter. But when the blade is cut and carved to suit the eye and mind of the designer, then the artificial shape takes the place of the natural form, but with what result will appear further on. I have, therefore, endeavoured to explain to you what the principles are, and I will now proceed with the description of the practice.

A very good example of a common screw blade is illustrated by Fig. 1. These are the side and end elevations as they actually appear to the eye from the two positions; the side view has a portion of the boss and the blade in section; it shows also that the shape of the outline is a parallelogram, and the end view depicts the two angles joined by the arc, forming the helix or top edge of the blade. As the corners of the extremities are cut off or rounded in this view, they are curved in the other also, instead of the sharp connections of the arcs, and angles, and vertical lines, which would appear were the blade to be a portion of a perfect screw. The propeller to which this blade belongs is 16 ft. in diameter, and 20 ft. pitch, and the chord of the arc of the helix, or maximum width of the blade, is 8 ft., and the length on the line of the keel 3 ft. 4 in.; it was constructed by Messrs. James Watt and Co., and fitted by them to H.M.T.S. *Simoom*.

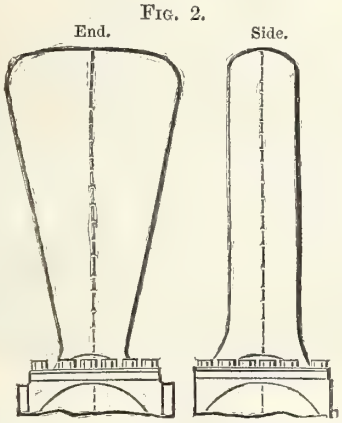
Fig. 1.



Elevations of the blade of the common two-bladed screw propeller fitted to H.M.T.S. *Simoom* by Messrs. James Watt and Co.

The next example of the common type is one of a four-bladed propeller, and is illustrated by Fig. 2. Here we

Fig. 2.

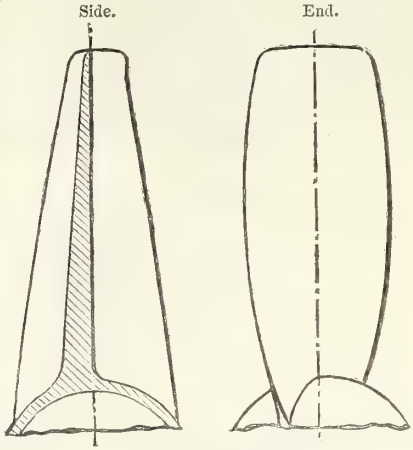


Elevations of the blade of the four bladed screw propeller fitted to H.M.S.A.P.S. *Minotaur* by Messrs. J. Penn and Son.

have the same form of outline as before, and very nearly the same proportion in the two views. This class has lately found its way into the Royal Navy by some means or other, for Messrs. Penn, Maudslay, and Ravenhill, have fitted four-bladed propellers to the *Minotaur*, diameter 24 ft.; to the *Agincourt*, diameter, 24 ft. 6 in.; to the *Lord Clyde*, diameter 23 ft. Those blades are not portions of a perfect screw of a uniform pitch, but of two screws of unequal pitches, and the centre of the blade is the point of their connection, thus:—The blades of the *Minotaur's* screw are constructed 25 ft. forward pitch, and aft 28 ft.; the *Agincourt's*, 24 ft. 10½ in. and 28 ft. 1½ in.; and the *Lord Clyde's*, 23·45 ft. and 26·55 ft. Messrs. Penn have also fitted the *Achilles* with a four-bladed propeller of the class under notice; its diameter is 24 ft. 6 in. pitch, 25 ft. aft and 28 ft. forward. Messrs. Maudslay have fitted a similar example to the *Lord Warden*, 23 ft. in diameter. I may add, in passing, that the *Agincourt's* propeller blade is a complete portion of a screw, for the corners are not rounded off, as with the examples shown in the illustration Fig 2.

The next shape of blade that I introduce to your notice is shown by Fig. 3. On contrasting its outline with that of Figs. 1 and 2, you will observe that the end elevation is narrower at the top than below; and that the sides are curved instead of angular lines, and the width at the root of the blade, or its connection with the boss, is but very

Fig. 3.

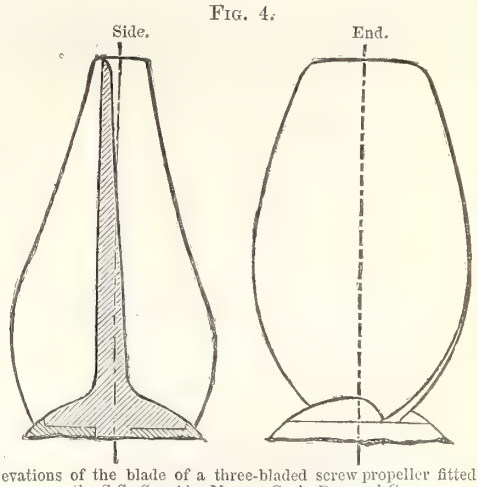


Elevations of the blade of the four-bladed screw propeller fitted to the S.S. *Allemannia* by Messrs. C. A. Day and Co.

little less than at the extremity. Viewing next the side elevation, the contrast is greater, for here the top width of the blade is the narrower, and the root the wider, instead of the sides being parallel; this, then, is the result of "cutting" and "carving," inasmuch that were these blades perfect portions of a screw, their appearance would be as those I have before described. The vertical section is given in the side view, which depicts the blade as straight from the root to the tip. This propeller was fitted to the S.S. *Allemania* by Messrs. C. A. Day and Co.

Another example, having three blades only, has been constructed by the same firm, and fitted to the S.S. *Surat*. One of the blades is shown by Fig. 4, which gives

Fig. 4.



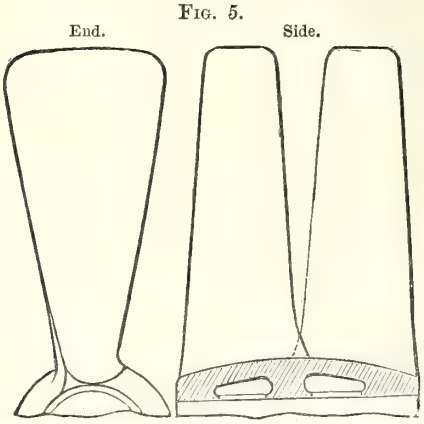
Elevations of the blade of a three-bladed screw propeller fitted to the S.S. *Surat* by Messrs. C. A. Day and Co.

an end and side view of it. Here it will be seen in the end view that the blade is wider, proportionately, than in Fig. 3, and therefore the sides are curved more than the other; excepting that difference the blades are identical.

I now direct your attention to a pair of double-bladed screw propeller blades, which, according to the general belief, were originated by a French gentleman named M. Mangin, from whom emanated the now well-known "Mangin" screw-propeller; and I may as well tell you that Messrs. Rennie were the first to entertain the idea in England, and the model of the first English screw of the kind was put into my hands by Mr. G. Rennie

a few days ago. The principle of this propeller is that the inventor has a propeller formed of double the length of the ordinary one; he then cuts it across in half, and puts one portion directly in front of the other, so that it becomes two propellers on one shaft. In the practice of construction each pair of blades are struck up as in the usual way, and shaped to suit the eye and mind of the designer, which Fig. 5 is an illus-

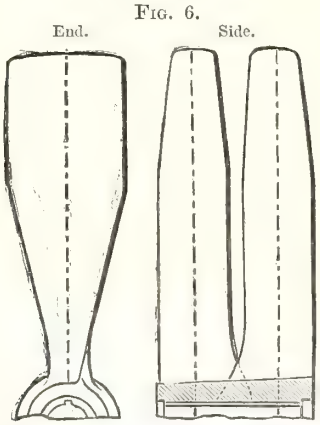
Fig. 5.



Elevations of the blades of a twin-double-bladed screw propeller fitted to H.M.S. *Bullfinch* by Messrs. J. and G. Rennie.

tration of. In this case the sides are angular reversely in each view, the end elevation showing the blade widest at the top and narrowest in the side elevation. This propeller was constructed by Messrs. Rennie; its diameter is 7 feet 3 inches, pitch 11 feet 4 inches, and the maximum width 1 foot 8 inches, being fitted by them to H.M.S. *Bullfinch*. The inventor, M. Mangin, not being content with double blades of a uniform pitch, advocates blades situated as before of unequal pitches, of which Fig. 6 is an

Fig. 6.

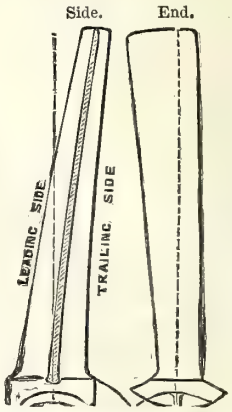


Elevations of the blades of the twin-double-bladed screw propeller fitted to H.M.S. *Favourite* by Messrs. Humphrys, Tennant, and Co.

illustration. Each blade is formed from two helices that are connected at one fourth of the full width, starting at the leading edge; the forward pitch is 16 feet 8 inches, and the aft 20 feet, the diameter of the screw is 16 feet, and the maximum width of each blade 2 ft. 8 in. The outline is peculiar, as in each view the sides are angular and vertical reversely situated. Messrs. Humphrys, Tennant, and Co., constructed this propeller and fitted it to H.M.S. *Favourite*. Of course it must be understood that it is a four-bladed propeller with straight blades like the other I have described.

I now follow on to a form of blade which, although having straight sides, is unlike any previously illustrated, it being shown by Fig. 7. Here the blade leans back in-

Fig. 7.

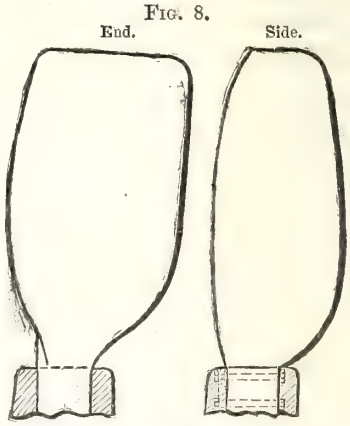


Elevations of the blade of the six-bladed screw propeller fitted to the S.S. *Charkieh* by Messrs. J. and G. Rennie.

stead of being vertical from the boss, and the outline is a portion of a perfect screw having the leading side cut back. This blade is shown in two views as the other examples, and illustrates the fact that a number of narrow blades are equivalent in propulsive effect to two wide blades, and *vice versa*. This propeller was constructed by Messrs. Rennie, and fitted by them to the S.S. *Charkieh*; the diameter of the screw is 15 ft. 9 in., and the construction pitch is 19 ft. 6 in., the length of the tip of the blade being only 6 in., with a lean-back of $5\frac{1}{2}$ in. from the centre of the root.

Another example of cutting off the leading side of the blade is shown by Fig. 8. In this case more than one-

Fig. 8.



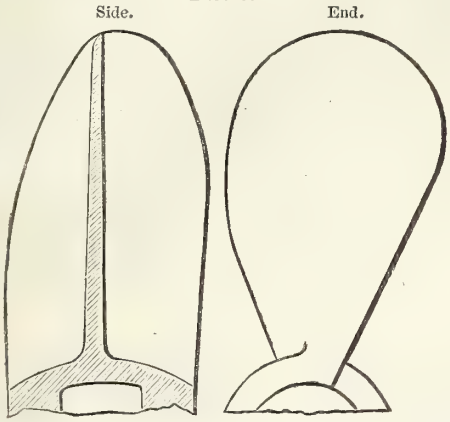
Elevations of the blade of the feathering two-bladed screw propeller fitted to H.M.S. *Aurora* by Messrs. Maudslay, Sons, and Field.

half of the perfect blade is taken away, as shown in the two views, so that a plan of the blade shows that the forward part of the helix is stopped off at a certain distance from the centre of the boss for a little less than half of the width of the aft portion of the blade or helix. The vertical section of the blade is perpendicular, and the sides nearly straight; the propeller is 17 feet in diameter, and the construction pitch 20 feet, the maximum width

of the blade being 4 feet. It was constructed by Messrs. Maudslay, Sons, and Field, and fitted by them to H.M.S. *Aurora*.

The ideas of Messrs. Dudgeon as to the best form of blade contrast extremely with those of Messrs. Maudslay, as shown by Fig. 9. The sides of the blade for half their

Fig. 9.



Elevations of the blade of the three-bladed common screw propeller fitted to the S.S. *Ruahine* by Messrs. J. and W. Dudgeon.

vertical length are portions of a perfect helix, but above that the cutting and carving commences, the tip is rounded aft and forward to a great extent—indeed, so much so that the natural outline of the top edge is entirely made away with. You will readily see this from the two views I have given. This propeller is 10 feet 6 inches in diameter, 18 feet pitch, and the maximum width of the blade is 4 feet 3 inches.

Now, this is an example of the modern form of blade for three and four-bladed common screw-propellers, and although of late construction, is of early adoption. I prove this fact to you by Fig. 10, which is the side

Fig. 10.

Side elevation of the four-bladed propeller fitted to H.M.S. *Dwarf* by the late G. Rennie, Esq.

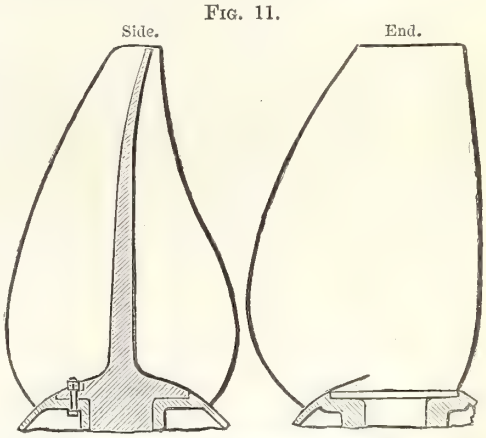
elevation of the original four-bladed screw-propeller, fitted by the late G. Rennie, Esq., to H.M.S. *Dwarf* many years ago, or rather at the eve of screw propulsion. This blade is cut away so much that its natural outline is taken off entirely, which shows that the "cutting" and "carving" commenced with the use of the screw for propulsion.

I next introduce to your notice another form of blade for screw propellers, invented and patented by my friend, Mr. Robert Griffiths. That gentleman has investigated this portion of the system thoroughly; he has written for me an article on it, and in one place he states, "I directed my attention to experiments with a view to ascertain what portion of the blade was the most effective. My first experiment with this object was to reverse the shape of the blades by putting the narrow parts to the outside, and the wide parts inside, or from and towards the centre of the disc—indeed, just the contrary to what was the usual practice, and I soon found I attained a better result with the blades formed in this manner than with any other." Mr. Griffiths treats on the vertical section of the blade also. He states, "I also find great advantage in constructing my screw-propeller blades to incline forward, the curve commencing from the centre of the length of the blade and extending to its point towards the ship, which result of advantage I account for in the following manner: when the ship is under 'way,' the screw is supplied with water from the after current, and this current has to be turned from its natural course, which is to fill up the space or channel that the ship has left, and also to supply the screw with propelling resistance, so that when the points of the blades bend towards the ship, they meet this current, and offer certain resistance to the power employed to work the screw, or what may be termed a greater bite to propel the ship."

It would appear from this statement that the straight blades must lose some power, or slip through the water instead of pressing full against it; yet in the face of this argument we find in practice that there is no disproportionate loss with either form of section.

The form of the Griffiths' blade will be understood from the illustration of it, Fig. 11. It will be noticed that the side

Fig. 11.

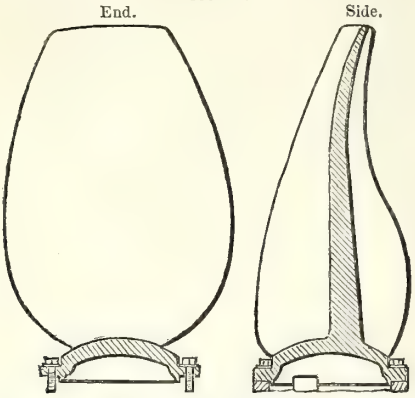


Elevations of the two-blade Griffiths' screw propeller fitted to H.M.S. *Arethusa* by Messrs. J. Penn and Son.

elevation shows that the vertical section is curved forward at the upper part, and the forward side is curved outwards over the boss, and above that it is curved inwards, while the aft side is a continuous curve in one direction from the root to the tip. The end elevation shows that the leading side is cut away more than that opposite.

The most modern practice of the principal firms is to make the leading and following sides of the blade alike, as shown by Fig. 12, which is an illustration of one of the two blades of the propeller constructed for H.M.S. *Lord Warden* by Messrs. Maudslay, Sons, and Field. The pitch of the screw is 23 feet 6 inches, its diameter 23 feet, and the maximum width of the blade 7 feet 4½ inches; at the tip 3 feet 2⅝ inches, and at the root 3 feet 3 inches. The *Lord Clyde*, also an armour-plated ship in the Royal Navy, was originally fitted with a Griffiths' two-bladed propeller—diameter, 23 feet; pitch, 23 feet 6 inches;

Fig. 12.



Elevations of a two-bladed Griffiths' screw propeller constructed for H.M.S. *Lord Warden* by Messrs. Maudslay, Sons, and Field.

maximum width of the blade, 7 feet; at the tip, 3 feet 3 inches; and at the root, 4 feet 4 inches—as constructed by Messrs. Ravenhill and Hodgson. I may add, in passing, that the screw of the example, Fig. 11, is 18 feet in diameter, and 23 feet pitch; maximum width of the blade 6 feet, at the tip 2 feet 7 inches, and at the root, 3 feet 9 inches, from which you see that all the matters agree pretty closely as to the proportions. The amount of curve forward of the blade, or "lean-to," is thus: that by Messrs. Penn is 9 inches from the aft side to the forward edge, that by Messrs. Maudslay 12½ inches, and that by Messrs. Ravenhill 12$\frac{3}{16}$ inches.

I have now laid before you twelve different shapes of blades, and before I conclude this section I will give you the cause for the "cutting and carving" which I have so often alluded to. The cause is that very often, when the shape of the blade is a natural portion of a screw, it vibrates so energetically during its revolution that, under various circumstances, it shakes the stern of the hull so much as to endanger the soundness of the structure. Now, the "vibration" must result from the blade striking the water surrounding it at intervals, and the cause for this unequal striking is that the blade is too wide across at the tip, or that the theoretical advance speed of the velocity of the screw is so far above that of the hull that the water surrounding the screw is beaten about by the blades; instead of the water being a continual resistant of nearly equal density. Then, as the resisting effect of the water is constantly changing, so will the screw "wabble" or vibrate during each revolution. It must be remembered also that the nearer the angle of the blade is to the transverse centre line of its length, the shorter the pitch is; and proportionately to the length, the wider the blade will be, so that when three or four or six narrow blades are used, the pitch must be greater in proportion to the number of the blades and diameter of the screw used than for two-bladed screws.

The theoretical action of the blade in the water is as a carpentry screw entering a piece of wood, *i.e.*, no slip or lateral commotion, but the practical action is far from that, inasmuch as there is some slip, and often lateral commotion too. The aim, then, of the designer, when cutting away the natural outline of the blade, is to make the leading side and edge curved, so that it will slice the water and not bruise it, and thus cause the least disturbance during its motion; of course, on the screw starting, the blades will strike the water sideways under all circumstances, and this "side-striking" is only reduced to the minimum when the shape of the blade, velocity, and pitch of the screw agree with the speed of the hull. I may as well observe, also, that the cutting away of the leading corner of the blade is not universal, for Messrs. Maudslay have generally constructed their common screw blades of the perfect shape; or as the helix and length on the line of the keel determine. The screw propeller 24 feet 6 inches in diameter, with four blades, fitted by them to H.M.S. *Agincourt*, is the perfect-shaped blade; its width at the tip is 5 feet 5 inches, and at the root 3 feet, the side being angular but perfectly straight; the construction pitch of the screw is so fine that the length of the blade on the line of the keel is only 1 foot 9 inches when it is set at 24 feet pitch. I will give you another example of the same shape of blade, but the screw only 9 feet in diameter, pitch 12 feet, width of blade at the tip 3 feet, at the root 1 foot 3 inches, and the length on the line of the keel 1 foot 2½ inches. This propeller is one of two pairs of twin-screws, fitted by the same firm to H.M.S's. *Viper* and *Vixen*, hung in lifting frames, while the *Agincourt's* screw is fixed on the shaft, and overhangs the stern-part. Now, with both these examples of screws there has been equally an almost entire absence of vibration and the cause for its obviation, is that the pitch is rather fine in relation to the diameter, while the blades are made narrow, although of the natural form. Now if they had been wider, or the screws longer on the line of the keel, the effect would be that the leading corner would have broken up the current of water in front instead of cutting it, because the extra material put on would be too much in advance of the position of the duty of the blade, and thus be an obstruction to its forward motion or travel. Evidence of the truth of this has been given by Mr. Griffiths, who has written for me the description of the following fact:—"When I first commenced applying my screw propellers, I put one on a vessel that was in dock, and I then dropped spots of candle-grease all over the blades of the propellers on both sides, and after some time, on the return of the ship to dock to alter the pitch of the screw, I found that the tallow had been worn off by the friction of the water on the propelling side of the front surface, just across the middle or widest part, and on the forward side of the leading edge of the back surface." That, I think, you will allow was surely a simple as well as a sure means of knowing where the friction or resistance was the greatest, both on the fore and aft surfaces of the blade, and proved, too, that the leading corners in that instance had better have been cut away. So far is this certain that when the blades are wide, as in fig. 9, the leading and following corners are rounded excessively; indeed, so much so that the natural limit of the blade is entirely destroyed, and an artificial reduced shape takes the place of the complete outline. By doing this the vibration is reduced to the minimum, and thus the coarsely-pitched screw with the wide blade—due also to the length on the line of keel—can, by shaping it accordingly, be made to act as effectively as the narrow blade, which remains untouched. In fact, it is but a matter of proportion *in toto* in relation to the speed of the hull, and my reason for dwelling so much on the shape of the blade is to prove its simplicity.

I now follow from this to the—

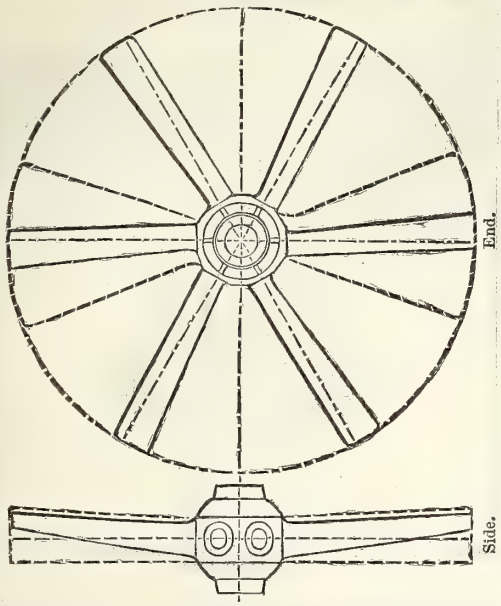
General Arrangement of Modern Screw Propellers.

I commence this section with a description of the six-bladed screw-propeller, constructed by Messrs. Rennie, and illustrated by fig. 13. You will notice that the blades are inclined back in both views, and that they are almost perfect parallelograms in outline, so that the rounding off of the leading corners is not carried out at all in this case.

As a contrast, I have drawn in dotted lines a two-bladed screw also, whose area of blade surface equals that of the original, by which you can see that a very little width and length comparatively only is required to make the surface of a two-bladed screw to equal that having six blades of a shorter length, but of the same pitch.

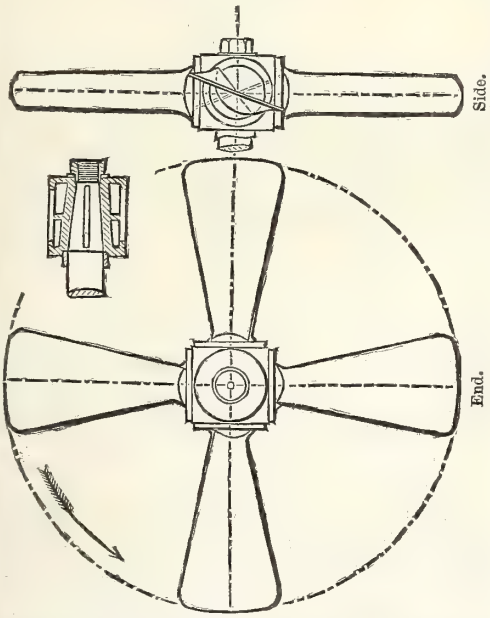
Next I illustrate, by fig. 14, a four-bladed screw, as used in the Royal Navy at present. The corners, you will observe, are but very slightly curved, so slightly that the natural outline is nearly preserved. As the shape of the

Fig. 13.



Elevations of a six-bladed propeller fitted to ships in the Egyptian Royal Navy by Messrs. Rennie, 1867. Diameter, 15ft. 9in.; pitch (adjustable), 17ft. 6in. to 21ft. 6in.; mean pitch, 19ft.; length on the line of the keel at root, 1ft. 2in.; at tip, 6in.

Fig. 14.

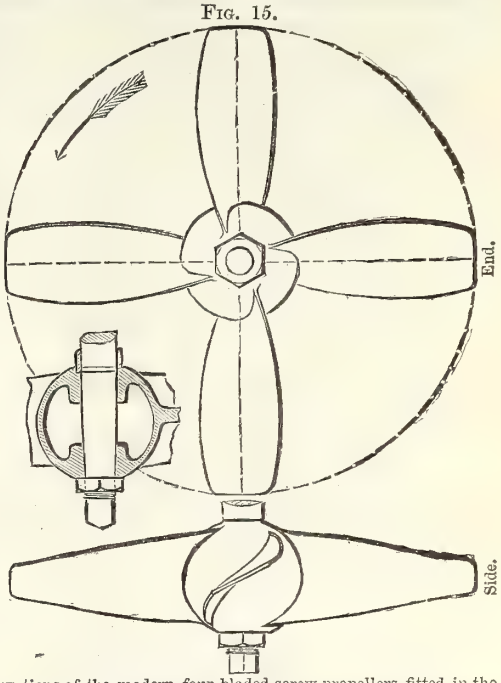


Elevations of the modern four-bladed screw propeller as fitted in the Royal Navy by Messrs. J. Penn and Son, 1869. Diameter, 24ft.; pitch, leading side, 24ft.; pitch, following side, 27ft; adjustable pitches, 23ft. to 28ft; mean pitch, 25ft. 6in.; length on the line of the keel, 2ft.

boss appears square, I have given a sectional plan of it, which shows also how it is secured on the shaft, being by a longitudinal key and a nut at the end. There are other methods, however, in practice, to which I shall presently refer.

The next example that I have deemed worthy of your attention is illustrated by Fig. 15. Here you will notice

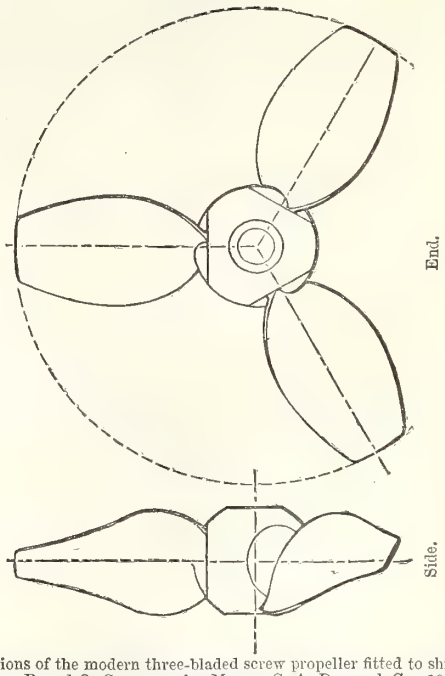
Fig. 15.



Elevations of the modern four-bladed screw propellers fitted in the merchant navy by Messrs. C. A. Day and Co., 1868. Diameter, 16ft.; pitch, 25ft.; length on line of the keel, 3ft. root, 1ft. tip.

that the blade is merely the Griffiths' shape, minus the lean-to or curve forward. The boss is spherical, as shown in the complete views and the sectional plan. This propeller has lately been constructed by Messrs. C. A. Day and Co., as also has the three-bladed example shown by fig. 16. The blades in this case are adjustable, as in figs.

Fig. 16.

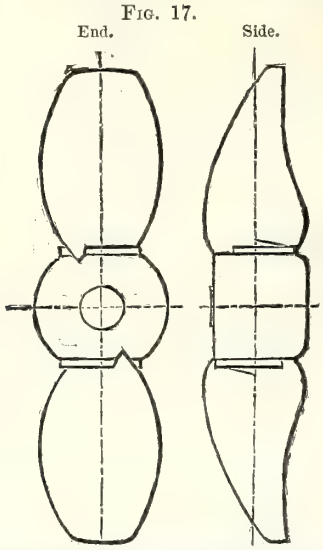


Elevations of the modern three-bladed screw propeller fitted to ships of the P. and O. Company by Messrs. C. A. Day and Co., 1868. Diameter 18ft; pitch (adjustable), 22ft. to 27ft.; pitch (mean), 24ft. 6in.; length on the line of the keel over boss, 4ft. 2in.; tip, 1ft.

13 and 14, which I will explain to you directly, and they are very much the same as the Griffiths' shape, particularly so in the end view. The boss, also, is as the most modern shape.

Fig. 17, which I introduce now, is the elevation of the

Fig. 17.

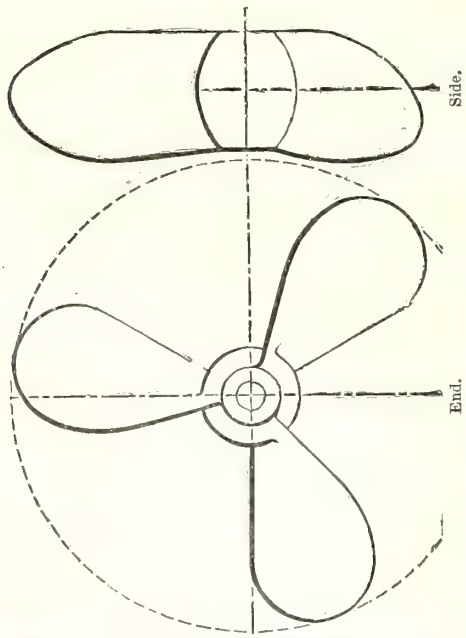


Elevations of the modern two-bladed Griffiths' screw propellers as fitted in the Royal Navy by the leading marine engineers, 1869. Diameter, 23ft; pitches (adjustable), 21ft. to 26ft.; mean pitch, 23ft. 6in.; lean-to, 11½in.; length on the line of the keel over boss, 6ft. 6in.; at tip, 1ft. 3in.

modern two-bladed Griffiths' screw-propeller with adjustable blades, and the boss shaped as the frustum of a sphere.

The next example is the latest three-bladed common screw propeller, illustrated by Fig. 18, as Messrs. Dudgeon

Fig. 18.

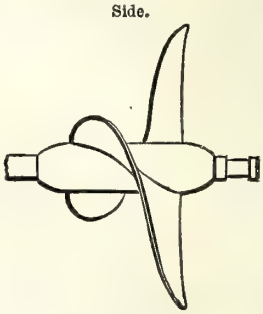


Elevations of the three-bladed screw propeller fitted to ships in the merchant navy by Messrs. Dudgeon, 1867. Diameter, 10ft. 6in.; pitch, 18ft; length on the line of the keel, 2ft.

construct, and as, indeed, do all the leading firms, not only for ships of heavy tonnage, but also for steam launches, yachts, &c.

I have now pretty well exhausted the arrangement of the modern screws; and I think I cannot conclude this section better than by asking you to notice the original form of screw propellers designed by the late Mr. G. Rennie, and fitted by him to H.M.S. *Dwarf*, as far back as 1843, as illustrated by Fig. 19. You will observe that

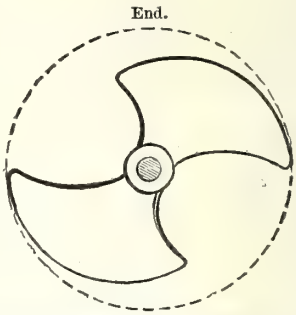
Fig. 19.



Side elevation of Mr. G. Rennie's screw propeller fitted to H.M.S. *Dwarf*, 1843.

the forms of the blades are much as those of later design, and, excepting the spiral portion in front, it might be termed a modern two-bladed screw. Another form of two bladed screw was designed and fitted to the *Dwarf* by Mr. Rennie, which I have illustrated by Fig. 20, and

Fig. 20.



End elevation of Mr. G. Rennie's two-bladed screw propeller, 1844.

it contrasts materially with our present practice. I now close this section, and proceed with the next, entitled—

The Details of Modern Screw Propellers.

This section contains a description of the best practice by all the leading marine engineers for securing the boss of the propeller on the shaft, for securing the blade to the boss, and for preventing the blade flange studs from unscrewing. These are three important matters, indeed, so much so, that the efficiency of the propeller properly depends on them, and it is for that reason that I have laid before you these subjects in as practical a manner as the manufacturers put them forth for actual construction. First, then, for the best methods for—

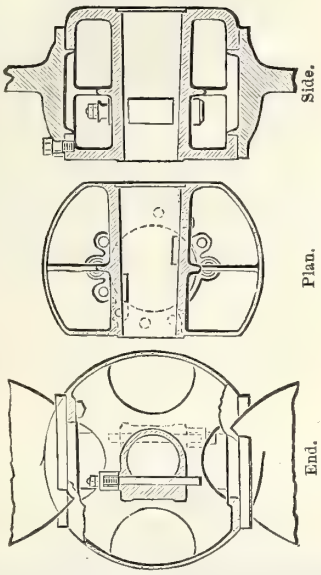
Securing the Boss on the Shaft.

Messrs. Penn's practice is shown by Fig. 14 in the previous section; they taper the shaft within the boss considerably. Thus, in the case of the *Minotaur's* screw, the shaft's diameter at the forward end of the boss is 1 ft. 11 in., but at the aft end it is 1 ft. 2 in., the length of the taper being 3 ft. 9 in.; the end of the shaft is screwed 13 in.

in diameter, and a nut acting against a washer, between it and the boss, maintains the resistance from the aft thrust. To prevent the screw from turning separately, or being loose on the shaft, two longitudinal keys, oppositely situated, each 3 inches wide, are driven in between grooves twinly formed in the boss and shaft. This is, I may term, a very healthy method, as it constitutes a good sound resistance to the wear and tear which the connection of the boss with the shaft is subject to.

Another means to maintain the same effect is used by Messrs. Ravenhill and Hodgson. I have illustrated this by Fig. 21. You will notice that in this case the shaft

Fig. 21.

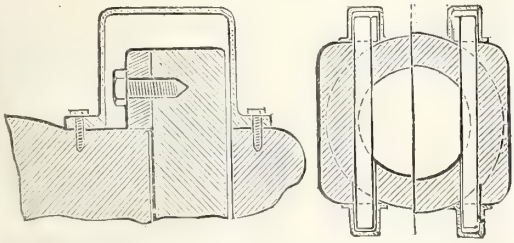


Sectional elevations and plan of the boss of a modern Griffiths' screw propeller, also showing the method of securing the boss on the shaft and the blades to the boss. By Messrs. Ravenhill and Hodgson.

is secured by keys only, but these keys are situated laterally, in relation to the shaft and boss, on each side of the diameter of the taper, and fore and aft of its length. You will understand this best when I explain that two segments are cut out of the circle of the shaft; into these spaces the keys fit, and thus the boss is fixed on the shaft laterally and longitudinally. To prevent the keys withdrawing, they are fitted at the smaller ends with double nuts, which can be used to tighten them also if required.

Messrs. Maudslay's practice I have illustrated by Fig. 22. I have shown a transverse sectional view of the boss

Fig. 22.



Transverse sectional view of the screw propeller, boss connection, and enlarged section of the method for securing the keys, by Messrs. Maudslay, Sons, and Field.

connection with the shaft, by which you will see that they adopt two lateral keys also, but their method of securing them is entirely different from Messrs. Ravenhill's practice. In this case the keys are held by side pieces that are secured against the keys by studs; as shown in detail on an enlarged scale in this illustration also.

As these two latter examples belong to propellers of equal proportions, but constructed by two firms, it may interest you to know how far the makers have taken similar views as to the main dimensions; and I may as well tell you that the *Lord Clyde* and *Lord Warden* are the hulls to which the propellers are fitted. Both propellers are the double-bladed Griffiths' types, made according to all the modern improvements. I here give the main dimensions:—

Proportions of the boss and shaft connection of the Propeller fitted by Messrs. Ravenhill to the "Lord Clyde."

	ft.	in.
Length of taper in boss	4	$5\frac{1}{2}$
Diameter of shaft (forward end)	1	$9\frac{7}{8}$
,, ,, (aft end)	1	$6\frac{1}{2}$
Width of key	0	10
Thickness of key	0	3
Longitudinal space between keys	0	4

Proportions of the boss and shaft connection of the Propeller fitted by Messrs. Maudslay to the "Lord Warden."

	ft.	in.
Length of taper in boss	4	0
Diameter of shaft (forward end)	1	9
,, ,, (aft end)	1	5
Width of key	0	$8\frac{1}{2}$
Thickness of key	0	3
Longitudinal space between keys	0	6

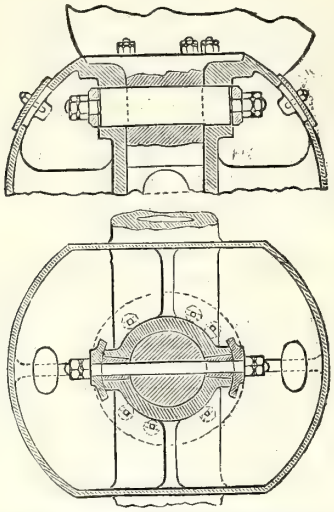
Besides the methods I have explained, many makers secure the propeller with one lateral key only, passing through the boss and shaft, and others with the key behind the boss, so that nearly all the mechanical modes have been adopted and tried. But the main practical question in this matter is—How to get the boss from the shaft? It is all very well to be able to key it on tightly, but a time will come when it must be made loose again to take it off, and it is for that reason that the lateral keys at the sides of the shaft have been adopted, for they can be easily removed, and thus the boss driven off, or the shaft withdrawn; or, as Messrs. Penn prefer, the taper is great, and thus, when the nut is withdrawn, the disconnection is easier. I now follow on to the description of the modern practice of

Securing the Blades to the Boss, Combined with Preventing the Flange Studs from Unscrewing.

You are of course aware that when the blades and the boss are in one casting, all the details I have now to describe are useless, but as we live in the days of gigantic means of warfare, so do we require gigantic propellers, and as those are costly as well as heavy, in the event of the fracture of any portion of them it is far better to replace the detail than the whole. But apart from that it has been deemed more advantageous to be able to adjust the angle of the blades to suit the velocity of the screw and speed of the hull, than to have a fixed angle which if altered required a new propeller.

When Mr. Griffiths started his propeller he made the blades fixed on the boss, but he soon discarded that practice, for in the article he has written for me, he states, "My attention was next directed to the construction of my screw-propeller in such a way as would combine the greatest possible stability with increased facilities for altering the pitch or replacing a broken blade in case of an accident," and the illustration, Fig. 23, represents his mode of carrying out his requirements. This is the "key and wedges" arrangement, the "key" passing through the securing portion of the blade, and the metal in the boss surrounding it. The "wedges" are arranged in the key spaces in the boss, so as to alter the angle of the key and blade simultaneously. To prevent the keys and wedges from shifting when set, stop plates and screw

Fig. 23.

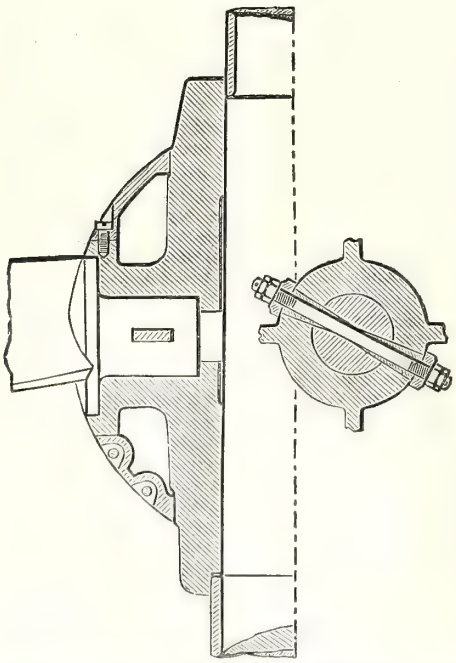


Sectional plan and elevation of Mr. Griffiths' mode of securing and adjusting the blades of screw propeller.

nuts are put on the extremities of the keys. This means has since been continually adopted with the addition of securing studs, as shown in the sectional elevation.

Now the adoption of the set or securing studs led to the non-adoption of the keys and wedges, *i.e.*, what was introduced as an assistant became the master entirely, and, therefore, the simple flange and stud connection was introduced, which is now almost universal. Some firms, however, have lately used the original mode; for example, Messrs. Rennie, with their modern six-bladed propeller, prefer to adjust the blades, as illustrated by Fig. 24,

Fig. 24.

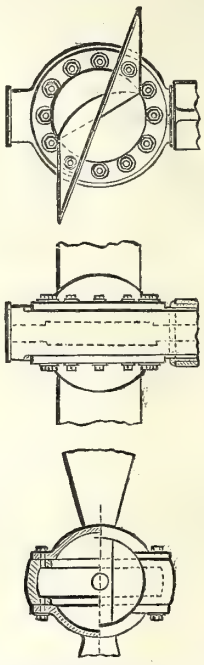


Sectional elevation and plan of Messrs. Rennie's mode of adjusting the blades of their six-bladed screw propeller.

which is the key and wedge arrangement without the securing studs and nuts.

I must not forget, however, to mention that Messrs. Maudslay have always preferred to omit the keys and wedges, and use the studs and flange only, which I illustrate an example of by Fig. 25. This is a flat boss,

Fig. 25.



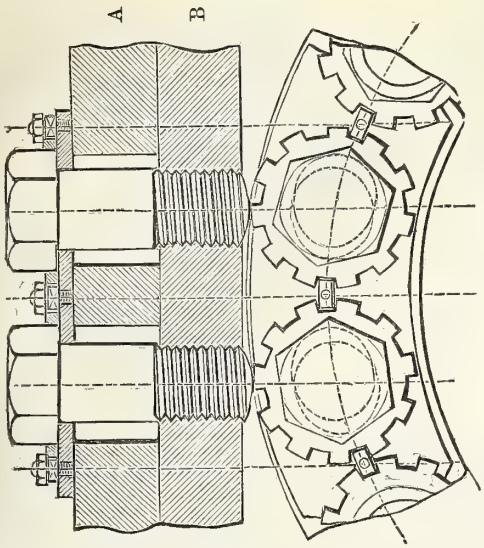
Elevations and plan of Messrs. Maudslay's mode of securing the blades of the propellers fitted to H.M.S. *Viper* and *Vixen*.

to which is secured the blades by studs screwed into flanges, and the complete outline forms a singular comparison with that in Figs. 21 and 23.

The reason why the studs and flanges are sufficient to secure the blades, is that the surfaces of the flange of the blade form a perfect point, and when thus connected the frictional contact is almost unlimited, so much so, indeed, that it is a rare occurrence for the largest and longest blades to shift round on their seats after being screwed down by the set studs.

I proceed now to describe the various methods for preventing the flange studs from unscrewing, commencing with Messrs. Penn's latest improvement, which I have illustrated in two views by Fig. 26. A is the flange of the blade, and B is the flange of the boss. The plan below shows that the arrangement consists of the heads of each stud being surrounded by a ring of metal of suitable thickness, the outer periphery of which is indented or formed as a pinion with square teeth and spaces; between the rings on the pitch line of the flange studs are stop-studs, having square collars which fit into one of the spaces in each ring, and thereby lock them together; the rings are also further secured by nuts on the stop-studs, holding them down on the flange plate that receives the studs. This method has the advantage also of preventing the flange studs from becoming loose, inasmuch as one head cannot turn without shifting the one next to it, and so on in succession. It will be noticed also that as each ring has eleven spaces on its outer edge, there are, therefore, eleven separate angles to which the main studs can be screwed up to for securing the flange of the blade to the boss.

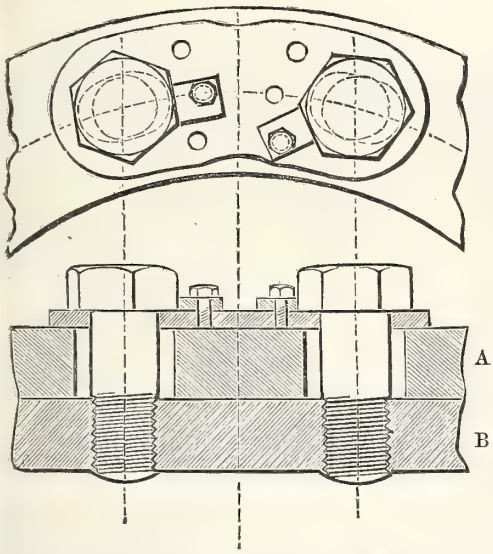
Fig. 26.



Messrs. Penn's method for securing the heads of screw-propeller flange-studs.

Messrs. Maudslays' mechanical arrangement in this matter is illustrated by Fig. 27. A is the blade flange,

Fig. 27.

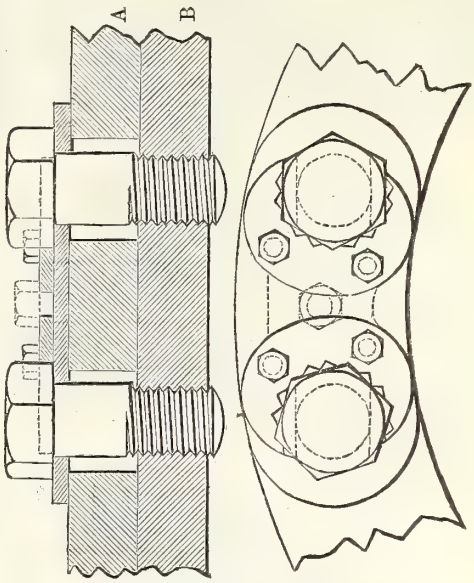


Messrs. Maudslay's method for securing the heads of screw-propeller flange-studs.

and B the boss; above this is the plan, which shows that each pair of studs are fitted with a flange plate, on which the head is fixed, and to secure the head from turning round the set-plate is used, the edge of which fits against any side of the head. This plate can be secured at three separate points by the same stud, and as the plate has four sides all un-equidistant from the centre of the stud, there are of course twelve angles in this case, to which the main studs can be screwed up to for securing the flange of the blade. This method is the cheapest possible, and equally as certain as the previous arrangement, but without the combined locking of the heads.

Messrs. Maudslay have used the arrangement shown by Fig. 28 also. Here A and B refer to the two flanges as

Fig. 28.

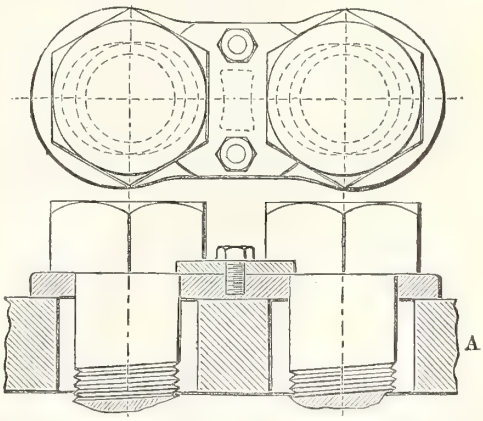


Messrs. Maudslay's method for securing the heads of screw-propeller flange-studs.

before, and the plan shows that the heads of the main-studs are held in position by separate plates of a curved form, the inside edge being indented angularly to fit the hexagonal edges of the stud, and the line of the depth of the indentations is a curve whose radius equals half the width of the head across the angles; each plate is secured by two studs, and as there are eleven indents, so can the heads be secured at eleven different angles; the firm sometimes prefers to connect each pair of main-stud heads by a single stop-plate secured by one stud, its extremities being as the single plate, the middle portion and the stud being shown by dotted lines in the plan and section of the above illustration.

Messrs. Ravenhill's practice must next be noticed. This firm prefers the appliance shown by Fig. 29, which consists

Fig. 29.



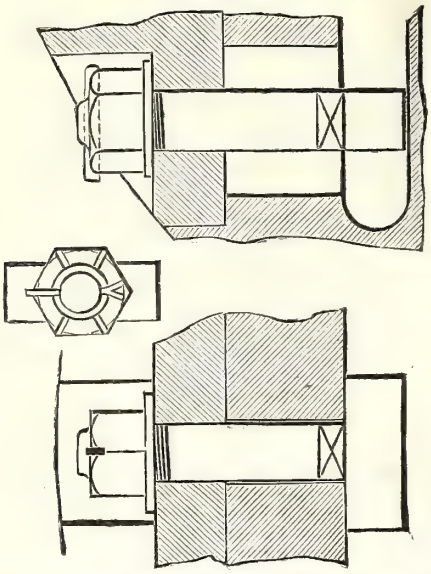
Messrs. Ravenhill's method for securing the heads of screw-propeller flange-studs.

of a stop-plate situated between each pair of main stud-heads; in this illustration the plate fits the flats of the

heads, but other forms of plates are used also, very much as the double plate by Messrs. Maudslay, just referred to. You will, of course, have noticed that with the four methods I have described, flange plates are used for the main stud-heads to rest on, and also to receive the stop-studs of the set-plates, and that the holes for the main-studs in the blade-flanges are elongated sufficiently to alter the angle of the blade if required.

A rather novel method has also been used by Messrs. Day, as illustrated by Fig. 30. Bolts are preferred here

Fig. 30.



Messrs. Day's method for securing the heads of screw-propeller flange-studs.

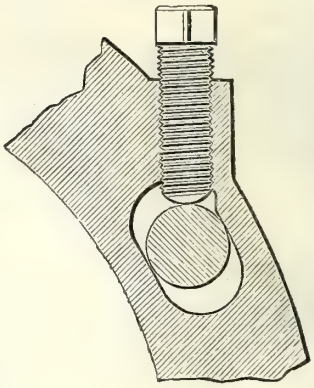
in the place of studs, and the heads are T-shaped, the holes in the boss flange being made to correspond. The main feature is in the nut being grooved at the top across each angle, and a split-pin, passing through the end of the bolt and one of the grooves, prevents the nut from unscrewing; of course there are only three angles in this case that the nut can be screwed up and held to.

Messrs. Humphrys have used the split-pin method also, and the Thames Iron Works Company have adopted double nuts, while the Scottish engineers have used similar means.

The process of altering the angle of the blade of the propeller is a matter of removing all the stop-plates, and loosening the main studs, and then by clamp levers turning the blade to the required position on its seat. Now, the power required to start the flange or break the point, is considerable, and doubtless Messrs. Maudslay were prompted by that fact to design their very simple but efficacious mode for starting and adjusting the blade. It is shown by Fig. 31, which you will see is but a stud—screwed through a projection formed in the flange of the blade—pressing against the flange stud, and thus the blade flange is started. Four of those studs are used with large blades, each situated in the corners of a square limit, and the method of adjustment is thus: if the forward edge of the blade nearest the sternpost were required to be turned towards it, the forward and aft adjusting studs on the left and right-hand sides would have to be turned to force against the two flange-securing studs opposite them, or to be screwed up, while those adjusting studs opposite must be turned to release their contact with the other two flange studs, or unscrewed; and *vice versa* should the blade be required to be shifted in an opposite direction.

I need scarcely inform you, for this is so well known,

Fig. 31.

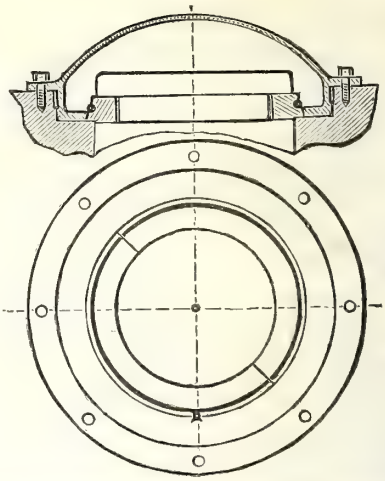


Messrs. Maudslay's method for adjusting the propeller blade.

that Messrs. Maudslay are the patentees and constructors of the only reliable feathering screw propeller, the arrangement of the mechanical appliance being a clutch shifted by bell-cranked levers connected to a screwed rod.

The same firm also has arranged a mechanical means to resist the aft thrust of the propeller on the shaft, and thus relieve the boss cross-keys from the full shearing strain; this is illustrated by Fig. 32. It is that the end of

Fig. 32.



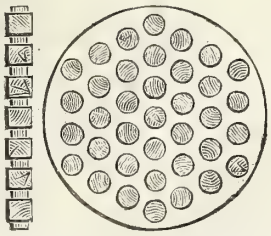
Messrs. Maudslay's arrangement to resist the aft thrust of the propeller on the shaft.

the shaft has a groove turned into it, into which a ring in halves is secured by a metallic cord, and, as the ring presses against the boss, it is prevented from shifting longitudinally. The end and ring are covered by a curved disc that is secured to the boss by studs, as shown in sectional and complete views.

When the propeller is hung in a lifting frame many of the leading firms adopt wooden surfaces in a brass disc, as shown by Fig. 33, which receives the aft thrust of the extremity of the boss, and bears against the back of the frame support.

My descriptive and illustrative matter here terminates, and I now conclude with a few passing observations on what I have laid before you. I have endeavoured to treat this matter in a practical manner, confining my remarks to the subject proper; by leaving out opinions and dealing with facts only, I have steered

Fig. 33.



Wood surfaces in a brass disc to resist the aft thrust of the screw-propeller, as the general practice, 1869.

clear of any ideas as to whether the propeller should be over-hung or suspended between bearings, and thus the lifting-frame and stern-tubing have not been alluded to until now. And my reason for thus confining my remarks is that I knew that if I dragged in any other details but what belonged to the screw propeller, it would be difficult to draw the line of limit. I have omitted also any opinion on the use of twin screws, for I think we all are pretty well satisfied with their utility now. Before I close this paper I may tell you, however, that the main proportions of screw propeller blades depend on the following causes:—The diameter of the propeller depends on the aft draught of the hull; the area of the blade's surface depends on the area of the hull's midship section, displacement, and speed; the number of the blades depends on the velocity of the screw; the length of the propeller depends on the shape of the blades, their number, and area; and the shape of the blade depends on the result of experiment with actual practice.

The Chairman, in inviting discussion on the paper that had been read, said that some thirty years ago a paper upon this subject would have provoked a great deal of discussion, if not a fierce controversy, and he hoped, although the utility of the screw propeller was now so universally acknowledged, that there was still something to be said with regard to its practical application.

Mr. Campin believed there was a gentleman in the room who had taken out a patent some years ago for a screw propeller with only one blade. He should like to hear what had been the result of what seemed to him at the time rather an extraordinary arrangement.

The Chairman said that if no one was disposed to enter into a discussion of the mechanical details which had been so ably brought before them by Mr. Burgh, he would at once move a vote of thanks to that gentleman for the paper which he had read, a vote which he was sure would meet with the unanimous approval of the meeting.

The vote of thanks having been carried,

Mr. Burgh said he felt extremely obliged to the members present for the kind manner in which they had listened to his paper, although he must confess to being rather disappointed that no discussion had taken place upon it. He believed there were several engineers present, and if they did not all agree with what he had advanced, they might, at least, have done him the honour to contradict him. His object had been to give, as concisely as possible, information, some of which he believed to be entirely new. In particular, the mode of preventing the screws from becoming loose had only come into use within the last few years, and was a matter of considerable practical importance.

The paper was illustrated by the following models, kindly lent by the firms named:—

Messrs. Maudslay, Sons, and Field—
- One large model of their improved adjustable four-bladed propeller.
- One large model of their ordinary fixed four-bladed propeller.
- Two small models of do.
- Two „ „ five blades.
- Three „ „ three blades.
- One „ „ one blade.
- One large model of the stern of a ship fitted with their two-bladed feathering screw propeller, with lifting frame and gear complete.

Messrs. J. and G. Rennie—
- One full-sized three-bladed screw propeller, as used for steam launches.
- Two full-sized two-bladed propellers.

Capt. T. E. Symonds, R.N.—
- A model of the method for lifting twin screws.
- A large drawing showing the entire arrangement fully applied.

The Secretary called attention to an improved safety lamp, invented by Mr. Thomas Story Horn, and placed upon the table. By a new arrangement of wire gauze and perforated metal plates in the base of the lamp, and perforated metal chimney caps at the top, the inventor believes that the lamp is rendered secure from passing the flame to the explosive mixture of gases in which it may be placed. By the introduction of a metal dome, the air is concentrated at the point of combustion, and thereby an increased amount of light is obtained. The dome also acts as an extinguisher to the flame, should the lamp be overturned. By a new form of lock, picking is rendered difficult. Should the glass chimney be broken, the draft or current of air will be altered and the light become less.

THE ADMINISTRATION OF GRANTS FOR NATIONAL ELEMENTARY EDUCATION.

A numerous deputation of schoolmasters from the London Church Schoolmasters' Association waited on Earl de Grey and Ripon, on Friday, 19th February, to present to him, as Lord President of the Privy Council, a memorial, signed by the teachers of upwards of a thousand schools, on the legislation affecting them. The deputation was accompanied by three of the vice-presidents of the association, by Mr. F. S. Powell, the late member for Cambridge, by Mr. Edwin Chadwick, C.B., and by Mr. Edward Carleton Tufnell, one of Her Majesty's Inspectors of Schools. Mr. Forster, M.P., Vice-President of the Council, attended with Earl de Grey to receive the deputation.

Mr. Chadwick said—I am requested to support the first resolution of the memorial as an administrative question, and to that resolution I shall confine myself. It states that the schoolmasters "hail as an important advance the proposal made in the Government Bill of last session to appoint a Minister of Education, for they are of opinion that national education is important enough to be made the subject of the undivided attention of a Minister of State, and of a department devoted exclusively to it. And they beg to express a hope that should such an appointment be made, it may be supplemented by the further appointment of permanent officers, chosen for their special qualifications in the actual work of education, who shall undividedly sustain public responsibility for the executive details of administration. And they venture to suggest that under the supervision of such a minister, a department so organised might be extended, so as to embrace the whole field of education, secondary as well as primary." In support of this resolution, I am warranted in declaring, on behalf of the great majority of the school teachers of England, and I might add in behalf of those of Scotland, that this Department, as at present organised and by reason of its organisation, does not possess their confidence or the confidence of those most conversant with the subject matter of its administration; and has ceased to have that moral weight amongst them which a superior public administrative body, charged with most important duties, ought to have. In my

view this has arisen in great part from the fragmentary and imperfect character of its functions, and its want of practical and comprehensive information for its guidance. Intending to promote efficiency and economy in the administration of the funds entrusted to it, for want of competent knowledge and skill it has misapplied the now important administrative principle of payments for results. It has, according to the impartial testimony of its most experienced inspectors, lowered the quality of the primary elementary instruction, which required elevation; it has degraded the elementary education of the people, and thence produced inferior and, therefore, wasteful results. It has, by the revised code, dealt unjustly with the status of the pupil teachers, which it has lowered, and through them it has struck at and crippled the training colleges—in themselves the most important and beneficial educational institutions of our time in this country. In ignorance, or in neglect of the aphorism, "as is the master, so is the school," it has through him lowered the school. As one example of its administration, I must mention its dealing in a matter with which I happen to be specially conversant. Year after year its inspectors in their reports presented examples of the bad sanitary condition of many of the common schools, in aid of which the public money had been expended, and which were sources of preventible disease to teachers as well as to the pupils, but nothing appears to have been done—no reference made to the health-inspectors of the council, who might have been fitly employed upon the matter. The medical officers of health of the metropolis had schools of this class brought within their cognizance as fever nests, centres for the spread of epidemic diseases amongst children and families. On their knowledge of particular schools within their respective districts, these medical officers ascribed an excess of seven thousand deaths annually of children in the metropolis, as due in great measure to the condition of these schools, and, apparently, an excess of no less than fifty thousand deaths of children in the school stages throughout the country. The Association of the Medical Officers of Health deemed it their duty to bring the case, by a memorial, under consideration of the Department, but they got no attention to it. At their request I headed a deputation of them, who brought the case under the notice of Lord Palmerston. He recommended them to try the Department again, and there the matter ended, and the evil, the destruction of infantile life from ignorance and inattention, yet goes on year after year. Now, France has got a special department of education of another organisation, unmixed up with other and disparate functions, which is presided over by a Minister of Public Instruction. Recognising the fact that the proper culture of the mind involves some care of the body, and the sanitary condition of the schools and treatment of the pupils, on a lesser complaint the Minister directed an examination of all the lycées of the Empire, by a competent sanitary officer, whose report, comparing one school with the other on all points, the condition of the sites and the structures, the sanitary treatment of the pupils, I have read, and it is fraught with valuable suggestions of measures of present amendment, and important precautions for future guidance in the extension of educational institutions. I have a letter from a distinguished Conseiller d'Etat of France, who says, that whilst they envy us our individual initiative, our local efforts, and our large private educational associations, they are nevertheless convinced that a well appointed Minister of Instruction, and an efficient central department is necessary to aid all such local and private effort, and to do what such effort does not do, and cannot do; and of this the instance I have given may serve as an example. One function of such a department is to collect local experience, and to obtain a thorough mastery of leading principles and promulgate them for local guidance. I submit two examples of failure in this respect. Having, as a commissioner of inquiry in the labour of young children in factories, prepared the provisions for the half-school-time system, I am conversant with it, and I can state that there are conditions of schools in which that principle of teaching is a failure, and there are others in which it is a pre-eminent success. Now that the half-school-time system is in course of extension, under governmental inspection, to upwards of a million of children, as indifference or ignorance of it, or a mastery of it, determines comparative success or failure, it is surely important that these conditions should be carefully ascertained and discriminated, and set forth in instructional minutes for the guidance of factory inspectors and sub-inspectors who are not educationists, as well as of the public at large, particularly at this time, when there is a question as to the application of the principle to the children of the agricultural classes, and when agriculturists are giving evidence upon it, who know little, if anything, about it. I am aware that your Lordship and your colleague know about the half-time system, as you have had it brought under your notice in the half-time schools in Yorkshire, which I have myself examined. But I can state that there are other, and advanced, and varied applications of the principle in other parts of the country which you cannot have seen, and probably have not heard of, which are specially important for the protection of children not engaged in factory or any other productive labour. The particular attention of your inspectors has never been directed to the subject; those I have met with are yet strange to it, and it may be said that, important as it is, the Department really has not proper knowledge of it. None is to be traced in its reports or in its actions. To present another example. There are the common conditions of school organisation and teaching, in which it requires six years, even with good teachers, to impart the common elementary instruction, reading, writing, and arithmetic, comparatively ill; and there are other conditions, now demonstrated by years of experience, in which they are taught comparatively well in three years, at an expense of one pound per head for the superior teaching power, as against thirty shillings or two pounds per head for the comparatively inferior teaching; or, in other words, there are conditions in which three or four are taught comparatively well, at the total expense at which one is taught comparatively ill. Moreover, with the good teaching of the three R's—generally on the half-time system—a bodily training is given, by gymnastics and the military drill, which imparts to three the efficiency of five for ordinary labour. It is manifest, from its course of action, that the Department has been uninformed of the experience of these conditions, though they are large and fundamentally organic, and, for economy as well as efficiency, must govern the whole field of national elementary education. In correct administrative principle, an educational department should be an agency for carefully collecting the results of experience from the whole field of service, not only for its own direct guidance, but for distributing it for the guidance of all isolated officers and people who may be engaged in the service. As a minister of education, Mons. Guizot lays it down as an administrative principle, that it is the duty of a government or of a department to make itself acquainted with all successful methods, to attend to all important trials, to promote all improvements, and to promulgate the knowledge of them to all who are employed in the service. The French Minister of Instruction performs this duty; circulars of information are distributed to all the schoolmasters, questions are asked of all of them direct, and each has the privilege of answering direct to the superior authority. I might present examples of valuable information for the guidance of the minister and public service thus obtained. Conferences are had with them, and discussions amongst them on the progress of their art are officially encouraged. But this committee of the Privy Council does nothing of the sort. Whilst the educational functions here are so imperfect,

lame, halting, and torpid, there are Governmental functions in respect to elementary education—functions of the control and direction of the public expenditure for elementary education, which, for efficiency and economy, ought to be under one competent superior head, but they are scattered about so capriciously amongst different "authorities" of inferior competency as to narrow the experience of each and to beget both waste and inefficiency. Thus there are educational functions, in respect to the elementary education of a great number of orphan children confided to the Poor-law Board, dependent upon the accidental competency and zeal of inspectors, who are under no proper superintendence, who have to report to changing political chiefs, who generally know nothing, and care nothing, whether the inspection is done well or ill, whether the education given is good or bad;—and there is evidence that much of it has been very bad. Then, there are educational functions in respect to elementary education, the teaching the three R's in the army schools, under the independent direction of the War Office, acting through a Council chiefly of superior military officers who are not educationists, though, I must say, that having urged upon the attention of the first Council the half-time principle, they adopted it, and that it is fairly carried out, at all events in the Chelsea school, by an able master, Mr. Macleod, who is here as one of our deputation. Then there are functions of elementary education of children for the navy, under the independent direction of the Lords of the Admiralty, whose incompetency I apprehend it will be fully conceded has been displayed in the reports of the different management at different times of the large Greenwich school. Now, in respect to these three departments, poor law, naval and military, it may be proved that the experience gained in one is lost to the others, and that had the same elementary functions been exercised by well constituted authority, the experience of one branch in cost of maintenance and training would have shown that half the money expended by the other two might have been saved to the public, and better results have been obtained. Then there are independent governmental educational functions—of all places!—cast amidst a mess and medley of functions in respect to the public health—functions as to gas and water supplies, testing anchors, looking after alkali works, shipwrecks, and what not—the Board of Trade. But above all there is an annual income of some million of money in educational endowments, mainly for the poorest classes and for elementary education, and charities left for the good of the poor (whose greatest practical good would be mixed physical and mental training to impart aptitude for productive industry), and this large sum of money, equivalent to the Parliamentary educational grant, is expended, as is proved, for the most part, in worse than waste, under Governmental functions of supervision, control, and direction by the Court of Chancery, which knows nothing of the educational art, which cannot be informed upon it except at a ruinous expense, whose unfitness for the exercise of such power has been declared by the President of our association, the present Lord Chancellor, as well as by other law lords. For myself, I beg leave to submit that it would well task the undivided attention and labour of a Council, specially conversant with the art of education, and also with the principles of educational organization, to stay this Governmental waste and inefficiency, by collecting these scattered Governmental functions together, and getting them in good efficient, uniform, and economical action, as a preparation for dealing with local waste and inefficiency by a general measure for a middle-class' national elementary education, including what cannot moreover be dealt with separately from lower class education except at great loss. I may state, for the schoolmasters generally, that their experience and observation does not lead them to expect that the progress required will be obtained by the transient effort of any ability and zeal, with only a divided and distracted attention and imperfect information, the result of divided fragmentary unsystematised and imperfect functions, such as those I have exemplified.

Mr. Tufnell showed that whilst, by the Revised Code, the number of the candidates for pupil-teacherships had been so reduced by the discouragements it gave to them, that the training colleges found it difficult to get on—that two had been given up and the rest crippled, and that the qualifications of those admitted as pupil teachers had been grievously reduced; so that a system which had produced the best trained teachers in Europe had been ruinously affected by the maladministration of the Department. Dr. Cromwell, the principal of the St. Mark's Training College, referred to the impartial evidence given before the Duke of Newcastle's Commission on the superior results and economy of trained teaching. Mr. Daniel, the Principal of the Battersea Training College, exemplified the injury done to the public by the course taken by the Department on that topic. Mr. Lawson, of St. Mark's College, spoke of the discouragement to competent school teaching from its disadvantage as compared with other branches of service from the want of retiring pensions or annuities, which had occasioned numbers of the most valuable trained teachers to abandon the elementary schools for more remunerative pursuits. Other speakers displayed the fallaciousness of the returns as to the results obtained, and to the inadequacy of the tests by the examinations of the inspectors, from their very frequent want of skill. Apprehensions were expressed of the effect of an educational rate, in subjecting the trained teacher to the caprice or ignorance of Local Boards; and confidence was manifested that religious teaching would be the most safely confided to the trained teacher. Earl de Grey and Ripon assured the deputation that attentive consideration would be given to their representations. It was from the deep sense of the importance of the whole subject that the Government had postponed the question, that they might give it the most mature examination. His lordship observed that his friend Mr. Chadwick, in what he had said on the subject of a minister of public instruction, had not sufficiently taken into account the difference of local conditions to be dealt with in England as compared with France. Mr. Forster assured the school teachers that he regarded their present position with much sympathy.

Fine Arts.

Statue to Callot.—The Art Society of Nancy has determined to raise a statue in honour of the celebrated Jacques Callot, who was a native of that place. The work is to be raised by subscription.

Busts placed in the Hôtel de Ville, Paris.—Busts in marble of Queen Victoria and the late Prince Consort, the Emperor of Russia, the King of Prussia, the King and Queen of the Belgians, the King of Bavaria, and the Sultan, all of whom have visited the fine old building of Henry IV. since 1854, have recently been placed in the galleries of the Hôtel de Ville.

Commerce.

The Dutch Herring Fishery.—The herring fishery to the north of the Shetlands and Hebrides, carried on by Dutch fishermen during the last season, has proved to have been more successful than that of the previous one in 1867, in spite of a great deal of rough weather. The number of boats engaged in this fishery was 153, manned by 1,200 men and boys. During the five months these boats made 778 voyages, and the number of fish brought to market was 64,308,860, not including the 2,081,400 the share of the owners, and those which were salted or cured.

Sale of Provisions at Turin.—The following quantities of provisions were sold in the Piazza Emanuele Filiberto (the principal market at Turin) during the past year:—Cereals (wheat, rye, barley, oats, rice, and maize), 1,258,945 hectolitres; poultry (chickens, geese, ducks, capons, turkeys, &c.), number of head, 833,640; fresh water fish, 14,671 myrias; vegetables, 188,275 myrias; fruit, 265,375 myrias; butter, 39,330 myrias; firewood, 1,171,158 myrias; charcoal, 262,450 myrias; hay and straw, 301,723 myrias; wine, 66,691 hectolitres. The following were the number of head of cattle slaughtered for food in Turin during 1868:—Bullocks, 8,852; calves, 22,658; oxen, 3,987; cows, 1,167; heifers, 352; pigs, 5,178; sheep, 7,592; lambs, 29,746; goats, 17,325; total, 96,857.

Colonies.

Victorian Railways.—It is evident that this system of lines is beginning to be more thoroughly appreciated as a means of rapid and safe transit for goods, and there is every reason to believe that under a management that worked the railways economically, and served the country cheaply, they would fully answer the purpose of their construction, the development of the resources of those districts through which they pass. This is apparent from the fact that it is the greater amount of goods and minerals carried which gives, from week to week, the advance on the returns of the previous year. In the statement for the week ending 24th December, 1868, for instance, the carriage of goods and minerals produced £7,441 4s. 11d., against £5,231 15s. 6d. in the corresponding period of 1867, an increase of over £2,209. But the passenger traffic gave only £6,617 5s. 10d., against £8,191 10s. 11d. in the same week of 1867, a decrease of £1,754, and this notwithstanding the issue of third-class and excursion tickets. The general statement is as follows:—Total receipts for the week, £14,756 18s. 11d., as compared with £14,080 6s. in the same period of 1867; aggregate to this date, £571,530 16s. 8d., as against £541,996 3s. 2d.; weekly average for the 51 weeks, £11,206 9s. 8d. against £10,627 7s. 6d.

Manufacture of Whips in Victoria.—A former manufacturer of whips in Birmingham has started a whip factory at a place called Footscray, in this colony. He found a great local demand for whips, and also that several of the raw materials which the manufacture required could be obtained at Footscray for an almost nominal cost. The adjacent abattoirs supply him with an abundance of sheeps' intestines, from which he makes his catgut. The rattan cane, which enters largely into the interior of a whip, comes as dunnage in rice and sugar ships from India. With these and similar advantages, in spite of the scarcity and cost of skilled labour, it is found possible to supply the colonial market with a more suitable article, and at a lower price than English manufacturers. Probably in time the value of the refuse of the abattoirs, and of the dunnage of the rice ships, will be fully understood at Footscray, as it is in England, but by that time the business will have thoroughly acclimatised.

Gold in Queensland.—A Brisbane paper says:—"Scarcely a week passes but information comes to hand of the discovery of auriferous ground, until, at last, it is reasonable to expect that it will soon be impossible to point to a district here where it is known that gold does not lie in the earth, only waiting to be developed by the hands of man. As a suitable field for intending gold diggers, in fact, Queensland stands amongst the first in the list of auriferous countries at present known. There can be scarcely a limit to the progress of that mainstay once capital labour and skill are fairly embarked in it, and it is evident that such a state of things is being rapidly brought about in consequence of the increasing knowledge that is being obtained elsewhere of our resources."

Obituary.

Lamartine.—The poet and statesman Alphonse de Lamartine expired at the residence presented to him by the City of Paris, at the edge of the Bois de Boulogne, on the Passy side, in the 79th year of his age. The Government decreed that, "on account of his services to his country in a time of great difficulty," the interment of his remains should, like these of the late M. Troplong, President of the Senate, be at the expense of the State, but the expressed desire of Lamartine that there should be no pomp or ceremony at his funeral induced his relatives and friends to decline the proposal. The remains were conveyed to Mâcon by railway, and there the funeral service was performed in the presence of a small number of friends, and a few representatives of art and literature. They were then conveyed to the family vault at St. Point, a distance of some leagues, the whole population of the villages on the route, headed by the clergy, lining the road. At St. Point the assemblage was immense. The vault contains the remains of the father and mother of the deceased, of Madame de Lamartine, an English lady, who died a short time since, of the daughter and only child of the poet, and of a faithful English nurse who desired to be buried there. The only ceremony consisted in an escort of twenty-five soldiers, on account of the deceased being a Chevalier of the Legion of Honour. A subscription has already been set on foot for the erection of a suitable memorial in honour of the deceased.

Notes.

Agricultural and Horticultural Shows in France.—The season of the annual exhibitions and competitions connected with agriculture is approaching, and the various provincial societies are this year actively engaged in organising supplementary exhibitions and congresses to add to the interest of the official meetings. We have already noticed the arrangements for Chartres, and are now enabled to add some others. The exhibition announced to take place at Beauvais, from the 1st June to the 15th July, will include agriculture, industry, and horticulture; Poitiers is to have industrial, artistic, and archæological exhibitions for the important departments of Vienne, Charentes, Dordogne, Gironde, Deux Sèvres, and Vendée; the Horticultural Society of the Eure and Loire announces an exhibition, to be held from the 5th to 17th May, for productions of the market garden, the pruning of trees, nursery gardening, and floral cultivation; the Horticultural Society of Allier holds its show at Moulins, from the 22nd to 25th of April; the Horticultural Society of Melun and Fontainebleau, a district famous for grapes and roses, and, indeed, for fruits and flowers of all kinds, announces that its spring exhibition will take place at Montereau, on the 16th and 17th of May; an exhibition of trained horses is to take place at Alençon on the 17th March instant, when prizes of £32, £36, and £48 will be awarded by the juries. The sum of £480 is devoted to the purposes of this competition. The Comice Agricole of Montluçon, in Allier, announces its meeting for the 30th instant, prizes to be awarded for the best breeding bulls, cows, sheep and pigs, poultry, and agricultural implements; there will also be competitive trials of agricultural labour.

Paris Academy of Sciences.—The French Academy of Sciences, at its last meeting, elected Dr. David Livingstone a corresponding member of that body in the section of geography and navigation, in place of the late Mr. Dallas Bache, of Washington.

Working Men's Clubs in France.—The proposal for establishing working men's clubs at Mulhouse, mentioned in the *Journal* of January the 22nd, has been followed by the announcement of the formation of a club of mechanics at Marseilles, and an Imperial decree has sanctioned the association in question, which is therein declared to be an establishment of public utility.

Correspondence.

Army Organization.—Sir,—The copy of your *Journal* for the 19th of February, containing the paper read by Mr. Henry Cole, C.B., on the efficiency and economy of a national army, having been sent to me, I have very carefully gone through the same, as also the observations made thereon by Major-General Sir William Denison, who, stating that the subject had been treated by Mr. Cole in the loosest possible manner, proceeds himself to treat it in that spirit of contempt for all who differ from him, and especially for civilians, which always forms a striking feature in the language and deportment of military officers. I have seldom read anything more clear and conclusive than the facts, arguments, and authorities adduced by Mr. Cole in support of the proposition that a standing army such as ours is a national weakness, and that to recur to the ancient and constitutional system of making every man contribute to the defence of the country is not only essential for our safety, but would of itself tend to elevate the moral character of the nation, while it relieved us of an expenditure that, to the extent of seven or eight millions a year, is far worse than utterly wasted. Such being the opinion I have long entertained, sustained, as I believe it to be, by the experience of our volunteer system, I beg leave to convey through you my best thanks to Mr. Cole for his most able elucidation of the subject; and, as a Member of Parliament, I shall at all times be prepared to promote to the utmost of my power the policy advocated by him.—I am, &c., G. H. Whalley.

Plas Madoc, Rhuabon, 27th February, 1869.

Schultze's Granulated Wood Gunpowder.—Sir,—I beg to state, for the information of the gentlemen who witnessed the experiments upon this composition, on the 27th of January, at Wandsworth, that the white powder accidentally bearing my name possesses all the properties ascribed to Captain Schultze's compound, the manufacture of which, depending in some measure upon the gun-cotton process, renders it subject to some of the inconveniencies attendant upon that process never yet entirely overcome. The manufacture of white powder will not cost more than one-tenth of the time, labour, machinery, and chemical experience required for that of the proposed granulated wood-powder, and it may be made, at present prices, for one shilling per lb.; its cost, on a large scale, would of course be much less. The explosion of white powder-mills would be impossible, as the materials never come together except in such quantities as may be required for immediate delivery, when the manufacture is completed in a few minutes by means of a large revolving conical sieve. It is only when ready for filling the cartridges that it becomes as dangerous as common gunpowder, but not more so, more especially as it cannot leak out so as to form explosive trains. From its compact nature it only occupies half the usual space in the chamber of the gun, none being blown out of the muzzle unconsumed, as is the case with all granulated powders. The whole of the charge is usefully expended in producing initial velocity, and consequent length of range or depth of penetration. The explosion of white powder producing four times the propelling force of the best black, leaves the barrel perfectly dry, and whatever slight carbonaceous deposit may remain is blown out at each successive discharge, and no fouling ever takes place. Its general introduction will, moreover, allow of a considerable reduction in the dimensions of fire-arms of every description to do the same work now performed by ordinary black powder. I can only say that I have made it for my own use, and have used it continually for ten or twelve years, and never yet had the slightest approach to an accident. — I am, &c., Henry W. Reveley.

1, Baker-street, Reading, Feb. 22.

MEETINGS FOR THE ENSUING WEEK.

Mon.....Society of Engineers, 7½. Mr. C. M. Barker, "Joints for the Prevention of Leakage in Gas and Water Mains."
R. United Service Inst., 8½. Capt. Edmund Wilson, R.N., "Working Heavy Guns on the Broadside; with some Observations on the all-round fire combined with the broadside system of Armament."
Entomological, 7.
British Architects, 8.
Statistical, 4. Anniversary Meeting.
Medical, 8.
Asiatic, 3.
Victoria Inst., 8.
London Inst., 6.

Tues ...Royal Inst., 3. Rev. F. W. Farrar, "On Comparative Philology."
Civil Engineers, 8. Discussion, "American Locomotives and Rolling Stock."
Statistical, 8. Mr. James Caird, "On the Agricultural Statistics of the United Kingdom."
Pathological, 8.
Anthropological, 8.

Wed ...Meteorological, 7.
Society of Arts, 8. Mr. W. Davison, "On the Trade and Commerce of Japan."
R. Society of Literature, 4½.

Thur ...Royal, 8½.
Antiquaries, 8½.
Linnæan, 8. Mr. J. G. Baker, "Monograph of British Roses."
Zoological, 4.
Chemical, 8.
Numismatic, 7.
Philosophical Club, 6.
Royal Inst., 3. Dr. H. Power, "On the Eye."
Society of Fine Arts, 8. Second Musical Evening (Schumann and Schubert). Conductor, Mr. Alfred Gilbert.

Fri .....Philological, 8½.
Royal Inst., 8. Dr. Crum Brown, "On Chemical Constitution."
Quekett Club, 8.

Sat.....Royal Inst., 3. Dr. Odling, "On Hydrogen."

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb.

Delivered on 2nd March, 1869.

21. Bill—Assessed Rates.
23. ,, Marriage with a Deceased Wife's Sister.
27. ,, Irish Church.
36. Post Office (Mail Service)—Contract.
16. National Debt (Savings Banks and Friendly Societies)—Accounts.
30. Bank of England—Annual Account.
40. Navy Estimates—(Corrected Pages).
45. Metropolitan Improvements—Statement.

Session 1868.

119. (xi.) Trade and Navigation Accounts (31st December, 1868).

Lords Address.

Delivered on 3rd March, 1869.

25. Bill—Evidence Amendment.
26. ,, Court of Common Pleas (County Palatine of Lancaster).
28. ,, Sea Birds Preservation.
30. ,, Metropolitan Commons Supplemental.
31. ,, Inclosure of Lands.
24. Metropolitan Board of Works—Returns.
32. Greek Loan—Account.
33. Sardinian Loan—Account.
49. Abyssinian Expedition (Vote of Credit)—Supplementary Estimate.

Public Petitions—Third Report.

Session 1868.

344. (a viii.) Poor Rates and Pauperism—Return (A).

Delivered on 4th March, 1869.

15. Bill—University Tests.
29. ,, Sale of Liquors on Sunday (Ireland).
31. Russian Dutch Loan—Account.
43. Navy—Supplementary Estimate.
46. Trade and Navigation Accounts (31st January, 1869).
50. Post Office Packet Service—Statement of Excess.
51. Civil Services—Statement of Excesses.

Education—Revised Code.
Turkey and Greece—Correspondence.

Delivered on 5th March, 1869.

24. Bill—Stannaries.
33. ,, Burials Regulation.
19. Public Income and Expenditure—Account.
35. Mint—Account.
47. Bankruptcy Act—Return.

Inland Revenue—Twelfth Report of Commissioners.

Delivered on 6th March, 1869.

22. Bill—Beerhouses, &c.
32. ,, Game Laws Amendment (Scotland).

34. „ Lands Clauses Consolidation Act Amendment.
35. „ Life Assurance Companies.
36. „ Game Laws (Scotland).
37. „ Pharmacy Act (1868) Amendment.
54. Piers and Harbours—Report of the Board of Trade.
61. Navy—Appropriation Account.
64. Committee of Selection—First Report.
Public Petitions—Fourth Report.

Session 1868.

433. (iv.) Endowed Charities—General Digest.
494. Local Government Act (1858)—Tenth Annual Report.

Delivered on 8th March, 1869.

20. Bill—Married Women's Property.
38. „ Contagious Diseases (Animals) (No. 2).
29. Dublin City Election—Minutes of Evidence.
34. Court of Chancery—Return.
53. Bank of England—Applications for Advances to Government.

Patents.

From Commissioners of Patents' Journal, March 5.

Grants of Provisional Protection.

Anchors—503—W. Daines.
Artificial stone—548—B. J. B. Mills.
Artificial teeth—542—J. O. C. Phillips.
Boilers—537—R. Foster.
Bricks, &c.—453—W. Basford.
Bricks, &c.—578—W. H. Tooth.
Buddles for separating ores, &c.—524—G. Green.
Butt-hinges—534—B. F. West.
Cartridges, wadding for—462—C. W. Lancaster.
Cast-steel, &c.—566—H. Bessemer.
Chimneys, &c., cowls for—518—E. Hewett.
Churns, &c.—514—S. Myers.
Coke ovens, &c.—558—A. Jobson.
Combustible liquids, burning and vaporising—523—G. G. Hairs.
Corks, drawing—527—J. Mabson.
Cotton, &c., winding on reels—526—J. T. Wibberley.
Electrical conductors—531—M. Gray.
Electric telegraphs, &c.—501—D. G. FitzGerald.
Fans, rotary blowing—490—H. Aland.
Felt carpeting, &c.—398—W. Mitchell.
Fire-arms, breech-loading—511—A. Henry.
Flannel, &c., treating—515—T. Smith.
Flax, &c., machinery for spinning—502—J. Newton.
Flour, apparatus for treating—3707—A. V. Newton.
Flowers, apparatus for gathering—554—J. Blyde.
Furnaces—569—J. Whitehead.
Furnaces, &c.—586—W. E. Newton.
Gas, manufacturing—575—R. Morton.
Gas pipes, &c., laying and joining—571—W. Willilams.
Gas, recovery of substances used in the purification of—565—S. Holroyd.
Glass, &c., producing designs upon—576—G. Rees.
Grate bars—557—J. T. Gaze and J. Hymas.
Hair-cutting machines, &c.—532—J. H. Morl.
Harvesting machines—577—J. T. Griffin.
Hats, &c.—555—H. F. Freutel.
Horse-shoes—454—W. Haycock and W. Carter.
Human figure, apparatus for measuring the—3919—G. M. Wolmershausen.
Hurdles for folds—552—J. B. Rushbrook.
India-rubber suction pipes, &c.—507—T. Forster and P. B. Cow, jun.
Iron and steel—546—T. S. Blair.
Lamps for lighting mines—3505—M. Wilkin and J. Clark.
Linen-faced paper, compound for glazing—533—T. H. Simmonds and E. B. Moreland.
Locomotive engines—564—A. V. Newton.
Locomotive engines and carriages—517—A. M. Clark.
Locomotive engines, heating apparatus for—544—W. R. Lake.
Locomotive engines, &c.—553—R. Meldrum.
Looms—480—T. Sagar and T. Richmond.
Looms—497—C. Brook, L. Barker, and M. Thompson.
Looms—509—T. Tunstill and J. Dodgeon.
Malting, heating, &c., apparatus for—539—J. and W. Weems.
Metallic articles, shaping and finishing by abrasion—582—B. P. Walker.
Metallic capsules, applying trade-marks, &c., upon—563—J. Neilson and J. Marshall.
Metallic salts and sulphuric acid, utilising waste—574—J. I. Vaughan.
Meters for measuring water, &c.—535—F. G. Fleury.
Mineral and rock drilling apparatus—492—J. Darlington.
Mines, ventilating—536—J. Daglish.
Motive-power engines—397—G. White.
Motive-power engines—516—J. Davey.
Ornamenting surfaces—327—J. Macintosh.
Ornamenting surfaces—505—M. Vary.
Oyster dredges—323—W. Brabazon.
Paper, manufacture of—540—W. Ibotson, W. W. Ladelle, and A. G. Southby.
Parasols, &c.—588—L. Engel.
Pianofortes—562—W. F. C. Moutrie.
Printed paper, drying and pressing—496—J. D. Nichol & J. Eckersley.
Printing, apparatus for—549—J. E. Liller.
Railway carriages, &c., steps for—498—R. Pyne.
Railway crossings and switches—556—R. P. Williams.
Railway trains, communication in—568—J. J. Myers.
Railways—522—M. MacLennan.
Reaping and mowing machines—541—S. Osborn.
Rotary engines, &c.—560—J. Johnson and W. Gill.
Screw wrenches—551—W. E. Newton.
Sewage, removing and utilising—506—F. Delbreil.
Sewers, ventilating—528—A. Jacob.
Sewing needles, machines for making—504—F. W. Mallett.
Ships, propelling—529—J. Eberhard.
Ships, propelling—545—G. A. Fall.
Signal lamps—459—E. J. Hill and R. Davis.
Solitaires, links, &c.—383—R. W. Row.
Spinning machines—573—B. Hunt.
Steam engines—519—H. T. and T. Jennings.
Steam engines, &c.—500—T. H. Martin.
Steam engines, &c.—525—J. D. Gauldie and T. A. Marshall.
Steam engines, &c.—572—J. Cooke and G. Hibbert.
Steam generators—513—J. Loader.
Steam, utilising waste—3307—R. Meldrum.
Stone, &c., cutting—494—A. Munro and W. B. Adamson.
String holders—495—A. Garrison.
Taps—559—J. Breeden.
Tenons and mortises, making—570—W. A. Ives.
Velocipedes—550—J. H. Johnson.
Velocipedes—580—W. Anyon.
Velocipedes, floating—538—J. E. Lucas.
Vessels for containing water, &c.—508—W. M. Cochrane.
Vessels, &c., mooring—584—J. Moody.
Vices—567—W. E. Gedge.
Water, apparatus for heating—520—J. Barton.
Weavers' harness or healds—590—W. R. Harris.
Windmills, feathering sails for—512—L. G. Moore.
Windows—493—A. Bartholomew.
Wool, &c., combing—530—H. W. Whitehead.
Wool, &c., winding slivers of—547—J. and T. Leach & J. Goodyear.

Inventions with Complete Specifications Filed.

Lawn mowing machine—625—W. R. Lake.
Ships—639—J. Howe, jun.

Patents Sealed.

2740. I. L. Pulvermacher.	2794. A. Cruls.
2757. J. C. Walker.	2805. G. Bischof, jun.
2759. C. Holland.	2814. E. Turner.
2762. J. Burdett.	3301. P. B. Cow and J. Hill.
2764. A. J. Fraser.	3772. F. Walton.
2775. J. Adams and H. Barrett.	3875. T. Warwick and A. Boyle.
2783. T. Bennett.	

From Commissioners of Patents' Journal, March 9.

Patents Sealed.

2788. J. Maynes.	2893. B. Dickinson.
2792. J. Challender & B. Kitchen.	2894. B. Dickinson.
2803. E. T. Hughes.	2901. N. Stevenson.
2806. J. Roberts.	2996. W. E. Newton.
2813. F. Warner.	3137. W. Yates.
2835. F. Brady.	3174. J. Ashcroft.
2840. R. Martin.	3234. C. D. Abel.
2847. J. Orrin and T. Geer.	3316. W. Brown.
2857. W. Betts.	3609. W. R. Lake.
2870. J. H. Johnson.	3950. W. R. Lake.
2881. W. Needham and J. Kite.	3983. B. Samuelson.
2884. G. Bernhardt.	76. J. Knowles.

Patents on which the Stamp Duty of £50 has been paid.

653. W. Clark.	702. J. G. Willans.
676. J. Broadbent.	703. G. E. Donisthorpe.
784. E. Tonks.	738. M. P. W. Boulton.
1023. J. Sparrow and S. Poole.	761. J. W. Yates.
740. P. H. Ashberry.	688. W. Richards.
671. C. W. Siemens.	727. A. V. Newton.
683. J. Norman.	

Patents on which the Stamp Duty of £100 has been Paid.

596. W. Tongue.	625. J. Platt and W. Richardson.
612. J. Fowler, jun., D. Greig, and R. Noddings.	657. E. G. Camp.

Registered Designs.

4997—Feb. 5—Refrigerating tankard—H. C. Ash, 315, Oxford-street, W.
4998—Feb. 11—Portable lamp—F. West, St. James's-street.
4999—Feb. 16—Sleeve link and other dress fasteners—Cooper Bros., Birmingham.
5000—Feb. 19—Letter or bill file or clip—Windle and Blyth, Walsall.
5001—Feb. 22—Harmonium case—J. H. Croft, 144, Westminster-rd.
5002—March 4—Reversible file—J. Gray, Sheffield.
5003—March 6—Apomecometer—R. C. Muller, Great Brunswick-street, Dublin.

Journal of the Society of Arts.

FRIDAY, MARCH 19, 1869.

Announcements by the Council.

Ordinary Meetings.

Wednesday Evenings at eight o'clock :—

March 24.—*Passion Week.*—No Meeting.

March 31.—"On Technical Education, considered in relation to Female Schools." By Ellis A. Davidson, Esq., Lecturer on Science and Art in the City of London Middle Class Schools. The Rev. Wm. Rogers, Rector of Bishopsgate, Member of the Council, will preside.

April 7.—"On the Theory of Boiling in connection with some processes in the Useful Arts." By Charles Tomlinson, Esq., F.R.S., F.C.S.

April 14.—"Spain Commercially and Economically Considered." By E. M. Underdown, Esq., Barrister-at-law.

April 21.—"On Trade Marks." By W. Wybrow Robertson, Esq.

April 28.—"On the Duties of the Architect with reference to the Arrangement and Structure of a Building." By Roger Smith, Esq. On this evening Sir Digby Wyatt will preside.

May 5. "On the Formation of Industrial Settlements in our Colonies." By Col. Francis C. Maude, C.B.

FINAL EXAMINATIONS, 1869.

In order to avoid holding these Examinations on the same evenings as those of the Department of Science and Art, it has been decided to hold them, in 1869, on the evenings of

TUESDAY, the 20th APRIL,
WEDNESDAY, the 21st ,,
THURSDAY, the 22nd ,,
FRIDAY, the 23rd ,,

From 7 p.m. to 10 p.m., instead of on the 27th, 28th, 29th, and 30th April, as announced in the Programme of Examinations for 1869.

A copy of Form No. 2 has been forwarded to each Local Board, and should be filled up and returned to the Secretary of the Society of Arts immediately, if this has not been already done.

A sufficient number of applications from candidates in all the subjects referred to in the notice at page 9 of the Programme having been received, papers will be set in Conic Sections, Navigation and Nautical Astronomy, Mining and Metallurgy, and Italian.

Committee on India.

Six Conferences are now in course of being held for the discussion of the following subjects, viz. :—

Tea Cultivation in India.
Hill Settlements and Sanitaria.
Waste Lands in India.
Trade with Central Asia, Thibet, and South-Western China.
Indian Fibres.
Silk Cultivation and Supply.

The following evenings have been fixed for the remaining five conferences :—

Friday, April 2nd.
,, April 16th.
,, April 30th.
,, May 14th.
,, May 28th.

At these Meetings the chair will be taken at 8 o'clock, and the discussion will be opened by a paper.

The subjects for each evening will be previously announced in the *Journal.*

Members of the Society interested in Indian questions are invited to attend.

Subscriptions.

The Christmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

India Conferences.

The first Conference on Indian subjects was held on Friday, March the 12th, Archibald Campbell, Esq., M.D., late Superintendent of Darjeeling, in the chair.

The Chairman called upon Mr. Hyde Clarke, before Mr. Fielder read his paper, to explain the object of these India conferences.

Mr. Hyde Clarke said that they were aware that the Society of Arts had devoted itself from an early period to the promotion of Arts, Manufactures, and Commerce, not only in connection with this country, but with our colonies and with India. From time to time various subjects connected with India had been brought before this Society, and those subjects had always been received with attention; it was natural, therefore, that those gentlemen who were specially interested in such matters should apply to the Society of Arts to appoint a committee with a view to the holding of discussions on various Indian questions, because these subjects came within its domain, and it was equally natural that the Council, in its desire to promote a public object of great importance, should accede to the request. It was under these circumstances these meetings had been projected. It had been the desire of the India Committee that these meetings should be in the nature of conferences, in order to elicit a greater variety of opinion, the subject to be considered being introduced by a short paper. He might congratulate them upon the presence this evening of many gentlemen greatly interested in India.

The Paper read was :—

ON TEA CULTIVATION IN INDIA.

By C. H. Fielder, Esq., Hon. Secretary of the India Tea Association.

The tea plant in British India was discovered by Major Bruce, to whom this Society, very justly, gave its gold medal for the important discovery. He was in the province of Upper Assam prior to the British entering it in 1824-25, when they drove the Burmese out, and advanced to Sudiya. The tea was first brought to the notice of British officers by the Sing-Fo chiefs, and the late Mr. David Scott, Commissioner of Assam, sent down specimens

of the leaves and seeds to Dr. Wallack, the superintendent of the botanical gardens at Calcutta, but it was not until, by the reports of the then Colonels Jenkins and Charlton, in 1834, all doubts were removed of its being genuine tea, and proofs given of its quality by samples sent down prepared by the latter officer, that Government tea nurseries were formed, under the charge of Mr. C. A. Bruce; and a Commission was sent up from Calcutta, consisting of Drs. Wallack, Griffiths, and McLean. In 1838 and 1840 the bulk of the tea gardens, experimentally planted by the Government, under the management of Mr. Bruce, and afterwards of Mr. Masters, in the Seebsangur and Debroghur districts, were handed over to the Assam Company. The plant is a shrub, nearly allied to the genus *Camellia*, from which the tea of commerce is manufactured.

The plants discovered by Bruce, and those since cultivated in British India, are merely varieties of the same species as those cultivated in China, and if left to their natural growth attain a height of from 30 to 40 feet, with numerous branches; the main trunk attains a diameter of from 10 to 20 inches, and the lateral branches from one to four inches; but in a state of cultivation it is kept down by judicious pruning to a height of from three to five feet. The leaves when full grown are of a length of from five to nine inches.

The green and black teas of commerce are made from the same plant, the difference arising solely from the difference in the manufacture, the green tea being made direct from the green leaf, while the black is allowed to wither by exposure to the sun or hot air before manufacture.

The tea plant appears to flourish best in a sub-tropical climate, *i.e.*, in China in N. lat. 24° to 35°, and British India in N. lat. 25° to 28°, and requires a most excellent soil, a very large average rainfall, and a comparatively high temperature. The cultivation of tea has already become an important feature, and the gradually increasing consumption of it here tends to show, beyond doubt, that it has taken root in the general tea trade of this country.

The tea districts, at first confined to Upper Assam, have since greatly extended, and teas arrive now from various parts, offering a good assortment of useful to very fine qualities. The best black tea that China produces compares but poorly, even the finest first crop requiring a certain quantity of the better description of Indian to be mixed with it, the latter being so much more brisk and pungent in flavour. Indian tea possesses extraordinary strength, a property invaluable for mixing purposes; and, looking to the comparatively inferior teas of China growth, I lean to the belief that those from India will continue to merit the attention of our dealers no longer as a curiosity, but with a view to satisfy the requirements and taste of the general public.

The lands actually at the disposal of the Government of India, *i.e.*, 1859 and 1860, in districts suitable to the cultivation of the tea plant, were as follows:—

	Square Miles.
Tenasarim	14,176,011
Arracan	4,860,000
Cossyah and Jyntiah hills	453,000
Assam, of 7 districts	6,500,000
Dehra Doon	141,652
Darjeeling	250,000
Kumaon	No return
Sunderbunds	809,648
Cachar	200,000
Chittagong, space for any number of European settlers.	

Of these, about 546,000 acres have been taken up, and 46,000 brought under tea cultivation.

The above is an abstract of returns made to Government, which are not considered complete, as none of the land has been surveyed. Grants of land were published by the Government on easy terms.

It was generally believed that all the best teas that reach England were grown in the north, the climate of which is temperate, and in winter very cold. By the most eminent men of the day the slopes of the Himalayas were recommended as offering the best prospect of success to cultivate the tea plant of commerce. The Assam plant was satisfactorily proved to be real tea; a question then arose, is it identical with the tea plant of China, or a new species?

The China tea shrub delights in high situations, and all fine green teas of China grow in the temperate climate of the north; the finest black teas on the slopes of the Bohea Hills. In China the best of all tea is procured from high mountains, viz., Vu-ye. Assam will grow, and has grown as good, if not better, certainly stronger tea than China, hence we have a right to anticipate as good results from the slopes of the Himalayas. From the Himalayan range we could ensure a supply of one hundred millions lbs. annually, which would be distributed through the commercial centres of the world by the London brokers. From one district in Assam, Luckimpoor, there is a report to Government that there are 228,634 acres of waste land available for tea cultivation, and that wherever factories are established comfort and plenty is provided. Similar evidence is forwarded from Nowgong, Seebsagur.

The Kangra Valley is about four thousand feet above the level of the sea. A tract of land of about a thousand acres was secured by Mr. Fortune, and it is described as being bounded on the east and west by mountains, well supplied with water, and admirably adapted for tea cultivation. In 1852, 20 acres were planted; 1853, 300 acres were planted; 1854, 300 acres were planted; thus in three years there was a fine plantation.

The tea plant, if planted out at the proper time, viz., in the rainy season, does not require irrigation, except to supply the want of rain; the seedlings in nurseries do require occasional watering, and in the planting-out season if attention is not paid to this they will certainly die. Once a tea plantation is formed, and the plants are from three to six years old, they may be considered safe, and independent of artificial irrigation.

Mr. Fortune says of Nagrowta, in 1855, it produced 300 lbs. an acre; the soil is of loam and rich in vegetable matter, well suited for tea cultivation; the plants are healthy and vigorous. At the plantation of Holter, in the Kangra Valley, Mr. Fortune says the condition of the plants is highly satisfactory; they are healthy, vigorous, and quite equal to the best plantations I have seen in China, much to the credit of Dr. Jamieson and his overseer, Mr. Rogers.

In 1856 tea had been fairly established on the Government plantations at the Himalayas, and encouragement was given to natives and Europeans; but the Europeans were not inclined, and the natives had not capacity for the work. Dr. Jamieson continued to prosper with his seed and nursery seedlings, and he was almost embarrassed with his riches, until he was obliged to distribute in thousands to native planters, and even to Assam.

The Kangra district comprises, with nominal exceptions, all the hill territory belonging to the English Government between the rivers Ravee and Sutlej. The area contained can only be conjectured, as it has never been surveyed, but the rough estimate is 8,000 square miles. Various races of men, speaking different languages, are distributed over its surfaces; hills just above the sea's level, mountain crests higher than any peak of the Andes. Every zone of climate and variety of vegetation, from the scorching heat and growth of the tropics to barren heights, destitute of verdure, and capped with perpetual snow.

Cachar, in 1855.—For the second time it was found that the plant was indigenous to Cachar also, which was immediately turned to good account, and, in 1862, in this province 68,149 acres had been leased to tea planters; 6,077 are in cultivation, with an estimated crop of 336,800 lbs. per year, and 6,719 labourers. The produce was quite equal in quality to Assam.

Darjeeling.—There is great difference of opinion as to this being a tea growing district, the elevation being 7,000 feet; some think it too cold for young seedlings, and that the summer heat is not sufficiently strong to ensure fine flushes. In opposition to this, practical planters have taken up 25,865 acres, and have now in cultivation 8,762 acres, of which planted out 5,152 acres.

The area of Assam is about 34,345 square miles, and the population was in 1854 about 1,200,000. The total stated by Colonel Vetch before the House of Commons was about 1,000,000, and this agrees with Captain Butler's figures, as Assam proper is generally reckoned without Goualparah. This was in 1858-9.

The large importation of labour into Assam, Cachar, and Sylhet began in 1863:—

	Where from May, 1863, to January, 1868.			
	Coolies Embarked.	Mortality during Voyage.	Percentage of Deaths.	Duration of Voyage.
Assam . . .	55,352	1,712	3·14	1 Month.
Cachar . . .	52,155	2,456	4·70	,,
Sylhet . . .	2,473	82	3·31	2 Weeks.

These high death rates were caused by cholera, overcrowding, and a bad selection of emigrants. Where a careful supervision has been exercised on the recruiting losses by deaths on the voyage are the exception. The average rate of wages per month in Assam was from 2 rupees 8 annas (*i.e.*, 5s.) to 3 rupees (6s.) previous to 1857. In 1859 the wages rose to 4 rupees per month, and since then to 7 and 8 rupees per month, through competition.

The statistics available are very meagre, but it may be stated that the average rainfall is from 70 to 100 inches in Upper Assam, and 60 to 90 inches in Lower Assam.

The variety advisable to cultivate is from indigenous or true Assam seed; that called the "China," introduced by Fortune into the Himalayas and Upper Assam, not yielding, after full growth is attained, so much leaf per acre, nor is the strength and flavour equal to the Assam. A variety called the "hybrid" was in great favour for some time, but it has been found to relapse more into the "China" character after some years' growth, and more especially in the seed obtained therefrom.

The distances the plants are sown or planted apart vary extremely, viz., from 6 ft. by 6 ft. to 3 ft. by 3 ft., and are regulated greatly by the nature of the soil, and the description or variety of plant to be grown.

The general opinion is, that a garden that can give an average of four chests, or maunds, of 80 lbs. each per acre, say 320 lbs. of manufactured tea per acre, is a good one; there are many gardens undoubtedly in British India that have given, over an extensive area of cultivation, much more than this average, but they are at present exceptions; a safe average may be taken at three chests, or 240 lbs.; and as each chest or maund of tea manufactured takes, on an average, four maunds, or 320 lbs. of the green leaf as gathered to produce this, it will be seen that even with double the average crop, the return of green leaf per acre would only amount to 1,920 lbs., or less than one ton, which ought to be considered a very moderate result for crops that are gathered in on an average fifteen times per annum. The out turn per acre will again depend—On the nature and quality of the soil; the locality of the garden in reference to aspect and average rainfall; the variety of plant cultivated; the distances the plants were originally staked or planted out apart, and more especially on the amount of labour available.

The amount of out turn per acre on good lands, and where the trees are of the Assam variety, may truly be said to depend on the labour available to work them. Gardens have been known to yield six, seven, and even nine maunds of 80 lbs. each of manufactured tea, or from 480 lbs. to 720 lbs. per acre. One adult to each acre under tea cultivation is considered the lowest amount of labour that a garden can be kept in a state of moderate cultivation with.

At present there are far too many subdivisions of qualities, owing to the number of small concerns that are engaged in its manufacture. It is recommended that eight qualities should be made, viz.:—Fine Pekoe, or all flowery leaf tea; Pekoe, little flowery, with small leaf; Pekoe Souchong, larger leaf, few ends; Souchong, larger leaf, without ends; Congou, all coarse, dark, leafy sorts; broken Pekoe, siftings of fine Pekoe Pekoe; broken black, siftings of Pekoe Souchong Souchong; fannings, siftings of Congou, old leaf. These classes would be found quite sufficient for all requirements of trade: nor will the difference in price between any two consecutive sorts be so much as to preclude the trade from buying either. It may appear that too much broken tea is advised, but the qualities of these differ so greatly that it is doubtful if they can be reduced to two alone. Teas such as Kangra Valley, Tukvar, Kursiong, Nemoonah, Dehra Doon, and some Darjeeling kinds, should be made into green teas, as when made into black the liquor is always so thin and highly burnt that prices are very irregular. Indian green teas fetch usually what would seem to be paying rates. The proportion of China green to black is about 1 to 10. Nothing at the moment can be said as to what qualities it would be advisable to manufacture, as their appearance here is so rare. Uniformity in taxes and weight of contents of the packages is a great desideratum. It would be advisable to fix a limit of weight of tea to a chest, say 80 lbs., a half chest 45 lbs., catty box 20 lbs., or with very fine sorts, even 12 lbs. It would also materially facilitate the working of the teas in the warehouses here if the taxes were to be even, the chests or packages properly marked with the correct quality, as at present the names marked on the chest are most arbitrary. Thus a Souchong is often marked Pekoe, and *vice versa*. Some have thought that Indian teas might eventually become an article of export to Russia, for when comparing a flavoury, though somewhat weak, Pekoe Souchong with fine black leaf China tea a great difference in intrinsic value is apparent. Many Pekoe Souchongs selling at 1s. 7d. and 1s. 10d. are far better than Monings fetching 2s. 3d. and 2s. 6d., and some, though deficient in strength as an Indian tea, are better in flavour and equal in strength to fine China black leaf. It is thought, were this class of Indian tea separated from the stronger qualities, and bulked in marks of not less than 100 chests, they would find a good market on the Continent.

With respect to thin, sour teas, the quantity of these becomes smaller every year, so that their presence among the stronger sorts would not be apparent after bulking if they were moderately used.

The example of the Assam Company ought to be followed as much as possible in all the details of mixing, bulking, and packing and evenness of tares, and scarcity of small breaks. Many items of expenditure could be saved by an amalgamation taking place among the competing interests.

The quantity of Indian tea imported in—

		lbs.	
1851	was	262,839	
1861	,,	1,520,000	
1864	,,	3,285,000	(increase over two-fold in 4 years.)
1868	,,	8,133,000	(increase nearly three-fold in 4 years.

The quantity delivered from warehouses in—

		lbs.	
1861	was	1,292,000	
1864	,,	2,781,000	(increase over two-fold.)
1868	will be	7,320,000	(increase nearly three-fold.)

The stock on 31st December—

	lbs.	
1861 was	1,028,000	
1864 ,,	1,783,000	(increase three-quarters.)
1868 ,,	3,691,000	(increase over two-fold.)

It will be seen that the increase in the eight years, 1861–8, of import, was five and a-half-fold; ditto, delivery, five and a-half-fold; ditto. stock, nearly four-fold. These figures cannot be regarded but as favourable in comparison with China tea—

	1867.	1868.
Import from Jan. 1 to Nov. 30...	109,000,000	135,000,000
Delivery ,, ,, ...	131,723,000	129,683,000
Stock on Dec. 1st	61,955,000	73,652,000

It may be fairly stated that no crop is more dependent on an adequate supply of labour than tea. Until the trees have become fit to pick leaf from, it requires at least one man to each two acres for clearing, hoeing, and planting; afterwards one man to the acre as a minimum, for in addition to keeping the ground clear of jungle, the leaf picking, when a flush is out, employs every hand, and the leaf, if neglected for even forty-eight hours, becomes unfit for the manufacture of the higher quality of tea, such as Flowery Pekoe, Pekoe, and Souchong. The labour question, therefore, in the words of the "Tea Commissioners of 1868," is the sole question to look to in the future.

The Commissioners were appointed to inquire into the "State and Prospects of Tea Cultivation in Assam, Cachar, and Sylhet, in accordance with the resolution of the Government of Bengal, dated November, 1867," and it appears that after a careful and lengthened investigation, and taking evidence on the spot, they came to the conclusion (vide p. 14 of their report) that—"On the whole we see no reason to believe that as far as soil and climate go, tea cannot be grown profitably in Assam, Cachar, and Sylhet. The whole matter may be reduced to the one question of the supply of labour. If this can be obtained in sufficient quantity and at reasonable cost, gardens properly planted and economically managed ought to return a fair profit on the outlay."

The revenue from Assam in 1852–53 amounted to 750,000 rupees, or £75,000, while in 1864–65 it had reached a total of 2,630,000 rupees, or £263,000, over £100,000 of which was from land and forest revenue, while £150,000 was received from excise and stamps, and thereby mainly (*i.e.*, to the extent of £143,500) from the sale of opium to the labouring population. To the use of this pernicious drug may be attributed the indolence and degeneracy of the bulk of the inhabitants of the Valley of Assam. The increase in the quantity sold, and the revenue obtained thereby have been as follows:—

	Sold.	Revenue.
1859–60	32,720 lbs.	£21,400
1864–65	155,200 lbs.	£143,500

The total revenue has since much increased, and has lately been in some districts doubled by the Government. It is now felt that the Government ought to immediately aid the planters, by expending not only a larger proportion of the revenue obtained from the province on public works, but that a free circulation of native labour should be promoted, the market enlarged and equalised. Facilities for cheap locomotion by steam vessels would transfer the surplus labour of Bengal and many other parts to Assam, Pegu, and other places where there is a scarcity of labour.

They should also improve the water communication by keeping up the bunds and embankments not only of the smaller rivers Dehing, Dhunsaril, Disang, which are so neglected now that large tracts of former cultivation are now deep morasses or dense swampy jungle.

The trunk roads should be considerably raised, and the water ways or bridge openings widened. The trunk and minor roads should be completed and the old native roads where possible improved and utilised, and the planters should be encouraged by liberal grants to give their personal attention to these urgent requirements, and to making them in sections, and the Government should send up the labour required in lieu as hitherto of competing with the planters for the small amount of local labour and time expired imported coolies.

The necessity of extension of telegraphic communication to Debrooghul was pointed out by the commissioners' report of 30th March, 1868, and also that Government should supply from local treasuries cash required by planters in lieu of the latter sending up specie from Calcutta in exchange for drafts. The Hon. William Grey, Lieut.-Governor of Bengal, visited Assam in 1867, and, in reply to a deputation of planters, on 14th September, in that year, stated that he hoped the communications would be improved, the roads repaired, the ferries rendered efficient, and the navigation of the smaller rivers made easier by the removal of the snags, &c., and that telegraphic communication would be extended—but as yet no action has been taken thereon.

The memorial of the planters to the Government was as follows:—

1st. That the whole of the revenues of the tea districts of Eastern Bengal be expended in the civil administration of these provinces, and that a sufficient sum in addition be provided annually, either from the immense surplus revenues of Bengal proper, or from loan specially raised for the purpose, as has lately been done in other cases, for the early completion of a system of bunds, roads, and bridges, which shall improve the sanitarium of these districts, place them in communication with the neighbouring and more populous provinces, and generally improve the internal communications of the country.

2nd. That measures be adopted for giving effect to the desire expressed in Lord Cranborne's Despatch (Public No. 3, dated India Office, London, the 3rd December, 1866), "to facilitate the acquisition on the part of the planters of an adequate supply of labour to the utmost possible extent," and that labour be imported also by Government in sufficient quantities for the execution of public works.

3rd. That courts of justice be increased to such an extent as will enable Government to enforce the due performance of contracts in the tea districts, and to mete out impartial justice to all Her Majesty's subjects, whether employers or labourers or other persons, and that all special legislation, other than as aforesaid may be considered necessary for sanitatary transport, be at once withdrawn.

The recommendations of the Tea Committee referred to previously were to a similar effect, and that cattle trespassing should be severely dealt with; that an extension of terms of engagement of coolies be made, say from three to five or seven years; and that an abolition of the minimum rate of wages by enactment for imported labourers take place, for, as a rule, they are a lazy set, and would simply do nothing if the rule of minimum rate being given were acted upon; the consequence is it is not carried out by either the planters or the officers of the Government on the Public Works Department.

There are records of thirty-eight joint stock companies engaged in Indian tea production. Their nominal capital amounts to nearly four millions and a-half sterling. Their subscribed capital is about three millions and three-quarters sterling, and that called up amounts to three millions.

The above statistics do not include a number of companies in course of liquidation.

The number of private planters is estimated at two hundred, but the want of reliable Government statistics on the foregoing points is one of the chief reasons for conferring on the rise and progress of tea cultivation in British India before your Society, and the action required for its future profitable development.

In conclusion, it must be admitted that the future of tea cultivation in British India must depend greatly on the action of the Government of Bengal in relation to labour, and it is believed that they are now fully alive to the importance of fostering, instead of obstructing, the

cultivation of the tea plant; considering the amount of capital engaged in its development, and the revenue derived from what was a few years ago mere waste land, it is trusted that the committee appointed on the tea cultivation of India will be carried out, and the competition between the Government engineers making roads, &c., and the planters cease, the Government importing the labour they require for their works. The rate of wages has become nearly reduced to that formerly ruling in Lower Assam through combination; and planters in the upper provinces have only to abandon the senseless competition hitherto existing to benefit likewise. The employment of machinery for the manufacture of the tea and the cultivation of the soil, together with rigid economy in the expenditure, is now being generally introduced and enforced, and the cultivation of British India ought for the future to yield at least remunerative returns on the capital employed.

The Chairman said he would supplement the interesting and suggestive paper of Mr. Fielder by a few notes of his own on the same subject:—

My acquaintance with the subject is from two sources. At the International Exhibition of 1862 I exhibited the teas of all the tea-producing provinces of India, including the government teas from Kumaon; and I was a member of the jury on articles of food at the same exhibition, when tea from all parts of the world came before us. Secondly, I had a great deal to do with the introduction of tea into the district of Darjeeling, of which I had civil charge, and there I became well acquainted with the cultivation and manufacture af tea and coffee.

The discovery of tea in India and the progress of its cultivation and manufacture are very remarkable. About twenty years ago the plant was discovered in Assam, where it is believed to be indigenous, although it is possible it may have reached that province from China overland. It was also some years later discovered in the neighbouring province of Cachar, where it had attained the size of small trees. At first it was believed that this great discovery was a mistake, and that the plant was a species of camellia, which, in all its botanical characters, very much resembles the tea plant. A commission of inquiry, headed by the late Dr. Wallich, was deputed to examine and report on the plants discovered, when it was decided that they were the veritable tea plant. The only important difference between the two plants being that in the one the seed pod when ripe opens along the back of the seed—which are three in each pod—while in the other it opens along the interstices of the seeds.

There were twenty-eight exhibitors of Indian teas from seven provinces in 1862. One hundred and fifty-three different kinds of tea were examined. Four "medals" and seven "honourable mentions" were awarded, and the teas were of most excellent quality. The manufacture is rapidly increasing. Seven million pounds are expected this year in England. A good deal is used in India, and the export of it to Thibet and Central Asia has commenced from the north-western portion of the British Himalaya, *viâ* Lâdâk, where we now have a British agent to look after our commercial interests, which have been so long obstructed and interfered with by our tributary ally, the Raja of Cashmere.

Of Assam, the finest district on the list, and the most important one, Mr. Fielder has given you full particulars.

Of Cachar I have no information, except that the tea is very good; and of Chittagong I cannot speak either.

The first trial of tea at Darjeeling was made by me in 1842, at an elevation of 7,000 feet. It grew well; but subsequent trials at the same elevation showed that the frost killed the seedlings, and that the succession of "flushes" were too few to promise being profitable, although it was proved, in 1845, that tea could be grown. So slow are people to try new discoveries, that it was not for 14 years afterwards that tea was tried as a mercantile speculation. Major Samlee was the first to venture it; and he chose elevations under 5,000 feet. Since then tea has become an established fact in the Darjeeling hills. Many thousand acres of waste land have been converted into "gardens," and the return this year will be far above a million pounds of a most excellent tea. The best elevations to secure high flavoured tea, and a healthy locality for the European planter, are probably from 2,500 to 4,000 feet.

Within the last three years a new experiment has been tried in the Darjeeling district. Tea is grown in the Turai, or low lands at the foot of the hills, where the elevation is not more than 1,000 feet above the level of the sea—about the elevation of Assam gardens. In this case the European planter has his residence on the hills, above the malarious level, where he sleeps, going down daily to work in his plantation. The coolies employed are Meches, natives of the Turai, or Dhanguri, who have an immunity from malaria.

It appears that the growth of the plant is more rapid than in the hills, a crop being taken in the third year, equal to that obtained on the hills—at 4,000 feet elevation—in the fifth year. The quality of the tea is good. Whether it will equal the mountain article in flavour remains to be seen. The succession of "flushes" will, no doubt, be more frequent, and labour is cheaper than in the hills. As regards labour, Darjeeling has been pretty well off. The supply is chiefly from the neighbouring country of Nepal, and is generally equal to the demand, and at moderate rates, varying from 4 to 6 rupees per mensem for coolies, and 7 to 10 for Siedars.

Tea cultivation is popular with all the hill tribes around Darjeeling, and the women and children gladly take work in leaf picking in the manufacturing season. There is still a good deal of land, I believe, available for cultivation, and the road communication with the plains is much improved. Railway communication, however, is still urgently required to develop fully the progress of the district. The Darjeeling tea is sent to England; it is also used on the spot, and in Bengal. There will no doubt be a market for it in Thibet by-and-bye. It is always a slow process to alter the course of trade anywhere, and Thibet has always been supplied direct from China. In recent times the Chinese government has become much less powerful in the countries lying between China proper and Thibet, and its hold on Thibet itself is becoming weaker. With increasing misrule in these countries, and the weakness of China in Thibet, the opening for Indian teas will greatly increase. Everyone in Thibet lives on tea.

Of the cultivation of tea in Dehra Dhoon, Kumaon, and Kangra, I have no personal experience, but I have the pleasure to present a report of Dr. Jameson's on the subject, which, although of old date, 1862, will interest the members of our Committee; and I shall read some extracts from it to show the capabilities of those districts for tea cultivation, and the assistance which was given by the Government to the first private tea planters, native and European. After showing how admirably the tea plant is fitted to the Rohistan or hill districts of the north-western provinces and the Punjaub, Dr. Jameson gives the return in one season of tea seed and seedlings in the Government gardens, and how they were disposed of. The return of seed was 3,636 maunds, or 130 tons. He says the soil and climate of Chata Nagpoor are suited to the cultivation of the tea plant. A well prepared specimen was exhibited in 1862, and I learn that Mr. Stainforth, late of the Bengal Civil Service, who is settled at Ranchee, has a large tea garden there. The elevation of Ranchee is about 2,000 feet above the level of the sea, the climate is healthy for Europeans, and labour most abundant; indeed, it may be called the metropolis of labour, as the Chata Nagpoor district has an overflowing population of coolies and Dhangues, who go in search of work over the whole of Bengal, and search for it also in Assam, the Mauritius, Reunion, West India Islands, and Demerara. If there is any gentleman present who could give us information about the quality and the rate of produce of

tea in Chata Nagpoor, where labour is so abundant, it would be very valuable.

Of tea in the Neilgherries I am not able to say more than that the climate and soil are suitable to its cultivation; but Sir William Denison, the late Governor of Madras, who is a member of our Committee, will perhaps be induced to favour us with information on the subject. I shall only remark on the subject of Lahore, that I always observed at Darjeeling, and I believe it is the same all over India, that officers of Government, and the planters who were best known to the natives for strict unswerving justice, with kindliness of feeling, and who were the most considerate of their habits, customs, and peculiarities of thought, and who were the most conversant with their language, were always the best off for coolies, and had their work best done.

The employer of labour in India is differently situated from the same person in England. Here the workman grumbles about his wages, enters unions, and strikes, with large bodies of his fellows. When a factory is closed by this means, the employers and the employed meet, argue and discuss the matter in dispute, when an arrangement of some kind is come to, and all goes on smoothly again. In India, when discontent exists among the coolies, it is borne in silence, smoulders, and accumulates, and ends by flight, leaving the employers helpless. This is particularly the case in wild and frontier districts, into which labour has to be imported in large masses. It was so in the early days of our settlement at Darjeeling, when we had no shelter and very little food to give our coolies, who were principally Dhangues from Chata Nagpoor, brought in large numbers for the Government works of road-making, building bazaars, barracks, &c.; and it is the same now in Assam, I believe, in tea cultivation.

I shall detain you no longer with these very imperfect notes, which, in my desire to meet the wishes of the Committee, I have troubled you with.

Mr. F. Hendricks wished to ask Mr. Fielder what number of hours constituted a day's work in Assam, because he felt rather alarmed at hearing that the rate of wages had increased within a short period from 2 rupees and a few annas per month to 8 rupees. That was a startling increase in the price of labour, particularly in face of the fact, stated by the Chairman, that large bodies of labourers suddenly decamped if they were dissatisfied with the wages. It was most important to have information on that point, because they must not leave out of sight that they had the competition of their great neighbours on the frontier, the Chinese, whose powers of tea production seemed almost unlimited. They knew that last year's exportation of tea to this country, chiefly from China, with the exception of seven millions of lbs. which came from Calcutta, was 154,000,000 lbs., of which 106,000,000 were retained for home consumption in this country. England, Russia, and America were, he believed, the chief tea-consuming countries. If they took the population of Russia and America together, they had another 100,000,000 of tea drinking population. Then there was the consumption of China itself, which must be very large, because the Chinese had been accustomed to that beverage from time immemorial. If they took the English consumption of tea, according to the figures of last year, of what was retained for home consumption, it amounted to something like 3½ lbs. per individual. If to these figures they added the consumption of the 300 millions at the lowest estimate of Chinese inhabitants, the 60 millions of Russia, and the 40 millions of North America and other American countries, they found that there was a positive production in China of from 800 to 1,000 millions of lbs. of tea per annum, whilst with all the efforts and expenditure in India for the last twenty years they had only succeeded in getting an export production of seven millions of lbs. That was not a result which was at all satisfactory. The consumption of tea in India was not large. The hill tribes did not habitually consume tea. There was no doubt on the first discovery of tea in India a cry of triumph was sounded by the friends of India as to the chance of that country competing with China in the article of tea. He hoped that day would arrive, but looking to the financial results up to this time it bid fair to be distant. When they considered that three millions of money had been sunk, the rate of interest it brought was very low. It showed they were overweighted in the race, and there was a necessity for a great alteration in the state of things before India could hope to compete with China. He was struck with the various remedies which Mr. Fielder mentioned as necessary to be applied by the Government, but he failed to see the feasibility of the last, but not least important one, viz., as to the supply of labour, because it was the fact that it was impracticable for the Government of India to influence the labour market in a country like Assam, sparsely peopled. They knew that the labourers of Dorchester, with all the advantages of cheap travelling by railway, could not be induced, by wages from 60 to 80 per cent. higher than they were receiving, to remove from their own county. He apprehended the difficulties in India in that respect were even greater; there were the differences of language, customs, and caste which prevented the moving and employment of armies of labourers in such parts of the country as they were most required. He did not say this to discourage enterprise, but as practical men they saw there were these difficulties to be faced, and, therefore, he was afraid the results were likely to be disappointing while they had the formidable competition of a nation like China, where population was redundant, and where the soil and climate were far better suited for tea cultivation than in British India. He, however, thought it was deserving of consideration whether they should memorialise the Government or move them to further inquiry on this subject, but he doubted whether the Government were in a position to recommend any large expenditure of funds derived from the revenues of India, for they were the trustees for the management of those funds, and it was not incumbent upon them to dissipate them in a careless or an idle manner, or in a way that did not produce a satisfactory return. He did not for a moment argue that they should not view with the utmost favour all attempts to open up the country by irrigation, by railways, and by improved police arrangements; but, at the same time, it behoved them, looking at the experiences of tea cultivation in India for the last 20 years, to consider whether they had not thrown away a great deal of money, and whether they ought to continue in the same course. It also behoved them to make some authoritative Government inquiries as to the system of cultivation pursued in China, because there they saw they had the power of increasing their production as the demand increased. It might be they would find that the system of administration by companies was not at all the practice in China. He admitted he was not informed on the subject, but it was possible that their system might be one of small cultivations. They knew that in this country, in the manufacture of cheese and other dairy produce, the custom very much prevailed of collecting from small cultivators the results of their industry. It might be a question with the Government, after full inquiry as to the system adopted in China, whether we might not carry out some of those principles, so far as they adapted themselves to our constitution in India.

Mr. Williamson (late of Assam) said there was a gentleman present (Mr. Bainbridge) who, having been entrusted with the important commission of investigating the affairs of one of the largest companies in Assam, was more competent than himself to give them information on this subject. He would say, with reference to the remarks of the last speaker, that he hardly knew the drift of them—whether he intended to convey that the development of tea cultivation in Assam had been so small that it ought to be snuffed out altogether, or whether the Government should be called upon to give encouragement.

If he meant because Assam produced the small quantity of tea described, it was no use going on, he might have gone back to a period when it produced only a few cwts. per annum. In drawing a parallel with China, the circumstances of the two countries were totally different. There was no doubt the latter system of cultivation of tea prevailed in China to a great extent. Each family grew and manufactured its own tea. But what was wanted in Assam was population, which existed in China to redundancy. What they required assistance in was supplying that immense vacuum which existed in Assam from want of population. No doubt the Government might say they were not bound to dispense their funds for promoting emigration, but, on the other hand, it was right to say, considering the nature of the government—its patriarchal character, its despotism, and how difficult it was for an obscure European to make his voice heard—they might expect the government to assist struggling enterprise, which might become exhausted for want of sufficient encouragement, and this had contributed to the present collapsed state of the tea cultivation of Assam. Looking at the statistics of Assam, they found that up to the year 1855 the revenue of the province only amounted to about £3,000 a year; from that time up to 1860 the revenue was quadrupled owing to the extension of tea cultivation. He did not say that the increased revenue should be dispensed for the sole benefit of that province, but they might look to the government to do its best to help a struggling industry. What Assam wanted was population. The ravages of the Burmese and the devastations of epidemics had done a great deal towards depopulating that portion of India, and these were circumstances against which private enterprise could not make headway.

Mr. Bainbridge was sorry Mr. Williamson, who had had larger, though not so recent, experience as himself in Assam, had not favoured the meeting with some practical views on this subject, because he believed, from Parliamentary reports and such statistics as were received at home, the question was but little understood. Without entering into the question of labour and other details, it resolved itself into the broad question whether the growth of tea in the provinces alluded to, and more particularly in Assam, was remunerative at the present time or not; and if not, what were the circumstances which prevented it being adequately remunerative? because, though a profit of 6 to 10 per cent. might be earned, that was not a remunerative return for colonial enterprise. He might state that most of the estates in Assam had come under his inspection, in the various appointments he had held; and he had besides a considerable personal stake in various districts. He would say, in the first place, there seemed to be a good deal of justice in Mr. Williamson's remarks with regard to the expenditure of the Government revenue in the province; but this was lost sight of, that the Government revenue was quite insufficient to meet the wants of the province. After paying the expenses of the several administrations, and the various police charges, and the public works absolutely necessary, there was not sufficient margin to carry out those extra public works that were required in that country. It was well known that works of this kind, whether new or old, generally had to be carried out by loans. If they considered Assam, it was a remote province and not very valuable, and there could be no doubt that there were many other provinces of India which had a prior claim upon the notice of the Government. There was no question the climate of Assam was against it. The people would not readily emigrate to it, and hence it was very sparsely populated. He felt sure nothing could so perfectly develop the province of Assam as the construction of a railway through it; but he did not think, in the present state of the revenues of India, and looking to the fact that there were many other provinces of more importance than Assam, it was to be expected that the Government would saddle the revenues of India with a guarantee interest on half-a-million of money necessary to make a railway through that province. He considered the tea interests in Assam had been brought from a legitimate industry to the verge of ruin by the over-speculation of recent companies; consequently, with the exception of the old Assam Company, which was in possession of a very large and valuable acreage represented by a comparatively small capital, almost every other concern was working in the face of great difficulties created by this speculation. When labour was cheap, and gardens were constructed at a small comparative cost, tea could be worked at a considerable profit—such a profit as he looked on as remunerative for colonial enterprise; but when labour rose to the extent stated by Mr. Fielder, which was beyond control—for in Upper Assam they had to work almost entirely with imported labour, which could not be reckoned at less than nine rupees per month—then the case was different. The rate of wages paid in India compared with the amount of work done was out of all comparison with the work of a full-bodied labourer in this country. When, therefore, they worked with such costly labour, and when they considered the prices obtained for the article were lower than they used to be, it was not difficult to understand why tea planting was not remunerative. It was impossible that a planter, as the employer of paid labour at a certain wage, could expect to compete with the class of peasant labour in China; and if Indian tea was to be brought into competition with the produce of China here, it could not be produced, at the prices obtained, at a price which would pay for the cost of production. Take the case of Upper Assam, where the principal plantations are situated. In that district they had no population working for hire. There was at one period a certain amount of labour available, but the wants of the Assamese were few; those who had laboured became enriched, and were not available for hire. Consequently, in Upper Assam the plantations were worked almost entirely with imported labour, and though the climate might be somewhat better than that of Lower Assam, and the rains three weeks or a month earlier, the result of experience showed that the great difference in favour of Lower Assam was in having a local population working for hire, which gave the lower country better results though the produce might not be so high. The population of Lower Assam was available for hire, but those who knew the nature of the Assamese were aware that they would sooner work for two rupees per month in their native province, than for eight rupees per month in another. Coming now to a few statistics of Upper Assam, the result of his experience was that taking the whole of the charges in the province connected with the manufacture of tea, they could not be put, in a large concern, at under 1s. 3⅜d. per lb. To that might be added 4⅛d. for the charges connected with tea from the time it left the factory to the sale, so they had 1s. 7½d. per lb. as the cost of the tea. Though they had heard a great deal about a yield of three or four maunds, and even more, per acre, he could say, in his own experience, he had never known a plantation producing anything like that quantity over the whole area. He thought 220 lbs. per acre might be taken as a fair average yield over the whole area of a good plantation. Taking that at the cost price of 1s. 7½d. per lb., they would find a result which, he hoped, would not cause dismay amongst the proprietors. If the tea was sold in London, it produced a gross price of 1s. 11½d. per lb. He thought that was a good price. That would leave a profit of 4d. per lb. upon the tea manufactured. The expenses would be, in India, for cultivation per acre, about £14, and the expenses connected with Calcutta, and home charges, would be about £4 per acre. Taking the produce at 220 lbs. per acre, this at 1s. 11d. per lb. would leave £3 10s. per acre profit, at the present rates of labour. Taking, then, the capital to be represented by £50 per acre—and he thought that was not putting it too high—that gave a net profit of 7 per cent., but he did not call that

a remunerative profit for such an enterprise, attended with such risk. His figures were based upon the average of seasons. Taking the case of Lower Assam, where local labour was obtained without importing it, the expenses were 1s. per lb. and the home expenses 4d., making the cost up to the sale in London 1s. 4d. per lb., at the average price of 1s. 11½d. per lb., but estimating the yield, in consideration of the climate being less favourable, at 180 lbs. per acre instead of 220 lbs., that would leave a profit of 7⅜d. per lb., as against 4d. in the other case. Taking the expenses at £9 per acre, and the colonial and home charges at £4—£13. That left them £1 12s. 6d. profit per acre in favour of the lower district, upon a yield of 18 per cent. less per acre. That result was attributable to the want of population in one case, and the existence of a considerable population in the other case. The next question to be considered was, how things could be altered so as to make the cultivation of tea more remunerative. He deprecated the interference of government or any attempt to induce legislation on the subject. He thought the laws of supply and demand would regulate themselves, and if persons found that the capital they had embarked, and the speculation they had undertaken, proved to be not sufficiently profitable, they would find some way to overcome the difficulty. One great difficulty was the utter want of unanimity amongst the planters themselves. He could not describe the jealousies that existed. If they were asked to continue in one line of action they considered it as an endeavour to get some advantage out of the transaction, and that they would be the losers, and all attempts to get anything like a united action invariably failed. He thought some unanimity of action was desirable to overcome the difficulties of the uncertainty of the home market. There was no relying upon the price the article fetched from week to week, and that was a great deal within their own control. There was no proper competition for the tea, and there was a great deal of by-play in the market which outsiders did not understand. He believed some unanimous course of action might be arrived at which would remedy that, because he thought the produce of India must to a certain extent remain as a fancy article in this market, and was not yet reduced to the level of China teas, which sold for what they would fetch. Another point, the difficulty of supplying population to Assam, was one they could not get over, because the climate was against imported coolies, and was held in such dislike and terror by the Bengalese, that willingly they would not go into the province, and the prospect of a railway in Assam was somewhat remote. There was, however, one point which those interested in this question should take up—that was the introduction of machinery in substitution of manual labour, which was so scarce and dear. He had done a good deal himself in introducing machinery when he was last in Assam, in 1867, and he could say success had attended his efforts; and he believed that machinery for the manufacture of tea had been largely used since then. But that was a small matter compared with machinery to do out-door work. He believed most of the cultivation could be carried out by the aid of machinery, so that they might be to a great extent independent of hand labour. Till that was done in Upper Assam, he did not think the planters would receive a sufficiently remunerative interest upon their capital; and this was a question which deserved immediate attention, because if the cost of producing the article went on increasing, and the price in the market went on decreasing, it was only a question of time when the whole thing must cease.

Mr. George Campbell (Commissioner of Nagpore) remarked that on occasions like this they were apt to have people who took too sanguine views, but as far as they had yet gone the speakers who had addressed the meeting had taken a very unsanguine view. The first speaker, who he gathered was not a planter, but spoke from theory, made an observation to the point. He said truly they had extreme difficulty in inducing a Dorsetshire labourer to migrate from his native county, in which he could barely subsist, to one in which he could live in comparative luxury, but it was still more difficult to induce the coolie to migrate to another part of India. This was the real difficulty in regard to tea planting in the remote parts of India, where, though they had land in plenty, they had not labour. They had heard the speech of Mr. Bainbridge, a thoroughly practical man; the observations of that gentleman seemed unduly discouraging. They could all see he had practical knowledge, and he had explained his views in a practical manner, but the results appeared to him (Mr. Campbell) extremely discouraging. He had told them they could not hope to compete against the free labour of China in tea, but he did not understand the remedy he suggested for that difficulty. He told them the difficulties with regard to the cost of cultivation of tea in India; that they could not expect to cultivate there except at a heavy expenditure, and that the profit which planters could hope to obtain was barely remunerative, and not adequate to the risk of carrying on cultivation at so great a distance. The first remedy which he understood Mr. Bainbridge to suggest was one which he thought would not be regarded with much favour in these days of free trade, viz., that the sellers should combine together not to submit to the exigencies of the market, and sell their teas at too low rates. That would not succeed. The other was, no doubt, in principle, the right thing, viz., that where labour was dear they should substitute it as much as possible by machinery; but, while Mr. Bainbridge told them that machinery intended for the manufacture was comparatively a small matter, they could hardly introduce machinery for doing the out-door labour. That was looking to perfection of machinery to which they were hardly likely to attain in the present generation, because up to this moment they had not succeeded in getting an efficient ploughing machine in this country, and they could hardly expect to get a machine to set out tea plants, gather the leaves, and do all that sort of thing. Therefore, if the hope of a large export of tea from India depended upon machinery brought to that perfection, it must, he thought, be a forlorn hope. He would like to put before the meeting another view, which was this—He understood Mr. Bainbridge estimated the capital sunk in the tea companies at an average of £50 per acre. If the calculation was made on that basis they could hardly expect the thing could succeed. But he (Mr. Campbell) submitted that was a false and unnatural basis, and the result of that over-speculation to which Mr. Bainbridge had alluded. For his own part, he did not believe the actual expenditure amounted to anything like the £50 per acre mentioned. It seemed to him that the real reason why tea planting was so discouraging was, because a large proportion of the gardens were formed, not to grow the tea, but to sell; and that £50 per acre represented, not the *bona fide* capital expended in bringing the land into cultivation, but the artificial and nominal price obtained by those people who made the gardens to sell; therefore, those who had paid fancy prices for their plantations, must make up their minds that they would have some difficulty in getting a fair interest for their capital; but those who had gardens which they had themselves brought into cultivation, and had not put down more than they had actually expended in bringing the land into cultivation, might hope to get a fair return by industry and perseverance. In that view only it was possible that tea cultivation in India might eventually be successful. They knew that plantations carried on at a great distance by absentee planters, under the charge of an agent, were carried on at great disadvantage. Take the case of ordinary farming in this country; they knew that agriculture was an art which required skill, industry, and perseverance, and by their exercise good returns could be made for capital and labour; but they knew, as a rule, gentlemen farmers were seldom successful in a commercial point of view;

and gentlemen who sat at home at ease, and sent out agents to plant tea for them, would, very probably, lose their money. At the same time, it was by no means a thing to be disregarded by vigorous young men of our own country, who possessed a little capital of their own. He believed, for such, tea-planting in India would be an extremely good field of operations; and if they invested their money in that way, they might yet hope to make a good thing of it.

Mr. Leonard Wray thought the cultivation of tea in India ought to be discussed in a wider sense than as it affected the province of Assam. It was true the tea plant was first discovered there, and a large amount of capital had been expended in its cultivation; but they knew the first efforts of the Old Assam Company resulted in a great success, through the energetic management that was brought to bear upon it. That company, he believed, eventually paid as much as 25 per cent. dividend, and was looked upon as one of the great successes of Indian enterprise. They knew that enterprise was killed, and he thought many in the room knew why. They knew that a lawyer of Calcutta, who scarcely knew a tea plant from a cabbage stem, was placed as manager, and bound himself in that appointment for three years, and the whole affair, instead of paying a good dividend, paid nothing. It was not from the intrinsic value of the undertaking, but from bad management. It was looked upon as one of the greatest enterprises ever undertaken in India. It gave great hopes to those who subsequently embarked in like concerns; but many who followed in the footsteps of the first Assam Company embarked their money as a means of deceiving others. They planted gardens, regardless of expense; and as long as they made money, they did not care who lost it. But, apart from bad management and dishonesty, no doubt the climate, and want of population in Assam, were against such enterprises. It was situated in a remote part of India, and very far from the labour market, which was Chata Nagpore. There was the great fault. They tried to take coolies from one part to another where it was very unhealthy, and where Europeans could hardly live. Why not cultivate in other parts? The vicinity of Nagpore was healthy, if not for Europeans at all events for natives, with abundant population, and labour at from three rupees per month. He had had them come to him in gangs to work at three rupees per month and find themselves, and he never knew a finer set of working men. If they could not take the labour to the plant, why not take the plant to the labour? Tea would grow in Nagpore as well as in Assam. Why was it that plantations were formed on hills? Because in a great portion of the low-lands miasma and hot winds prevailed. Nagpore was not subject to either of these. They could grow tea there with as much certainty as in any part of Assam. It was something like smelting in the present day. Instead of smelting the ore in Chili they took it to where the coal was, and it was the same all over the world, and in this case, he said, take the plant to the labour. In Nagpore they had a good climate, abundant rains, and fertile soil, and Mr. De Merley, the manager of the company with which he (Mr. Wray) was connected had reported that Chittagong was eminently suited for the tea plant. Another field of operations was to be found in the Ghauts settlements, and Mr. De Merley had sent to Assam for seed for planting in the Ghauts settlements. They all knew that the quality of tea differed according to the plan on which it was made. The China plant differed from that of India. The former was more delicate in flavour, while that of Assam was stronger flavoured and better for blending, consequently it fetched a good price, and it was just the plant which was wanted in the Straits settlements. It was not necessary to confine the cultivation of tea to one district of India alone, because the plant was not indigenous to any one part of the country. Everyone had made a rush to Assam, and great jealousies had arisen not only as to labour, but as to seed, and the consequence was there was no unanimity, and tea-growing in India was at a discount. He begged to thank Mr. Bainbridge for the honest way in which he had given expression to his opinions. It was refreshing to hear him; it had the genuine ring of the true metal. They had the views of a practical man who had worked out the whole subject. They knew now how much it cost per lb. to grow tea in Assam. The question was, could they grow it elsewhere at a cheaper rate and with larger profit to the planter than in Assam. He said they could, but let them not take the labour to the plant, but rather take the plant to the labour.

Mr. Samuel Ward (Secretary of the Lebong Tea Company) thought the great difficulties in connection with tea cultivation in Assam had arisen in the matter of labour, and he would say, in Darjeeling, where attention was paid to the comfort of the coolies, they had found no difficulty in getting labour at from 3 to 5½ rupees per month, and at those rates they got all the labour they required. Everybody who had spoken appeared to take a depressed view of tea cultivation in India. He was happy to say personally he took a more favourable view as regarded Darjeeling, with which he was acquainted, than he did a year ago. The company with which he was connected had already more than a thousand acres of land under tea cultivation, but to obtain that quantity they had opened out two thousand acres. The thousand acres were in full plant, and he anticipated that this year the yield would be 2,000 maunds of tea (last year it was 1,500 maunds), which would bring the produce to two maunds per acre. A great deal of the plantation was young, and a portion was hardly commenced at the time the Chairman left India. If they made two maunds per acre this year, they might calculate in a few years the yield would be 4 maunds per acre. The best results were obtained from that portion of the estate which immediately joined that of the hills. On the hills estate, the cultivation was necessarily carried on in detached pieces, which added to the expense. It was essential to get the plantations as compact and well together as possible; and it was necessary to have skilful and trustworthy managers. Sub-managers were to be avoided as much as possible, because to be successful, the cultivation must be carefully conducted; and he thought it desirable that natives should as far as possible be placed in positions of trust and responsibility. With regard to Indian tea being a fancy article in the market, he thought that was an erroneous view. Tea must always stand on its own merits. It was impossible to control the market. If they produced a better article than China, it would bring higher prices.

Dr. Barry said it was in the year 1856 that Mr. Williamson and himself first embarked in tea cultivation in Cachar. At that time the average price of labour was 3 rupees per month; and upon the supposition that labourers and artisans could be obtained at those rates he was led to embark his capital in tea cultivation, in which he was joined by several friends. It had been stated by Mr. Fielder and Mr. Bainbridge that wages had gone up from 6s. to 18s. per month. What was the cause of that? Simply competition. When he invested his money, and that of his friends, in this enterprise, he hoped to do some good to the country, as well as benefit himself, and for some years he had a prospect of making the returns spoken of, viz., 25 per cent. He believed, in some instances, a larger return than that was being made. If he were at liberty to do so, he could mention the name of one house which was now making that return from their tea cultivation. When that cultivation was in embryo, it paid in some cases as much as 50 per cent. profit, and he had made 25 per cent. himself. There were reasons why it did not pay so well at the present time. Competition was one of the principal reasons. The moment a person went to take gardens he was followed by scores of people —little better than convicts from Australia—men from the streets. Any man could get a grant of land. The

result was that those who had capital, and could have managed the property successfully, could not get labour. The effect of that was that managers and superintendents who had been trained on estates from boyhood threw up the engagements to which they were bound for higher salaries. He ventured to say there was not a tea garden which was fully stocked with plants. Instead of 4,000 plants per acre, as there ought to be, the average was not more than 1,800 or 2,000. He had himself been deceived, and he was sorry to say he had been the means of deceiving others. About twelve months ago he received a telegram, stating that estates in which he had a large interest were going to ruin. He at once started for India, and those estates which were reported to be on the verge of ruin were now in a fair way of yielding a good return. Why was that? Because he turned out the rascals! Previously, he had no choice, but now people came begging for appointments, and they could elect honest men, and by doing that they would be certain of success. Last year the cost of the estate was £12,500. When he went there last he found some 20 body servants in attendance upon the manager. The result of the measures he took was that the cost of cultivation was reduced from £12,500 to £9,000 per annum, and, instead of a yield of 140,000 lbs., it was 200,000 lbs., which result was obtained by having honest managers, and an honest day's work for his money. The Assam gentlemen were much to blame. They had not, as a rule, taken proper care of their coolies, and occasionally a fearful amount of mortality among them resulted. On the occasion of his last visit to Cachar, he had added £5,000 more to his investments there. He had more hopes for tea cultivation than ever, and he had no fear but that the teas of India, manufactured in a scientific way, would hold their own against the teas of China, which had to be carried 500 miles in small portions to be manipulated. He was warranted in saying the manufacture of tea in Cachar was scientifically conducted, and those teas which had been made upon the new process had been pronounced by the brokers to be of excellent quality, and were valued at 2s. 8d. per lb. in the market. He was convinced that tea cultivation would prosper under honest management and ordinary industry.

Mr. Tait congratulated Dr. Barry upon the success he had achieved. He was a shareholder in tea companies, but had never realised such results as had been just stated. With reference to the prospects of tea in India, he would point to the last share list he had received from Calcutta, from which he found there were 24 tea companies whose names were quoted in Calcutta. Of those 24, there were 2 which paid a dividend of 5 per cent; there were others which paid under 5 per cent., and 18 which paid no dividend at all, and the shares of those 18 companies were at a heavy discount. The shares of one company, with £10 paid, were quoted at from 2 to 3 rupees each. He did not dispute the statement of 25 per cent. profit, but it seemed to him a large amount of money was spent in management, and on boards of directors, and officers at home.

The discussion was then adjourned till Tuesday evening, March 16th.

Thames Embankment Committee.

The Council have appointed a Committee to report upon the best way of dealing with the Thames Embankment, so that the opportunity may not be lost of making this noble site conducive to the embellishment and improvement of the metropolis.

The following gentlemen have been invited to serve on the Committee:—

The Archbishop of York, Vice-Pres. of the Society.
The Duke of Buccleuch, K.G., Vice-Pres. of the Society.
Lord Henry G. Lennox, M.P., Chairman of the Council.
*The Lord De L'Isle and Dudley, Vice-Pres. of the Society.
*Lord Elcho, M.P.
*Baron Meyer de Rothschild.
Rt. Hon. Russell Gurney, Q.C., M.P.
*The Hon. Auberon Herbert.
A. B. Beresford Hope, M.P.
Henry Bidgood.
*William Boxall, R.A.
*Sir William Bodkin, Assistant-Judge, Vice-Pres. of the Society.
Montague Chambers, Q.C., M.P.
*Hyde Clarke, Member of the Council.
*Baillie Cochrane, M.P.
*Henry Cole, C.B., Vice-Pres. of the Society.
*C. W. Dilke, M.P.
*W. R. Drake, F.S.A.
*Lieut.-Col. Ewart, R.E.
*Edwin W. Field.
*Alderman Sir T. Gabriel.
*W. H. Gregory, M.P.
*Earl Grosvenor, M.P.
*C. F. Hayward.
Thomas Hughes, M.P.
Sir John Lefevre, K.C.B.
*John Locke, M.P.
*J. E. Millais, R.A.
*S. Redgrave, Vice-Chairman of the Council.
John Ruskin.
Alderman Salomons, M.P.
*Lieut.-Col. Scott, R.E.
*Seymour Teulon, Vice-Chairman of the Council.
*Sir Charles Trevelyan, K.C.B.
John Walter, M.P.
*Richard Westmacott, R.A.
The Rev. Henry White.
*Joseph Whitworth, LL.D.
*Watkyn Williams, M.P.

Those gentlemen whose names have an asterisk (*) have already consented to serve on the Committee.

The second meeting of the Committee took place on Tuesday, the 16th inst., at 11 a.m. Present—Lord Elcho, M.P., in the chair; Sir Charles Trevelyan, K.C.B., Sir W. H. Bodkin (Assistant Judge), Lieut.-Col. Scott, R.E., Lieut.-Col. Ewart, R.E., Messrs. R. Westmacott, R.A., Samuel Redgrave, Seymour Teulon, W. H. Gregory, M.P., C. W. Dilke, M.P., Hyde Clarke, Edwin Field, C. F. Hayward, W. R. Drake, Henry Cole, C.B., and the Hon. Auberon Herbert.

The Committee have passed the following resolutions:—

"That it is the opinion of the Committee that public or quasi-public buildings only should be erected on the Thames Embankment; that the designs for such buildings should be publicly exhibited, and approved by an authority responsible to Parliament; and that if any private rights existing before the Embankment was formed or created by it should be found to interfere with the proper execution of such buildings, Parliament should be asked to deal with such rights."

"That this committee inquire whether any, and if so what, controlling power over public works in the metropolis is vested in, and exercised by, any Government department, and whether it might be desirable to establish some such controlling power, in the event of its appearing that none such at present exists."

A discussion on the relative advantages of the Thames Embankment site and the Carey-street site for the new Courts of Law, took place at the meeting on the 16th inst. A report of this discussion will appear in the *Journal*.

The Committee adjourned to Tuesday, the 23rd instant, at 11 a.m.

Fifteenth Ordinary Meeting.

Wednesday, March 17th, 1869; Major-General Sir Vincent Eyre, C.B., Member of Council, in the chair.

The following candidates were proposed for election as members of the Society :—

Backhouse, Edmund, M.P., 84, Eaton-place, S.W.
Barry, Charles, 1, Westminster-chambers, S.W.
Bourne, Lieut.-Colonel, J., M.P., Heathfield, Wavertree, Liverpool.
Briggs, General John, F.R.S., Oriental Club, W., Athenæum Club, S.W., and Bridge-lodge, Burgess-hill, Sussex.
Burke, Edmund Haviland, M.P., 13, Old-square, Lincoln's-inn, W.C.
Grosvenor, Earl, M.P., 28, Prince's-gate, W.
Knaggs, James, Helmsley-house, London-fields, Hackney, N.E.
Lea, Thomas, M.P., The Larches, Kidderminster.
Mauritius, the Bishop of, St. Nicholas Rectory, Guildford.
McGarel, Mrs., 2, Belgrave-square, S.W.
Nunes, Francis, Hayes-grove, near Bromley, Kent.
Parry, T. L. D. Jones, M.P., Junior United Service Club, S.W.
Potter, Thomas Bayley, M.P., Langham Hotel, W.
Stone, William Henry, M.P., Dulwich-hill, S.E.
Tredegar, Lord, 39, Portman-square, W.
Wingfield, Sir C. J., K.S.I., M.P., 37, Clarges-street, W.

The following candidates were balloted for, and duly elected members of the Society :—

Allender, G. Mander, 6, Dawson-place, W.
Berrington, Arthur, Pant-y-goitre.
Perdicaris, Ion, 2, Heathcote-villas, St. Margaret's, Twickenham.
Portman, Hon. Edwin B., 3, King's Bench-walk, Temple, E.C.
Sooby, Thomas Hill, 12, Lansdowne-terrace, Kensington-park-gardens, W.
Stokes, Thomas N., the Priory, Totteridge, Herts.
Worthington, Robert, Salmon Pool-lodge, Island Bridge, Dublin.

The Paper read was—

ON THE TRADE AND COMMERCE OF JAPAN.

By William Davison, Esq.

A few words on Japan, its trade and commerce, may prove interesting to the Society of Arts; at the same time, in offering this rough sketch, the writer would claim the indulgence of the members. A residence of only two years in such a country is far from being sufficient to give one (the greater portion of whose time was taken up with mercantile pursuits) anything like a thorough knowledge of its history, arts, sciences, and commerce. Moreover, as these notes are made principally from memory, it is possible many small errors may have crept in; in the main, however, the writer gives his own personal experience, and the statements may be relied upon.

Nagasaki is usually the first town visited by the tourist, and is well known as the place where the Dutch maintained a factory for so many years. It was a very large and flourishing town, but seems to have fallen off considerably of late. It formed one of the Shogoon's ports, but now the flag of the Mikado waves over the place. The entrance is particularly lovely, through a narrow winding strait, with high land on either side clothed in verdure. Many guns of large calibre frown upon the entering ship, and it is said as many as seven hundred can be brought to bear upon any part of the entrance. Just before making the harbour of Nagasaki the island of Pappenburgh is passed on the left; it is a small island, with a precipitous sea front, down which the unfortunate native Christians were hurled in the great persecution that took place against them some two hundred years ago. The harbour of Nagasaki, although perfectly land-locked, is not good for vessels. Violent gusts of wind sweep down the mountain side, and, the holding ground being bad, ships are apt to drift considerably.

The traveller's sensations on first landing in Japan are almost indescribable; he feels almost overwhelmed with wonder and amazement. Everything he sees is so different from what he had previously conceived. If his visit is during the hot season, he will see the women (as fair as the women of Italy) working in their houses naked to the waist. Then, the bathrooms, of which there is one in almost every street, are another cause of astonishment, the sexes bathing indiscriminately and without shame. It is extraordinary, however, how soon one becomes accustomed to the sight, and what strangers rush to see, a resident will scarce consider worthy of a passing glance. The lower orders are, undoubtedly, lewd and licentious, but the upper classes and the respectable tradespeople will compare very favourably with Western nations. In courtliness of manner and delicacy of language they are unsurpassed.

The exports consist of coals, planks, dried and salt fish, tea, seaweed of all kinds, mushrooms, &c. The import trade of late has been principally of arms and ammunition, large quantities of which have been sold to the different princes in the neighbourhood. A great number of steamers have been sold to the Japanese at this port, and in this branch of trade they have been shamefully treated. Old used-up vessels have been painted, made to look smart, and passed off as first class. This cannot be easily done now, however, as the Japanese are beginning to know "what's what," and can tell an old boiler from a new one.

The journey from Nagasaki to Hiogo and Osaka can be made by going through the inland sea, the entrance to which is through the Spec Straits to the north, or by taking the outside course to the south, rounding Cape Chichakoff and passing through the Van Dieman's Straits. Everywhere the country shows signs of its volcanic origin. Opposite Cape Chichakoff there is a small island called Iwoga Sima, or burning mountain; this volcano was in active operation when the writer passed it in September last. The Kurosiwo or Japan stream rushes through these straits, and along the whole coast, taking a northerly direction. Shortly after passing through the straits the Boungo Channel is made; it is one of the entrances to the inland sea, and is about half way from Nagasaki to the Kii Channel (the entrance to the Bay of Osaka). Here the surveys are sadly deficient, the Boungo Channel should be properly surveyed, and a chart on a large scale published, so that in the event of a vessel being caught in a typhoon, or in one of the fearful gales so common to this coast (where, in a few minutes, from a dead calm a vessel may be compelled to heave-to on account of the heavy seas raging) a safe harbour of refuge may be made, for many a ship has been lost on this coast from the simple fact of the navigators not knowing where to make for. Continuing our course we come to the Kii Channel, the entrance to the Bay of Osaka. On the right is the island of Oosima, behind which there is a good and safe anchorage. The Kii Channel is a grand and noble entrance to a magnificent bay; it is about one hundred miles broad at the coast line, but gradually narrows on approaching the entrance to the bay, where it is only about a quarter of a mile wide. Passing through this a direct course is made for Hiogo, or rather Kobé, a village one and a-half miles from the former town. Ships anchor here in six fathoms of water, within swinging distance of the shore, thus making the landing and shipping of goods expeditious and easy. Hiogo is a very large and flourishing town; foreigners, however, are not permitted to reside there, but have to make shift as well as they can at the wretched fishing village of Kobé.

Between Hiogo and Kobé is an aqueduct for carrying off the water from the mountains (about a mile and

a-half in the rear) during the rainy season. The water rushes down with great force and in immense volume, bringing with it and depositing in the bed of the aqueduct large quantities of sand. This the Japanese never attempt to clear away, but as the bed rises so they raise the banks; consequently, these have been raised to their present height, nearly fifty feet above the level of the town. Sir Rutherford Alcock, in his work, describes this aqueduct as "the dry bed of what had once been a river."

On the side of Kobé, furthest from the town of Hiogo, there is a patch of sand, about three-quarters of a mile square. This was pointed out to me as the site of the new foreign settlement. The glare from this dazzling white sand was quite painful to the eyes; foreigners protest against living in such a spot, but they cannot help themselves. The ministers have accepted the site, and they must make the best of it. How substantial houses and godowns can be built where there is nothing but sand for a foundation, is a problem that remains to be solved.

The City of Osaka is about eighteen, and the bar off the entrance about fourteen, miles from Kobé. To cross this bar, except at certain seasons, such as the top of high-water and in calm weather, is a work of very great danger, owing to the heavy rollers that dash in from seawards. Here the good old Admiral Bell, U.S.N., together with some of his officers and men, met with a watery grave; and, at the same time, Admiral Sir Henry Keppel had a most narrow escape from meeting a like fate.

There was a mud-bank in the middle of the river at Osaka, which the Japanese raised a few feet and bunded, and this spot the Ministers accepted as a fit and proper site for the foreign settlement, which the unfortunate foreigners would have to purchase at an enormous price, build costly houses, and store valuable goods upon. As might have been expected, when the rains came, the river rose and covered the place. At the time of my visit to Kobé last summer, a gentleman, who had just returned from Osaka, informed me that he had actually seen junks anchored over the site of the new foreign settlement. Previous to the 1st April last (appropriate day), on which these ports were opened, the Yokohama Chamber of Commerce petitioned to be allowed to send representatives from its body to consult with the Ministers as to sites the most suitable for purposes of trade and commerce, but their reasonable request was refused. The foreign merchant in Europe holds a good position, and possesses some influence. In Japan he is upon an entirely different footing; there he is under the guardian care of Ministers and consuls, and their numerous attachés, each one of whom knows far better than the poor bewildered man himself what duty he should pay on his goods, and where it is best for him to store them.

But little trade has been done in Kobé. It is true, a considerable amount of tea has been purchased by foreigners, and a somewhat profitable business in shipping rice to Yokohama existed for a few months, but the Japanese did not seem to care for foreign goods. Perhaps when the country becomes settled, trade will assume healthier proportions; when the writer left it was wretchedly dull, both here and at Yokohama. For about a mile and a-half behind Kobé the country rises gradually to the foot of a range of mountains thickly wooded, and presenting a fine appearance. There are many pretty waterfalls; we visited one, and were much pleased, obtaining a fine view of the whole fall from a teahouse, perched on the top of a hill facing the fall.

The Japanese are great lovers of the picturesque, and wherever there is a spot more prettily situated, or commanding a finer view than its neighbours, there you are sure to find either a temple or teahouse. At the time of our visit to the waterfall, the teahouse had no native visitors; our friends told us that, as a rule, a lot of half-drunken Yakonins were generally to be found there, and foreigners had to be careful to go well armed, and in numbers, otherwise they would be certain to be insulted, and probably cut down. In all parts of Japan the Yakonins, or two-sworded men, seem inimical to foreigners; and when these fellows are drunk, as they very often are, a wide berth must be given them. The people, on the contrary, everywhere seem peaceful and friendly, and a foreigner who behaves himself properly is sure of receiving courteous treatment from them.

From Kobé to Yokohama, in the Bay of Yedo, the distance is 325 miles. My previous remarks respecting the surveys apply to this part of the coast as well; wherever safe harbours exist charts on a large scale should be published. Vries Island is an active volcano, situated opposite the entrance to the Bay of Yedo, and is about seventy miles from Yokohama. The passage from Vries Island to Cape Sagami should always be made by daylight; the water is exceedingly deep, and the currents variable, so that when the land is shrouded in mist, as it often is during the rains, the navigator has no possible means of ascertaining his exact position. Although the distance is only about twenty-five miles, even steamers, when overtaken by one of these mists, have to reduce speed to "dead slow," and keep a most careful look-out.

The foreign settlement of Yokohama is charmingly situated, but being upon an almost dead level, and but little above high-water mark, it is most difficult to drain, and it is to be feared, unless active steps are taken in the matter, it will lose the character of being one of the healthiest stations in the East.

Yokohama is the great tea and silk port of Japan, and in both these commodities a large and stirring trade is done. The trade in sea-weed, dried fish, and such like merchandise is conducted chiefly by the Chinese, of whom there are far too many in the settlement for the interests of the foreign merchants.

The Chinese were no doubt useful in the first commencement of business in Japan, inasmuch as they pick up the language very quickly, but they should never have been allowed to act as "go-betweens" between the foreign merchant and the native buyer. Nearly all business in the sale of imports is conducted through the Chinese compradores, and these men invariably make a squeeze, thus reducing the foreign merchants' profits and preventing the natives from purchasing so freely as they might otherwise do, by increasing the cost of the goods. Many of the foreign merchants are beginning to find this out now, but whether anything can be done to remedy the evil is doubtful. Occasionally rice and sugar become in great demand with the Japanese, sufficiently so to induce shipments on a large scale from China. In nearly every instance when this has occurred the Chinese have kept back the information from their masters until large quantities were afloat to their own consignment, then they would go to their employers, who very often were severe losers for acting on such information. Nearly every compradore either has a shop of his own, or is interested in one, for the sale of wines, spirits, oilmen's stores and such like. Many hundred cases of a horrible compound called brandy are imported for these establishments. It is a mixture made in Hongkong and Shanghai and put into Hennessy's or other brandy bottles; it costs, landed in Yokohama, about one dollar and a-half per dozen, or say 6½d. per bottle; this is retailed at the grog shops to foreign soldiers and sailors, with, as may be imagined, most lamentable results. The English soldiers in garrison rapidly become demoralised in consequence of the freedom with which intoxicating drinks of the very worst description can be obtained.

I may mention a case that came under my own notice. A Chinaman presented a bill of lading for two hundred cases of brandy; in delivering these one was found slightly broken, and the consignee refused to take delivery; it was consequently transferred to a hulk, where the contents were inspected. The bottles had contained Hennessy's brandy, and bore their label, but the contents were anything but brandy; the bottles, moreover, were very badly corked, without either seal or capsule.

Orders were given for the case to be detained with a view to having the contents analysed, but, to my great disappointment, it disappeared, stolen, no doubt, by one of the Chinese servants on board, at the instigation of the consignee. My own compradore inspected the case, and valued the contents at one dollar and a-half; yet the consignee had the audacity to take an action against me for nine dollars, the value of one case of Hennessy's brandy. The case was dismissed, and the scoundrel severely reprimanded by H.M.'s Consul, who, however, had no power to go further in the matter. Here was an instance of a man, who had no right to reside in Yokohama, importing rank poisons for sale to H.M.'s soldiers and sailors, yet nothing was done in the matter. The naval and military authorities, if properly authorised, would soon put a stop to this iniquitous system. Unfortunately, there seems to be no law for the Chinese; they have no treaty with Japan, and are disowned by the foreign ministers; they, consequently, are allowed to do just as they please, and, whilst they can always insure redress in any action they may have against British subjects, it is very doubtful, nay, almost impossible, for British subjects to obtain redress against Chinese.

The city of Yedo is twenty-one miles from Yokohama. When the Shogoons (or Tycoons) were in power, all the princes of the empire were forced to live in this city. One year in three was allowed them to visit their own territories, and during this year of leave their families were forced to remain as hostages. The more important of the princes would never travel with a train of less than ten thousand men; some idea may thus be formed of what an important city it must have been a few years back. Now that the princes have all gone to their own territories their establishments are closed in Yedo. This change may prove highly beneficial to trade, as extensive knowledge of foreigners, their ships, and articles of commerce will thus be disseminated over the empire. On the other hand it will tend to strengthen the old feudal system, and until that is done away with we cannot expect to see Japan advance with rapid strides in the march of civilisation. It may sound well to say the country is now under one government, viz., that of the Mikado, but it should be borne in mind that the Mikado is but a boy, and has no power. The country is actually ruled by the princes, who, for the time being, have possession of and guard his person. The country at the present time appears to be ruled by the two southern princes, Satsuma and Chosin. Thus, in Yokohama, nearly all the old customs' officers have been sent away, and their places filled by men of Satsuma's clan, and the change is anything but appreciated by foreigners. The old Shogoon's Government was strong, and worked well; the new Government, as at present constituted, in the opinion of many, cannot work well; it stands to reason it must give rise to bitter jealousies; the numerous and powerful northern princes will not remain quietly in the background and see Satsuma and Chosin's officers carrying all before them under the Mikado's flag.

Great changes have taken place quite lately; it is rumoured that the Mikado has paid a visit to Yedo, and intends remaining there for the present. If such is the case, it must prove highly beneficial to trade at Yokohama, and bring Yedo back to something like what it was in its days of prosperity. If it is true the southern princes run a great risk, as the northerners would be only too glad to dispossess them, a feat not very difficult in Yedo, the inhabitants of which are entirely northern in their sympathies.

Yokohama, and the country round about, are subject to frequent earthquakes; as a rule they are very slight, but the natives say that about every ten or twelve years fearfully severe earthquakes are experienced, causing much loss of life and damage to property. The last was in 1854, when the Russian frigate, *Diana*, was wrecked. The sea wave that followed this dreadful visitation covered the neck of land upon which the foreign settlement of Yokohama is now built.

The beautiful mountain of Fusiyama, an extinct volcano, is north-west from Yokohama about 60 miles. Most of the foreign ministers have made a pilgrimage to the top. Foreign merchants, and such like common people, of course are not allowed such a privilege. Fusiyama is 14,177 feet above the level of the sea, and from the summit a view is obtained that probably equals any other in the world. The ascent is best made about the beginning of October, when there is less snow than at any other period. During the winter it is covered with snow, and, with the rays of the morning sun upon it, presents the most dazzling and beautiful appearance. At certain periods of the year the sun sets immediately behind the mountain, and then it assumes a lovely purple transparency. Altogether it is the wonder and admiration of all beholders—the longest resident is never tired of gazing upon it—and it is not surprising that it is an object of deep veneration on the part of the natives; a representation of it figures on almost every article they manufacture. Japanese tradition says this mountain was thrown up in one day.

During the season 1867-8, over eight million lbs. of tea were shipped off to America and Great Britain, and 12,306 bales of silk, nearly the whole of which were purchased for the English and French markets. A large business was also done in silkworms' eggs; last year upwards of a million sterling was invested in this article of commerce alone, and nearly all for the Italian market. In our excursions into the interior we had opportunities of seeing the arrangements for storing the eggs and feeding the worms. In the neighbourhood of the mulberry plantations every house, even to the public tea houses, appeared to be taken up with this business, and when the worms are feeding foreigners are only admitted upon promising to be very quiet, and on no account to disturb the insects. The leaves are cut up into small pieces and spread upon trays, which are laid out in the upper floors, or very often in the roof; the work of feeding and watching is done by the women, who are on duty night and day. The eggs are laid upon cards about 14 inches long, by 9 inches broad. The moths are guided in their course over the cards, which are completely covered with eggs, each card holding from 25,000 to 30,000. Fears were at one time entertained that the enormous numbers of eggs shipped by foreigners would cause a great reduction in the supply of silk, but such has not been the case. Most likely the eggs now purchased by foreigners were looked upon formerly as surplus stock, and destroyed. The annuals are the most valuable, and realise as much as from one to five Mexican dollars per card. The biannuals are much cheaper.

One of the Italian shippers who accompanied his shipment of eggs, and who returned to Europe by the same mail as the writer, had 73 cases, containing 26,000 cards; each card had cost him one Napoleon, or say £20,000 for the whole. This gentlemen was by no means the largest shipper, as much as £100,000 worth being shipped off by one man last year. This is a trade that is likely to continue for many years, as the Italians find it necessary to import fresh eggs every year. The Indian Government is very wisely experimenting with Japanese seed, in view of securing for India a portion of this lucrative trade, but it is very doubtful if that country will ever be able to compete with Japan.

There are extensive mulberry plantations about ten miles from Yokohama. Great attention is paid to the trees, which are not allowed to grow higher than about seven or eight feet, and are planted in rows about six feet apart.

Some of the farmers must realise enormous sums of money by the sale of silk and eggs, yet they do not appear to be by any means wealthy, all the surplus dollars most likely being seized by the Yakonins for the prince of the province. The people everywhere, however, appear well clothed, happy, and comfortable, far more so than the agricultural classes of our own land.

In taking a journey for a few days into the interior, it

is usual to hire a pack-horse to carry the provisions, blankets, &c.; this is sent off at daylight, the horse-boy having orders to make a mid-day halt at some suitable village where he is overtaken by the excursionists. After the hungry travellers have satisfied their cravings, the pack-horse is hurried on and generally reaches the destination of the party by five or six o'clock in the evening. Twenty-five miles a day can be easily done this way, and nothing more enjoyable than these cruises can be imagined. Of course it is a great drawback having to carry arms, and knowing that the loveliest lane may hide a bloodthirsty assassin; but, somehow or other, when once started these matters give but little anxiety, and merrier or happier parties than those that dash away from Yokohama at every opportunity could not be met with anywhere.

The Japanese are remarkably clever in the manufacture of paper; unfortunately, the writer has had no means of ascertaining the process. They have many descriptions, all of which are worthy of notice, from the finest tissue to the stout, coarse article, almost waterproof, and far stronger than anything manufactured in this country. Exceedingly good and useful paper waterproof coats can be purchased for five or six shillings; these are found far more effective than European-made india-rubber coats, which cost in Japan between two and three pounds. Paper is extensively used for open sores and wounds. Amongst the articles made of paper are fans, screens, straps and belts, tobacco pouches and pipe cases, boxes of all kinds, string, and even armour. It is also used in place of window glass. It received marked notice at the Paris Exhibition.

Their bronzes are very beautiful and wonderfully varied in design; birds and fish of all kinds are represented to the very life. Their favourite and sacred bird, the stork, is represented in every possible attitude; they also excel greatly in castings of craw fish. Beautiful vases, covered with dragons, serpents, birds, trees, men in armour and on horseback, are freely offered for sale. The Japanese are justly celebrated for their porcelain ware; the egg-shell ware has a world-wide reputation, and some of their vases are of curious and beautiful designs. In lacquering they probably excel all nations. It would be impossible in this paper to go into details upon these subjects. On the table will be found a few specimens of the articles referred to; unfortunately, they are but of a common description, still they will serve to show the kind of workmanship.

At Kavasaki, a village half-way between Yokohama and Yedo, a considerable business is done in straw work, of quite a common and cheap description. Some of the designs on these straw covered articles, of which samples are exhibited, are curious and worthy of notice when we consider they are the work of poor villagers. Considering the tools with which these people work with, their cabinets and boxes are really wonderful.

A considerable trade is carried on in Yokohama in elegant articles of bijouterie of Yedo manufacture. A few specimens are exhibited.

Yokohama is the head-quarters in the East of the Pacific Mail Steamship Company, whose noble steamers, each 5,000 tons burthen, run once a month to and from San Francisco. The Peninsular and Oriental, and the Messageries Imperiales have also agencies here. Each of the last-named companies runs fortnightly mail steamers to and from China.

In dealing with the native officials the foreigner is made painfully conscious of the fact that he is only in Japan upon sufferance. The writer, as agent for the English mail steamers, held a sort of semi-official position, yet a communication from him to any of the officials would be returned opened but without remark. To insure any attention being paid, it was necessary to proceed to the consulate and have the letter stamped with the consul's seal; the Japanese would then acknowledge the receipt of it. A simple acknowledgment is about the only attention any communication from a civilian is likely to receive, unless, indeed, it relates to a robbery, when the native police, who are very expert, at once look into the matter.

In Japan the merchant class hold a very low position, and the native officials appear determined not to recognise the fact that influential foreign merchants are a very different class, and entitled to be treated with more consideration than the abject and cringing natives.

The lowest of the two-sworded class, whose income, probably, does not exceed three or four dollars a month, looks down with the utmost contempt and scorn upon the richest merchant; he struts along the street with the air of a prince, making all give place to him, and would gladly serve foreigners the same way, but he cowers before the foreigner's calm, fearless gaze, and the deadly revolver he thinks every one carries.

Hakodate is the principal town on the island of Yesso, and is much frequented by the American whalers, who found it more convenient than the Sandwich Islands, where they have been in the habit of refitting; they have lately taken to shipping Japanese as seamen, and find they answer well.

The exports of Hakodate are principally fish, seaweed, and planks. These are shipped off to Osaka, and in return crockery-ware and such like articles of southern manufacture are imported.

The writer started to visit this port in August, 1867, in the steamship *Singapore*, and when within a few miles of Hakodate Head, the vessel struck on a sunken rock not marked in the charts; the engine-room was cut open, and the amidships compartment instantly filled with water. Thanks to the admirable state of efficiency in which the Peninsular and Oriental steamers are kept, not a single casualty occurred; all the boats were lowered and the passengers in them in eight minutes from the time of the ship striking. The vessel shortly after went down, stern foremost, and the passengers and crew safely landed at a village some twenty miles from Hakodate, on the opposite side of the straits of Tsugar. We were very kindly treated by the natives; the officials, however, did not seem to know how to act. They devoted themselves to keeping the shipwrecked ones from wandering about and seeing more than they were entitled to. The captain of the steamer and the writer succeeded in crossing the straits in a life-boat, and were most kindly received by Mr. Eusden, Her Majesty's Consul, and his charming and amiable wife. We found the Prussian frigate *Vineta* in port, and were at once taken on board of her by Mr. Eusden, who introduced us to Captain Kühn. Before our tale of woe was finished the noble fellow gave the order, "up boats," "get steam," and in an hour and a-half from that order being given the gallant ship was steaming out of the harbour to the assistance of our fellow-sufferers, of whom there were about one hundred and fifty. The frigate soon reached Soo-mow-fru, the name of the village the shipwrecked people were quartered at, and they were at once taken on board, when, to their surprise and delight, they found the whole of the between decks had been cleared and a magnificent collation spread. The captain and officers gave up of their best; such noble generosity is not easily forgotten. The Peninsular and Oriental Company showed their appreciation of Captain Kühn's action by presenting him with a very valuable watch. Whether the British Government took any notice of the affair the writer is unable to say, but he sincerely trusts it did.

Coal is to be found all over Japan, but the mines best known to foreigners are those in the neighbourhood of Nagasaki, one about five miles from Hiogo, and one a short distance from Hakodate; the latter is under foreign superintendence, and is producing coal of superior quality. The Japanese do not understand mining; they never attempt a vertical shaft, but commence boring from the side of a hill; they work at a slight incline downwards until their operations are stopped by water, when they retire and commence a fresh shaft. It is not fair to judge of the coal from specimens thus produced; it is

doubtful if they have ever penetrated below the thin layer that lies near the surface to the deep seam that no doubt exists below. Now the Japanese are large steamshipowners, it is to be hoped they will see the necessity of properly working these mines; when this takes place, railways will soon follow and the country be rapidly opened up.

Copper of very superior quality is plentiful, and will probably soon form an important article of export; a peculiar kind of white copper is extensively used for locks and hinges to cabinets, &c.

Gold mines exist in two islands, one near the coast above Yokohama, the other on the other side of Japan, near Hakodate; about these very little is known. Nearly all the gold coins have been purchased by foreigners, and exported; and no attempt seems to have been made to replenish the stock; it is with the greatest difficulty that even a single gold coin can be procured now.

The limits of this paper have necessarily compelled the writer to confine himself to but a hasty sketch of the subjects introduced. Much might have been said upon the religion of the country, and the numerous festivals that are strictly observed. Also upon the sulphur springs that are remarkably efficacious in the cure of many diseases. The country is in a state of transition, and it is difficult to speak of its future at present; the being able to kill each other with much greater facility than before, with theft and drunkenness largely on the increase, seem the only results of intercourse with foreigners.

The middle class, however, in time must rise and take their proper position; when this occurs Japan will rapidly advance, and earn for itself the name of the England of the East.

DISCUSSION.

Mr. Robert Davison said there were one or two things mentioned in the paper on which it was very important that they should have, if possible, some further information. For instance, a peculiar kind of white copper was spoken of, and it would be both interesting and useful to know the characteristics of this metal. He had not had an opportunity of speaking to the writer of the paper on the subject, but he should like to know whether it really was a simple metal, and if so, its degree of ductility; whether it could be forged, rolled, soldered, and so on, and whether it was liable to oxidisation. One of the greatest objections to the use of ordinary copper was the verdigris which attached to it; and if this white metal were free from this drawback, it would be very useful in brewing, and for many other cognate purposes. It was also of importance that they should know whether the metal was abundant, and what was its market value. Then, again, with regard to coal, if, as appeared to be the case, the Japanese were ignorant of the proper mode of working this mineral, assistance and information should be afforded them, for it would be of the utmost importance to shippers and steamship owners to be able to get supplies of coal in such localities without the expense of forwarding it.

Mr. Botly had been much interested in the paper, particularly in the account of the many mineral productions of the country, which included gold, copper, coal, and sulphur, but he should like to hear what chance there was of English capital and enterprise being brought to bear upon them; and if there was any likelihood of an English company being allowed to carry on mining or other operations in Japan if they made the attempt. It was generally understood that there was a great objection to foreigners entering the country, and the unfortunate murder of Mr. Richardson, who was a relation of his (Mr. Botly's), showed the state of feeling which then existed. Government had made some very strong remonstrances on the subject, and, perhaps, it was fortunate that we were not involved in a war on account of it, but he should be very glad to hear if Mr. Davison could give them any hope that a change for the better had taken place in the sentiments which were felt towards foreigners by he Japanese.

Mr. William Davison, in reply to the questions which had been asked, was sorry to say that he was not able to give much further information on the subject of the white copper. One of the small cabinets on the table was mounted with this metal, and a necklace was also exhibited made of the same material. He believed it was liable to oxidise slightly, but not to so great a degree as ordinary copper. He was not in a position to say anything as to its value, but it seemed plentiful enough, as it was in constant use for numerous purposes, and he had no doubt that it might be exported in considerable quantities. With regard to coal, there was a coal mine now under foreign superintendence in the country. He believed it was an American enterprise, the manager being a gentleman of great ability. No Englishman would have any chance in Japan unless he were supported by the Foreign Office; but, even in that case, it was difficult to feel any great confidence, because the country had been involved in civil-war, and, of course, all commercial operations had been interfered with. The sad affair of Mr. Richardson's murder, alluded to by Mr. Botly, took place close to Yokohama, and had nothing, therefore, to do with foreigners going into the interior of the country. With regard to what he had said about the Mikado, and the present government not being strong, he might read an extract from a newspaper, entitled the *Japan Times*, which he had just received from Yokohama, dated 13th January last, which contained an account of a visit to the Mikado at Yedo. After mentioning various particulars with regard to the arrival at the palace, the writer proceeded as follows:—"Our ears were greeted by a hideous noise, apparently composed of eagles screaming and bitterns booming, but which turned out to be the Imperial band, playing, probably, the Japanese national air, as a signal that the Mikado was ready to receive us. Accordingly, passing by suites of apartments, looking beautifully fresh and clean, but, so far as variety of furniture is concerned, differing nothing from the rooms of a good tea-house, we entered a spacious hall, in the centre of which, on a raised platform, stood the throne. Certainly if sombre stillness and ghastly rigour be the distinctive circumstances of dignity, then, indeed, dignity was here personified. At the brightest of times, but scant sunshine can find its way into these precincts, and to-day it was more than usually gloomy, for the dusky, snow-laden atmosphere perished feebly at the very threshold. On first entering, the throne became, of course, an object of universal scrutiny, but in a moment one was astonished to find that his mind, excluding all other ideas, had become embued with this one morbid question, 'Is it a man or a mummy that sits under that canopy, swathed in masses of crape and silk; those stiff folds and angles refuse to acknowledge the most shadowy presence of animation!' It may be that the Thomasian creed, which centuries of seclusion have set up between the mythical and the tangible Mikado, had somewhat prostrated our stouter faculties, but certainly it was not without considerable scrutiny, and no small disappointment, that we at length disentangled from among dress and duskiness the features of a worn-out, languid-looking boy, to whom life had apparently already told its secrets and their sequels, and in whose face, whether from training or indifference, no symptom of interest or vitality presented itself from first to last. On either side of the throne stood a line of princes and *kugés*, who also carried out the principle of stolid immobility even as far as the long wings of their head-dresses." Such was the being in whose name the finest country in the world was at present governed.

The Chairman said he was quite sure that all present had listened with great pleasure to the interesting

description which Mr. Davison had given of his two years' residence in Japan. When they considered within how very recent a period the veil which shrouded that country from the gaze of the outer barbarians had been withdrawn, it was evident that every contribution such as Mr. Davison had given them towards a knowledge of this strange and distant land was of great value. It was not long since the position of Japan in the civilised world might be compared to that of Ancient Britain, as described by the Roman writer—"toto divisos orbe Britannos." In like manner, until a very recent period Japan was divided from the rest of the world by its own exclusive spirit rather than from any want of curiosity on the part of the outer world to dive into its secrets. Now, however, that even a slight footing had been obtained there, it would appear as if the Japanese, who had for countless ages rested, as it were, content with that amount of civilisation which they had attained (but which at the same time far exceeded that which existed in the British islands a thousand years ago), were now, from their contact with the intelligence and energy of the West, awakening to fresh life, and very much inclined to prove themselves a thoroughly "go-ahead" people. He recollected a few years ago, when the Japanese ambassadors were in this country, how intent they were upon looking into everything which came under their notice, and how careful were the observations they made. When visiting Woolwich they took notes of all the intricacies of the machinery for manufacturing the Armstrong guns, and he hoped the result would not some day be unsatisfactory to ourselves. In conclusion, he proposed a cordial vote of thanks to Mr. Davison for the excellent paper he had read.

The vote of thanks was passed unanimously and acknowledged.

The paper was illustrated by numerous specimens of Japanese manufacture, contributed by Mr. Davison.

ARMY ORGANIZATION.

The Secretary of State for War, Mr. Cardwell, made the following important declaration of principles, when moving the army estimates, on 11th March, 1869:—

Total Force.

The total number of men we provide for to be at home on the present estimates is as follows:—Last year there were of regulars 87,505; this year there are 90,677. Of the militia last year there were 67,600; this year there are 83,000. Of the yeomanry I take the same number as last year, 13,700. The first army reserve last year was 1,006; this year I take it at 2.000. The second reserve and pensioners last year stood at 16,970; this year it is 21,870. The Volunteers last year were 155,216; this year they are 170,581, making a gross result last year of 341,997, and this year of 381,828. Now, Sir, the force of 92,000 men in this country, in 61 battalions, represents a far greater force than 92,000 in 46 battalions. If you have your battalions in good order, your *cadres* full, all your officers and men in a state of efficiency; if you have in every battalion 560 veterans, you would have no difficulty, if any emergency arose, in raising your 92,000 men to 100,000. Your militia, if you include the Irish militia, already exceed 100,000; and there is no reason, though you do not train them this year, why you should leave them out of your calculations. I say, therefore, you may fairly regard this as representing a strength of certainly not less than 400,000 men. And according to high military authorities, no force is more efficient than where you have a backbone of veterans with a slight admixture of young recruits within it. You will have 100,000 regulars, 100,000 militia, 24,000 reserves and pensioners, and 184,000 yeomanry and volunteers, which, in all, make up a force of 408,000; and with such a force, I venture to think this country may be considered perfectly safe, both from attack and menace. But I do not think we ought to be content with less than that strong force, when I see before me, so far as we have at this moment, the returns of the forces of the four other Great Powers of Europe, and remember that the force of not one of them is less than a million of men.

Organization of Forces.

The total number of men will be 92,015. They will be distributed into cavalry regiments, each containing 554 of all ranks; while of infantry regiments there will be 61 battalions, each consisting of 560 rank and file, those only which are going to the colonies containing a larger number. Perhaps I may be told by critics of a certain school that 560 is a very small number of men to have in a battalion. But, Sir, I wish to state that very high authorities may be adduced on the other side of the question. There are three ways in which, if you desire at any time to reduce your force, you can accomplish your object. The first is by the reduction of battalions. By adopting that method you effect the greatest pecuniary saving, but, on the other hand, you incur these three undesirable results. First of all, you inflict a hardship on a great number of officers; secondly, you incur a considerable expenditure in half-pay for services for which you get no return; and, thirdly, you are diminishing the strength and elasticity of your army and lessening the power of defence which you possess. The second mode by which you can reduce your force is by the reduction of companies in regiments. That is an intermediate course, which shares those disadvantages to a certain extent, but not to the whole extent. The last course is by maintaining your *cadre* intact, stopping recruiting, and diminishing the number of men in the *cadre*. This latter is the course pursued in the armies of France, where the *cadre* is always kept intact, though a number of men are permitted to be absent from their regiments. In a pamphlet by Colonel Baker, which has attracted a great deal of attention, this subject is spoken of as follows:—

"A large number of weak battalions should be kept up in time of peace, complete in everything but the number of men. I have taken the opinion of some most distinguished foreign officers, as well as those in our own service, as to the smallest number of men which would keep a battalion serviceable in time of peace, and nearly all agree that 500 is the lowest limit."

And he adds in a note:—

"Among others, Marshal M'Mahon, perhaps one of the greatest authorities in Europe. He thought 500 quite sufficient in time of peace, provided that the *cadres* were fully kept up."

Military Stations Abroad.

All that are called colonies in that account are not colonies. There is the widest distinction between those colonies which are occupied for the purpose of colonization and those maritime posts which are occupied for imperial objects as stations for our fleet.

Colonies.

Now, last year's estimates were based on the distribution of 16,185 men in the whole of our British North-American possessions, whereas the estimates of the present year are based on a distribution of 6,249 men. Hon. gentlemen will remember that the committee appointed in 1861, on the motion of my hon. friend, Mr. Arthur Mills, recommended a great change in the policy of this country in that respect, in order that the burdens of the people at home might be diminished, and a spirit of generous self-reliance generated in our colonial possessions, so that the result might be mutually advantageous both to the colonies and to the mother country. Well, the resolution of that committee was adopted by the House, and from that time to the present, I think I may say, it has been the settled policy of this country. By the Duke of Newcastle, when his grace was Colonial Secretary, it was first carried into effect with regard to the Australian colonies; and almost immediately afterwards there was

withdrawn from New Zealand a force of 10,000 men, which at that time was waging war with the insurgent Maories. A little later the same policy was carried into effect in the Crown colonies of Hongkong, the Mauritius, Ceylon, and the Straits Settlement, not, indeed, by the withdrawal of the troops, but by making the colonists contribute towards their support; and just before I left office, having proposed in this House a Bill for the annexation of British Caffraria to the Cape, I gave notice to the Governor of the Cape that the policy adopted by the House of Commons in 1861 must now be applied to the Cape. That policy Lord Carnarvon carried into effect, and with regard to our colonies generally, with the exception of Canada, it has been our settled policy since 1861. If the advice of the Duke of Buckingham had been adopted there would, I believe, have been left in the British North American provinces 8,944 men. Now we think we ought to carry out that policy still further, and consequently we propose that only 6,249 men shall be left there. And here let me pause for a moment to ask whether this diminution of force is really any weakening of our colonies? In my opinion it is exactly the reverse. I do not believe that New Zealand was in any way better off when she had 10,000 of our troops to fight her battles. If, instead of calling upon your colonists to exert themselves and to rely on their own resources, you distribute forces among them in small divisions, you will paralyse their efforts without furnishing them with real strength. I believe that Canada, with 30,000 or 40,000 armed men of her own, occupies a stronger and more independent position than she ever did before. Again, I believe that Victoria, raising her own fleet to defend her own harbours, is in a better position to defend herself, and will be a greater strength to the empire than at any previous time. One of the eastern potentates—I think Hyder Ali—said the English he was afraid of were not those whom he saw, but those whom he could not see; and I believe that we shall be augmenting the power of England by encouraging in the colonies a spirit of self-reliance.

Local Forces.

I have laid down this principle, that it is not desirable to maintain for the defence of the mother country forces which, owing either to the conditions under which they are recruited or other circumstances, are purely local forces. A purely local force should, in my opinion, be paid solely from local sources, and those forces paid from the Imperial Exchequer should, I think, be of an Imperial character, so that Her Majesty might be able to command their services at any moment in any part of the world. It was the boast of the Duke of Wellington that his army could do anything and go anywhere, but let a corps be ever so efficient, if in its nature it be purely a local force, it is evident it cannot satisfy the conditions of that canon, and be regarded as a force which can go anywhere and do anything.

Shorter Enlistment.

I wish to speak with becoming diffidence upon matters which, of course, are new to me, but I cannot allude to the subject of Army Reform without saying that I have always felt a very strong disposition to favour a system of much shorter enlistments than now exists. I do not desire to speak presumptuously, but I shall be very sorry, as I become more acquainted with the subject, and have time to go more into details, if I find that there is no power of accomplishing the great object of introducing shorter enlistments. The pension list amounts to a very considerable sum above a million—I think about a million and a-half—and it increases without control. I think we may hope that in the system of shorter enlistments may be found a solution of some of the economical difficulties which surround us.

Reserves.

The great problem is how we are to maintain an army of moderate strength in time of peace, and capable of expansion in time of war. Before I proceed to deal with the reserves, I think I may be permitted to lay down the following propositions—namely, that the army of a country circumstanced as this is, ought to be, as regards both men and material, in time of peace, comparatively small; that its efficiency should be the highest possible; that it should be in a form capable of easy expansion; that, as regards its *matériel*, this should be of the highest quality and the greatest efficiency, and with this object it should not be allowed to accumulate in proportions so large as to be likely to become obsolete, to wear out, or to be the worse for keeping.

Militia.

The question is, how can we fill up our battalions when the emergency arises, and how can we maintain reserves efficient in themselves and able to second and support the army? I am sure everyone will agree that the first body to which we turn in answering this question is the old constitutional force of England, the Militia. The well-known sneer of Dryden might be applicable in his time; but Dryden, I fear, was ready to turn his pen to any political purpose, and it may be that the object of the country when he wrote was to raise not a Militia, but a standing army. The Militia had ever been a force dear to the people of England from its constitutional antecedents, and I believe that in its efficiency the people of England will always take the greatest pride. On the last occasion when the great Duke of Wellington addressed the House of Lords, he spoke in terms which I hope will ever be remembered of the services which the Militia had rendered to him in the great struggle of our country's liberties. If I may be permitted to repeat an anecdote to the Committee, I once had the honour of sitting at the Curragh next to a soldier second only to the Duke of Wellington—the late Lord Seaton—who said, as a Militia regiment marched by, "That regiment is fit to stand by any regiment of the Line." I hope the Militia will always be regarded as the great support and reserve of the standing army. Major-General Garvock, speaking of the forces in the district he commanded, said that they consisted of about 7,000 regulars, but that there were within his district the following forces, to the maintenance of all of which Parliament contributed, but with none of which the general commanding the district had any communication at all:—Yeomanry, 8,000; Militia, 25,000; Volunteers, 53,000; making a force of 86,000 men. That is a state of things to which I think my right hon. friend did well to call attention. We intend to bring it under the notice of the House in a more formal manner, and I trust that Parliament and the country will determine to put an end to it. I want also to see the Militia itself a most effective force, fit, as the Duke of Wellington and Lord Seaton said, to take its place by the regular army. With regard to the Militia, Her Majesty's Government have not the slightest intention of altering the constitution of that force. They have not the smallest intention of in any way depriving it of its local character, and of its connection with the county. Least of all have they the smallest intention of endeavouring to withdraw from the lord-lieutenant of the county any patronage, if there be any, in regard to the appointment of the officers. But these things we think Parliament would be desirous to do, that there ought to be a relation between the regular army and the Volunteer forces for special purposes and of a limited kind, but in such a manner that the country may feel that the whole strength of its force is welded and consolidated together, and that any enemy who should venture to assail us would find that all our forces were applied with the greatest advantage to resist and repel invasion. Then, we think we have a right to say that the conditions under which the officers are chosen shall be those which shall insure a greater amount of military qualification in the officers selected. It may seem a small matter, and I only say it in passing, but we

think that as we have repealed the property qualification for members of Parliament we might as well abolish the property qualification for officers of the Militia. We have entered the sum of £20,000 in the estimates for the purpose of improving the position of the officers of Militia. There is, as is well known, a disinclination to join the Militia regiments, and I must say I am surprised at some of the inducements which this great country offers to gentlemen to become officers of Militia. When I found a personal allowance of 1s. a day for officers of the Militia, I own it seemed to me one of the greatest curiosities that had come to my knowledge in the course of my official inquiries. We propose to add the sum of £20,000 to equalise the Militia with the army pay during the period of training, and to raise the personal allowance from the ridiculous sum of 1s. to the very moderate amount of 4s. a day.

Yeomanry.

At a period when Her Majesty's Government are most desirous to encourage the reserve, and to try whether it cannot be brought into a more efficient state and act with complete harmony with the regular forces, we should be exceedingly sorry to discourage any branch of the reserve, and not to call out the Yeomanry. In concert with his Royal Highness Commanding-in-Chief, on the part of the regular forces, and with a friend of ours whose name I am sure will always be acceptable in this House—General Lindsay, the Inspector-General of the Reserve Forces, I am engaged in making arrangements which may tend to the efficiency of the reserve, and to have a better combination at fixed times and for special purposes with the regular troops. Of course, the Yeomanry will not escape the critical attention of the country, and I will only hope that it will answer to the requirements made upon it, and that we shall never find that it is undesirable to call out that ancient and most excellent force, the Yeomanry, but that we shall be able to place them in a state of efficient relation with the other reserve forces.

Volunteers.

I come now, sir, to the volunteers. They are a very powerful body, for whom I for one entertain the highest possible esteem and respect. I think they were never better described than in the pamphlet of my honourable friend, the member for Devonshire, and I will just quote some words from the pamphlet which were used by a distinguished officer of the regular service. He speaks of the volunteers as a school of preparation for duties which are required of all British citizens, in the event of an invasion. I think it will be admitted that, although the most efficient Volunteers may be as efficient as any soldiers in the world, yet before the Government can come to Parliament to propose an increase in the present grant it will be necessary for them to require a much more efficient organization of the body, and among other things to lay down these rules—first, that there shall not be in any locality more separate corps of Volunteers than that locality requires; secondly, that a greater proportion of those who receive the grant shall attain to the highest standard of efficiency; thirdly—and I attach great importance to this—that officers and non-commissioned officers shall always be selected for their efficiency, and that neither social position nor any other recommendation shall compensate for the want of perfect efficiency in the officers; and fourthly, I think myself entitled to say that if Parliament is asked for an additional contribution for the Volunteers, it must be made, not as I have said, by sowing broadcast an addition to the capitation grant, but by adopting measures the direct tendency of which shall be to contribute to increased efficiency. Now, Sir, we must look forward to an increase of expense for the Volunteers.

Abolition of Ordnance Select Committee.

Just before Sir John Pakington left office he took the step, in which I entirely concurred, of putting an end to the Ordnance Select Committee. Its object was too varied, and its responsibility too vague and confused; it was expensive, and led to difficulties of various kinds with inventors, to which it was necessary to put an end. But I do not agree in the step he took of sending the Director-General of Ordnance to reside at Woolwich. We have suspended that arrangement.

Munitions of War.

The whole question of the munitions of war is, I think, at the present moment one of the most difficult and one of the most interesting. I am happy to be able to say that, as regards the arms—whether the great guns or the small arms—I believe we have, at this moment, the best weapons of any in Europe. There is scarcely a branch of the great question connected with fire-arms which is not at present the subject of the most careful inquiry by scientific men, therefore we must confine our demands on Parliament to what is really and immediately wanted.

Fortifications.

In connection with fortifications, and in the race between attack and defence, I am happy to say that an advantage has been lately gained by defence, through the great improvements that have been made in what are called torpedoes, which appear to afford a security to our mercantile harbours that has not hitherto been attained, and which are more easily applied to defence than to attack.

Education.

On the subject of military education my right hon. friend opposite appointed a Commission, with Lord De Grey at its head. When the noble lord accepted office I had the good fortune to secure the services of Lord Dufferin as chairman of the Commission, in which other changes have been made. I would only say that, as we are introducing scientific appliances in every branch of the service, it becomes more and more necessary that the men should be educated and the officers also, and it is impossible to attach too great importance to the investigations of the Commission.

Manufactures.

The Cotton Trade. — Mr. Sam Mendel's circular, dated March 1st, says:—"The month of February has witnessed no improvement in the state of trade in this district. On the contrary, the situation of affairs has become worse, and has been attracting more general attention, the failures which are being announced from day to day having more than a local interest. The chief element of prosperity—the want of a plentiful supply of cheap cotton—is more and more felt, and it unfortunately happens that our limited stock is considered a favourite article for speculation, and is thereby maintained at a fictitious value. With the farther advance in the raw material, which took place in the early part of the month, manufacturers are thrown into a still more anomalous position, as they find it impossible to get an equivalent for their goods, and stern necessity is compelling a number of them to close their mills, while the actual loss in working now so far exceeds the fixed charges on a mill that some of them are voluntarily doing so. Production is consequently being curtailed, but is still much in excess of the current demand for goods, which has continued on a most restricted scale, at no material variation in prices."

Commerce.

Telegraphy in Switzerand.—The reduction from one franc to 50 centimes, which was made at the beginning of last year, has on the whole proved a success. With-

out counting the 44,805 despatches relating to the telegraph service, there were 1,596,353 inland telegrams sent during 1868, against 794,666 in 1867, an increase of 801,687 despatches in favour of 1868. The number of international despatches sent in 1868 was 282,627, against 245,154 during the previous year, an increase also in favour of the former of 37,473 despatches. The receipts during 1868, as compared with those of the previous year, were as follows:—

	1867.	1868.
	frs.	frs.
Gross receipts	823,538·61	921,182·45
Expenditure	748,976·46	846,900·60
Net receipts	74,562·15	74,281·85

Although the net receipts during 1868 were 280frs. 30c. less than those of the previous year, it cannot be attributed to the lowering of the price for telegrams, but rather to the extraordinary expenses incurred by the telegraphic administration in the laying of new lines.

Colonies.

Emigration to Victoria.—A Melbourne paper says:—"Victorian affairs have now arrived at a stage when the question of immigration demands special attention. There are times when immigration should be let alone, and it is a primary duty of the citizen, as well as the statesman, to consider when either the one or the other should be done. If immigration be induced when it is not required, a twofold injury is thereby inflicted, an injury to the immigrant and an injury to the State. The Land Act, by rendering the lands of the colony available to the people on advantageous terms, and for whatever purposes they were suited, opened up an enormous field for the employment of labour. Since the Protective Tariff and the Land Act of 1865 have come into operation wages have had a gradual upward tendency. In the wages of agricultural and domestic servants there has been the average increase of at least sixteen per cent. during the past three years, and this rise in wages has not been accompanied by a corresponding rise in the price of the things produced. Agricultural produce, in consequence of its increased supply, has, upon the whole, declined in price, although not to any formidable extent. A full supply of labour is essential to the development of our agricultural resources, and the securing of the advantages which a good land law would bestow on the colony. An examination of the subject convinces us that Victoria now stands in urgent need of an extensive immigration; and a glance at the future detects a retardation of progress, unless a system of immigration be established at once. The maintenance of even her present condition and prosperity demands it; and for the future development of her resources, for her growth in wealth and power, it is absolutely essential."

Publications Issued.

Engineering Facts and Figures for 1868. (*Fullarton and Co.*)—This is the sixth volume of a series, and forms an annual register of progress in mechanical engineering and construction, and, in addition to the information hitherto given, certain notes of the International Maritime Exhibition held at Havre, in 1868, and a few additional notes on the Paris Exhibition of 1867, completing some of the subjects which were noticed in last year's volume. The matter is principally taken from the pages of the *Journal of the Society of Arts, Engineering, The Engineer, The English Mechanic, The Practical Mechanic's Journal, The Civil Engineer and Architect's Journal, The Scientific Review, The Scientific American, The Builder, The Building News*, &c. The volume is illustrated by numerous plates and woodcuts.

Causeries Scientifiques, &c., by Henri de Parville; small 8vo. J. Rothschild, Paris.—Of the many hand-books of science and invention which have appeared of late in Paris, M. de Parville's is certainly the most remarkable. The volume before us is the eighth of the series, and, like its predecessors, gives an account of all the most important discoveries in science and industry that have been made in France, together with some of foreign origin, that have been made during the twelve-months preceding its publication. The plan of the work includes all departments of science and industry. In astronomy we have, amongst many other matters, an account of the observations of M. Jaussen of the great eclipse of August, 1868, with notes upon the labours of other astronomers and natural philosophers; an account of the late M. Foucault's remarkable instruments and experiments. In physics, the latest achievements in electricity as applied to the arts of life, including submarine and other lamps, spectrum analysis, &c. In chemistry, the economic production of oxygen with its application to lighting streets; improvements in the preparation and preservation of food, wine, &c. A large amount of important information relative to progress in medicine and physiology. Descriptions of a large number of new machines and mechanical inventions. Under the head of natural history are accounts of eruptions and earthquakes, terrestrial physics, papers on silk and vegetable fibres, &c. In the section of art and construction, articles on ship-building, the new sewer works of Paris, railways, explosion in mines, &c, with a variety of other subjects. One of the principal charms of French works of this description is the simple, popular, yet sufficiently explicit style in which they are written, without fine writing on the one hand, or pedantry on the other. As an educated man of science, as well as a popular writer, M. de Parville is able to make scientific matters entertaining as well as instructive. The volume, which contains nearly four hundred well-filled pages, illustrated by means of a number of well executed engravings, is admirably printed, and sold at an extremely moderate price.

Notes.

Institution of Naval Architects.—The meetings are now being held in the great room of the Society of Arts, by permission of the Council. The Right Hon. Sir J. S. Pakington, Bart., M.P., G.C.B., D.C.L., President, will occupy the chair. The following is the programme of proceedings. Thursday, March 18:—Morning Meeting, at 12 o'clock.—1. Annual Report of the Council. 2. Address by the President. The following Papers will then be read and discussed:—1. "On the Law of Resistance of Armour Plates, composed of one or more thicknesses," by William Fairbairn, Esq., C.E., LL.D., F.R.S., Honorary Associate; 2. "On the Iron Floating Dock at Carthagena," by George B. Rennie, Esq., M. Inst., C.E., Associate; 3. "On Floating Docks," by Edwin Clark, Esq., C.E.; 4. "On a Project for a Floating Dock," by Charles H. Wigram, Esq., Member of Council. Evening Meeting, at 7 o'clock.—1. "On Liquid Fuel," by Captain Selwyn, R.N.; 2. "On Railway Communication across the Sea," by John Scott Russell, Esq., F.R.S., Vice-President. Friday morning, at 12 o'clock.—1. "On Long and Short Ironclads," by E. J. Reed, Esq., C.B., Vice-President; 2. "On a new System of Ironclad Vessels," by Herr Josef Romako, Chief Constructor of the Austrian Navy, Member; 3. "On the Hydraulic Steering Apparatus now being fitted to H.M.S. *Achilles*," by Captain Inglefield, R.N., F.R.S.; 4. "On the Steam Steering Apparatus, fitted in the *Great*

Eastern, and H.M.S.S. *Northumberland* and *Monarch*," by James Mac Farlane Gray, Esq. Friday evening, at 7 o'clock.—1. "On the Qualities of Boiler Plate," by S. M. Saxby, Esq., R.N., Associate; 2. "On the Calculation of the Stress in Propeller Shafts," by W. J. Macquorn Rankine, Esq., C.E., LL.D., F.R.S., Associate Member of Council; 3. "On the Resistance opposed by Water to the Motion of Vessels of various forms, and the way in which this varies with the velocity," by John Isaac Thornycroft, Esq., C.E., Associate; 4. "On the Preservation of Life at Sea by Life Buoys and Rafts," by Staff-Commander Bourchier, R.N. Saturday morning, at 12 o'clock.—1. "On Copper Sheathing for Iron Ships, considered at the present stage of our experience," by John Grantham, Esq., Member of Council; 2. "On Zinc Sheathing for Ships," by Benjamin Bell, Esq.; 3. "On the Location of Independent Steam, Fire, and Bilge Pumps in Steamers," by Charles H. Haswell, Esq., Associate.

MEETINGS FOR THE ENSUING WEEK.

Mon.....R. United Service Inst., 8½. Sir Alex. Malet, K.C.B., "Our Reserve Forces;" and (time permitting) Dr. Eddy, "On a Steel Moveable Mantelet for the Protection of Troops."
R. Geographical, 8½. 1. "The Swedish North Polar Expedition of 1867 and other Arctic Projects." 2. Mr. Christopher T. Gardner, "Ningpo to Hangchow."
Actuaries, 7.
Medical, 8.
London Inst., 6.

Tues ...R. Medical and Chirurgical, 8½.
Civil Engineers, 8. Renewed discussion, "American Locomotives and Rolling Stock."
Ethnological, 8.

Wed ...Geological, 8. 1. Mr. M. H. Coquand, "On the Cretaceous Strata of England, France, and Algeria" Communicated by Mr. J. W. Flower. 2. Mr. W. Carruthers, "On the Structure and Affinities of *Sigillaria* and allied genera." 3. Dr. H. A. Nicholson, "On the British Species of the genera *Climacograpsus*, *Diplograpsus*, *Dicranograpsus*, and *Didymograpsus*."
Archæological Assoc., 8.

Sat .....R. Botanic, 3¾.

Patents.

From Commissioners of Patents' Journal, March 12.

Grants of Provisional Protection.

Advertising apparatus—3867—L. E. Leroy.
Boilers—603—C. Markham.
Boilers—630—B. C. Crawford.
Bricks, &c., machinery for pressing—499—J. A. Wade & J. Cherry.
Bridges, friction rollers for rolling—583—W. Turner & J. W. Gibson.
Cardboard, &c., apparatus for perforating, &c.—643—J. Sloper.
Carding engines—579—E. A. V. Leroi.
Carding engines—613—E. Chapman.
Cartridge cases—591—W. T. Eley.
Cartridges—624—A. H. Brandon.
Ceiling, &c., apparatus for walking on a—447—A. W. Taylor.
Chain, casting—656—E. T. Hughes.
Circular saw benches—633—W. Olley.
Clipping apparatus—640—W. Clark.
Coal, getting—615—R. S. Norris.
Coal, &c., getting—626—D. Davies.
Copying presses—629—A. H. Honegger.
Cotton seed, cleaning—644—H. W. Goldring.
Cylinders for distributing ink, &c.—666—J. Gough.
Decorticating apparatus—628—J. Hadley.
Dyeing and printing with aniline colours—664—J. H. Johnson.
Electric bell-sounding and telegraphing apparatus for domestic use—3925—W. E. Gedge.
Fire-arms, &c., breech-loading—622—W. E. Gedge.
Fire escape, &c., apparatus to be used as a—646—F. Andoe.
Fires, lighting—614—T. Atkinson.
Flint glass, cutting—599—J. T. H. Richardson.
Furnaces for melting steel, &c.—597—J. A. F. Suter and T. C. Hinde.
Gas valves—561—B. W. Farey.
Hats, &c., compound to be used in manufacturing—581—H. Loewenberg.
Horse shoes—636—J. Hall.
Iron and steel—632—J. G. Willans.
Iron or steel, coating with copper, &c.—598—G. J. Hinde.
Iron ores, reducing—616—G. J. Snelus.
Lamps—648—E. Lyons.
Lamps for carriages—649—W. Howes and W. Burley.
Liquids, distributing in a state of spray—601—E. Falck.
Looms—608—J. R. Croskey.
Looms—638—J. Woods, J. Hampson and L. and G. Fish.
Madder, &c., obtaining the colouring matter of—641—F. A. Gatty.
Marine structures, constructing—654—A. A. L. P. Cochrane.
Metals, &c., heating, &c.—510—E. Dorsett.
Motive-power—605—C. Williams.
Motive-power engines—642—J. Cooke and G. Hibbert.
Musical boxes—593—H. Harburg.
Oils, &c., extracting and refining—600—J. Townsend.
Oils, &c., refining—637—J. Townsend and P. Forbes.
Oxides, &c., mixing molten cast-iron with solid—612—T. S. Blair.
Paper pulp—543—J. W. Reid.
Pictorial and decorative purposes, composition for—621—J. Rust.
Pipe joints, &c.—357—J. Page.
Printing rollers—662—T. Forster and R. Taylor.
Pumps—604—W. A. Herring.
Railway breaks—587—E. D. Barker.
Railway buffer carriages—609—R. Pyne.
Railway switch apparatus—589—F. Brady.
Railway trains, communication in—606—J. Adams.
Reaping and mowing machines—658—T. Howcroft & A. McGregor.
Refrigerators—521—W. R. Lake.
Rifle practice, signalling apparatus for—617—L. G. Lysons.
Screw gill roving frames—660—T. Greenwood.
Ships, &c., for carrying liquid cargoes—595—W. R. Lake.
Silk, measuring raw—610—J. H. Johnson.
Smiths' forges, &c., blowing apparatus for—647—J. Robertson and J. Shanks.
Spring hinges—602—J. Reap and W. H. Michelmore.
Stuffs, tissues, &c., apparatus for doubling—650—H. A. Bonneville.
Tin canisters—618—P. S. Regnauld.
Tobacco—620—R. J. Goodbody and R. E. Donovan.
Tuning forks, apparatus for sounding—352—H. Jones.
Warping—645—R. Law and S. Hargreaves.
Waterclosets, &c.—651—W. E. Newton.
Wood-cutting machinery—585—W. Parkinson.
Wool, &c, spinning and twisting—619—J. Ladley.
Yarns, winding—596—J. Cheetham.

Inventions with Complete Specifications Filed.

Iron ships, &c., preserving from oxidation—670—W. E. Gedge.
Porcelain—713—H. A. Bonneville.

Patents Sealed.

2817. J. Coppard.
2821. C. E. Pommier.
2822. M. A. Soul.
2823. J. D. Pinfold.
2825. H. J. Turnbull.
2834. C. de Bergue.
2836. J. H. Schucht.
2844. W. Darham.
2853. J. De Masy.
2855. G. B. Sharpe.
2860. T. Beards.
2862. W. T. Watts.
2865. W. R. Lake.
2866. H. Wilson.
2867. G. H. Barth.
2868. T. and J. Jones, J. Brandwood, and J. Wren.
2871. R. Smith.
2873. J. Head.
2874. C. H. Hudson.
2875. E. T. Hughes.
2876. W. Cross.
2879. E. Tempelhoff.
2888. F. Dyer.
2897. G. Sanders.
2997. W. E. Newton.
3631. C. D. Abel.
3644. N. and R. G. West.
3900. H. T. Vanner and E. Prest.
207. F. R. Ensor.

From Commissioners of Patents' Journal, March 16.

Patents Sealed.

2652. R. W. Morgan.
2882. J. Smith and J. Dewdney.
2883. W. H. Hughan.
2887. J. Blakey.
2889. W. Haynes.
2899. W. C. Woodcock.
2905. J. Kirk and J. Batstone.
2906. J. G. Piton.
2907. C. Vero.
2912. W. J. Murphy and J. B. O'Hea.
2915. W. Leatham.
2939. W. T. Watts and D. J. Fleetwood.
2950. R. Oxland and J. Hocking, jun.
2928. W. Thomas.
2974. T. Briggs.
3030. J. Baker.
3058. J. H. Johnson.
3064. J. Watson.
3066. J. Watson.
3098. H. Deacon.
3171. W. E. Newton.
3246. C. B. James.
3384. M. B. Westhead and C. B. James.
3388. J. Sturrock.
3515. C. D. Abel.
3560. W. E. Newton.
3760. W. Gray and T. Biggin.
114. A. V. Newton.

Patents on which the Stamp Duty of £50 has been paid.

641. J. Tansley.
704. S. F. Schoonmaker.
763. J. F. Belleville.
782. T. Briggs, jun.
732. G. Phillips.
788. A. Pilling.
825. P. G. B. Westmacott.
843. S. Chatwood and J. and T. Sturgeon.
744. T. A. Mathieson.
769. G. McKenzie.
789. J. H. Johnson.
824. T. N. Kirkham, V. F. Ensom, and H. Brook.
865. T. Ironmonger.
880. W. T. Eley.
758. L. Kaberry.
759. J. Elder.
798. J. Heaton.

Patents on which the Stamp Duty of £100 has been paid.

648. J. T. Calow.
739. J. M. Courtauld.
647. J. B. G. M. F. Piret.
737. W. Barber.
824. T. Guibal.
671. W. Conyers.
810. T. White.

Journal of the Society of Arts.

FRIDAY, MARCH 26, 1869.

Announcements by the Council.

Ordinary Meetings.

Wednesday Evenings at eight o'clock :—

March 31.—"On Technical Education, considered in relation to Female Schools." By Ellis A. Davidson, Esq., Lecturer on Science and Art in the City of London Middle Class Schools. The Rev. Wm. Rogers, Rector of Bishopsgate, Member of the Council, will preside.

April 7.—"On the Theory of Boiling in connection with some processes in the Useful Arts." By Charles Tomlinson, Esq., F.R.S., F.C.S.

April 14.—"Spain Commercially and Economically Considered." By E. M. Underdown, Esq., Barrister-at-law.

April 21.—"On Trade Marks." By W. Wybrow Robertson, Esq.

April 28.—"On the Duties of the Architect with reference to the Arrangement and Structure of a Building." By Roger Smith, Esq. On this evening Sir Digby Wyatt will preside.

May 5. "On the Formation of Industrial Settlements in our Colonies." By Col. Francis C. Maude, C.B.

FINAL EXAMINATIONS, 1869.

In order to avoid holding these Examinations on the same evenings as those of the Department of Science and Art, it has been decided to hold them, in 1869, on the evenings of

TUESDAY, the 20th APRIL,
WEDNESDAY, the 21st ,,
THURSDAY, the 22nd ,,
FRIDAY, the 23rd ,,

From 7 p.m. to 10 p.m., instead of on the 27th, 28th, 29th, and 30th April, as announced in the Programme of Examinations for 1869.

A sufficient number of applications from candidates in all the subjects referred to in the notice at page 9 of the Programme having been received, papers will be set in Conic Sections, Navigation and Nautical Astronomy, Mining and Metallurgy, and Italian.

Cantor Lectures.

The Third Course of Cantor Lectures for the present Session will be "On Applied Mechanics," and will consist of Four Lectures, to be delivered by John Anderson, Esq., C.E., Superintendent of Machinery to the War Department, as follows :—

Lecture I.—Monday, April 12th.

Applied Mechanics in relation to Art and Science.

Lecture II.—Monday, April 19th.

Applied Mechanics in relation to Natural Properties of Materials.

Lecture III.—Monday, April 26th.

Applied Mechanics in relation to Natural Laws in processes.

Lecture IV.—Monday, May 3rd.

Applied Mechanics in relation to Natural Power.

Each lecture will begin at eight o'clock. These Lectures are open to Members, each of whom has the privilege of introducing two friends to each lecture. Tickets for this purpose will be forwarded with next week's *Journal.*

Committee on India.

Six Conferences are now in course of being held for the discussion of the following subjects, viz. :—

Tea Cultivation in India.
Hill Settlements and Sanitaria.
Waste Lands in India.
Trade with Central Asia, Thibet, and South-Western China.
Indian Fibres.
Silk Cultivation and Supply.

The following evenings have been fixed for the remaining five conferences :—

Friday, April 2nd.
,, April 16th.
,, April 30th.
,, May 14th.
,, May 28th.

At these Meetings the chair will be taken at 8 o'clock, and the discussion will be opened by a paper.

On Friday evening, April 2nd, a paper, "On Silk Cultivation and Supply in India," will be read by P. L. Simmonds, Esq. Dr. Forbes Watson will preside.

Members of the Society interested in Indian questions are invited to attend.

Subscriptions.

The Lady-day subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Thames Embankment Committee.

The second meeting of the Committee took place on Tuesday, the 16th inst., at 11 a.m. Present—Lord Elcho, M.P., in the chair; Sir Charles Trevelyan, K.C.B., Sir W. H. Bodkin (Assistant Judge), Lieut.-Col. Scott, R.E., Lieut.-Col. Ewart, R.E., Messrs. R. Westmacott, R.A., Samuel Redgrave, Seymour Teulon, W. H. Gregory, M.P., C. W. Dilke, M.P., Hyde Clarke, Edwin Field, C. F. Hayward, W. R. Drake, Henry Cole, C.B., and the Hon. Auberon Herbert.

Mr. G. E. Street, A.R.A., attended by invitation.

A discussion on the relative advantages of the Thames Embankment site and the Carey-street site for the new Courts of Law, was opened by

Sir Charles Trevelyan, K.C.B., who said he had, in order to save the time of the Committee, written out most of what he had to say on the subject under six heads, and he suggested that he should read what he had to say under each head, after which the discussion upon it might be taken, and then they might pass on to the next head. The first was:—

Whether the Courts and Offices of Law should be built on the same Site?

On this point he would quote from the report of Sir G. C. Lewis's Commission, at page 5:—"In speaking of concentration, we find it necessary to include not merely that of courts with courts but of courts with their offices, and, in a larger sense, with the chambers of the bar, and the offices of the attornies, and also the requisite of sufficient and well-arranged accommodation for the judges, the officers, the bar, the attornies, the jurymen, and the public; meaning by the latter term, and especially with regard to the courts themselves, the suitors, the witnesses, and such a number of persons coming either to learn or merely to satisfy a reasonable curiosity and interest, as the indispensable character of open courts requires to be provided for. . . . Every court, too, has various offices attached to it, in which its judgments, decrees, and orders are reduced into form, and from which they issue to the parties interested—in which a variety of documents are, from time to time, filed, in which also references from the court to its masters are conducted."

The desideratum is that the offices should be as near to their respective courts as may be consistent with light and air, and absence of crowding and confusion; or, in other words, that the courts of law and their respective offices should be at once adjacent but separate. This is admirably provided for in Mr. Street's plan, by placing the courts in the centre, and the offices in a surrounding zone, with a wide intervening courtyard; but in its application to the Carey-street site, this principle could not be fully carried out, owing to its contracted dimensions, and the buildings, therefore, adhere to one side of the zone. The Embankment site, on the other hand, being much larger and of a more oblong form, would allow of the full development of this principle.

It is a special recommendation of the Embankment site that the building site includes also the necessary provision for light and air, and approaches; so that these requirements, which generally form a heavy item in the expense of public buildings, are obtained here without any additional expense beyond the cost of the actual building site. But, in order to obtain this advantage, the outer lines of the building must coincide with the outer lines of the block bounded by the Thames Embankment, the Strand, the Temple, and Somerset House. If, for instance, the building was carried only as far as Howard-street, nearly the whole of the space between that and the Strand would have to be taken at a heavy additional cost for light and air and approaches. The great resort of people to the central courts and offices of law, and the nature of the business carried on in them, make it necessary that there should be a wide adjoining open space.

The conclusion at which I arrive is that a good public service has been done by Sir G. Lewis's Commission in proposing a real concentration of the courts and offices; by the Courts of Justice Commission in maintaining it; and by Mr. G. E. Street, in devising a plan by which it has been suitably applied.

Mr. Edwin Field said one great mistake under which Sir Charles Trevelyan laboured was, in supposing that great facilities for the access of the public at large were required. It could be proved beyond all question that 92 per cent. of the persons attending courts of law came from the chambers of professional persons. He believed the Embankment site proposed would necessitate the widening of the Strand, which ought to be taken note of in estimating the expense.

Sir C. Trevelyan understood that Mr. Street's plan would also require the widening of the Strand.

Mr. Street believed that, as a matter of utility and public improvement, this would have to be done, but his plan did not require it.

Mr. Field saw no necessity, except an architectural one, which he would not pretend to deal with, for separating the courts from the offices. He, therefore, did not at all agree that the way in which the offices in the zone were at one place attached to the court, in Mr. Street's plan, was at all a disadvantage, but rather the reverse.

Mr. Street said a great many more people used the offices than the courts; for that reason the offices had been arranged outside.

Mr. Field wished to remark that he was present at this discusssion, not as Secretary to the Law Courts Commission, but in his individual capacity as a person deeply interested in the question, who was probably one of the few individuals now living who had been examined upon the matter by a Committee of the House of Commons in 1841 or 1842. The Commission of which he was secretary was only appointed to decide upon the particular mode in which the Carey-street site should be appropriated, and had, therefore, no power of inquiring into the eligibility of other places. Parliament had settled the question of site by the same Act by which it required a commission to be appointed.

The Chairman said he understood Mr. Field to agree that the courts and offices should be in convenient conjunction, but he did not agree that this desideratum would be better obtained on the site of the Embankment than in Carey-street.

Mr. Field said he thought the Embankment scheme wholly a mistake. It was also a mistake to suppose that crowds of the public wanted to attend the courts, and that the proceedings were initiated in the offices. They were really initiated in the chambers of solicitors and counsel, and the great end to be kept in view was to keep the courts as close as possible to counsel's chambers.

Sir Charles Trevelyan then read his observations on the second head, as follows, viz.:—

Whether the area of the Embankment site is sufficient for the Courts and Offices.

The area of Mr. Street's amended plan is 370,000 superficial feet, or, as nearly as possible, 8½ acres. The Embankment and Strand site contains 446,500 superficial feet, or rather more than 10¼ acres, without including any portion of the Embankment. The Embankment site, therefore, affords the necessary building area, and 76,500 superficial feet to spare. Access, light, and air being satisfactorily provided for, without cost, outside these 10¼ acres, by the Embankment road and railway, the river steamers, the Strand, and the open spaces towards the Temple, on one side, and Somerset-house on the other, the whole of the 10¼ acres may be built upon. Too much stress can hardly be laid upon the advantage of having a broad tidal river as the ventilator and reflector of such a building as this will be.

The area covered by building in Mr. Street's plan is 285,000 superficial feet. Three modes of laying out the ground are shown in plan No. 2, annexed to the printed correspondence, which respectively give as the area covered with buildings 300,000, 310,000, and 315,000 superficial feet. The first of these is an adaptation of Mr. Street's plan, with the additional advantage of completing the circuit of the courtyard, and providing a separate quadrangle for the Probate Court and Wills.

The zone where the law offices are to be placed, is much

larger in the Embankment, than in the Carey-street site, partly because the Embankment site itself is larger, but still more, because it is of an oblong, instead of being of a square form. On the other hand, we know, from our experience in the management of the ordinary civil establishments, that office establishments may be much reduced by a careful, independent revision, in a manner which also increases their efficiency and expedites the transaction of business; and that the office-room required by them may be adjusted by a detailed investigation, at a point much below that demanded by the officers themselves. The investigation which has lately been made into the accommodation required by the Home and Colonial Departments, and the numerous offices dependent upon them, is highly illustrative of this. The demand upon the public for office accommodation has been reduced from one-third to one-half by this investigation. Great pains had been taken to settle the amount of accommodation required, and yet, when the matter was gone into by experts holding an independent position, viz., by Mr. Stephenson, Mr. Fergusson, and myself, the space required was reduced by nearly one-half. The application of these principles to the legal offices opens a great economy to view. At any rate, the ground-floor throughout the long Strand front of the Embankment site might be given up to law-booksellers, law-stationers, printers, lithographers, and other shops connected with the administration of the law, and the offices might be placed in the upper stories, where they would be more free from noise. This would be at once convenient and economical, and would give life and warmth to this long façade, which would be much more agreeable than the unbroken cold exterior of a public building.

Lastly, the tendency of all the arrangements in progress for the improvement of the administration of the law is towards the decentralization and localization of the system of judicature, so that a site large enough for the purposes of the present day is likely to be more than enough twenty years hence.

Mr. Field said that the consideration on this second head belonged rather to an architect than to himself, but he must make an observation on the assumptions which seemed to be made that experts had not been at work with regard to the accommodation required; that by their aid the space might be much reduced; and that the question of shops had not been considered. All these assumptions were erroneous. An amount of investigation as to the size of the rooms, &c., had been gone into, such as had never taken place in this country with respect to any other building. The number of people going in and out of every office had now been counted over and over again, and the position of each department was allotted to it, not at all according to its real or supposed importance or dignity, but solely with a view to the greatest convenience of the greatest number. He did not believe, therefore, that any additional investigation by experts would wisely reduce the space determined upon. The same with regard to the shops; the saving which might be effected by letting them had been fully considered by the Commission, but on the whole they were decidedly of opinion that the space could be allotted with much more benefit to the public in other ways. He did not put that forward as his own view (he had never thought much about the shop question), but it was the deliberate opinion of the Commission, and it would take a great deal to convince him that it was a wrong one. With regard to the size of the rooms, he might mention that particular attention had been given in each case to so apportion the space as not to have a room too large for one man, but not large enough for two, and the same principle had been followed throughout. Nor had they neglected the changes in the administration of the law which were likely to take place at no distant future, and the possibility of equity and common law being amalgamated had by no means been forgotten in the arrangements. He must also beg leave emphatically to deny the insinuation which he considered was thrown out in Sir Charles Trevelyan's pamphlet, to the effect that all these matters had been his (Mr. Field's) work rather than that of the Commissioners themselves. The minutes of the Commissioners would show the thousands, he might almost say, of hours they had devoted to the subject, and the amount of real hard work they had gone through.

The Chairman inquired whether the idea of letting shops had been abandoned, on the ground that the space which they would require could be more advantageously occupied in other ways.

Mr. Field said it was some years since the question had been discussed, but his recollection was that it was not considered any advantage to have shops of any kind in the building itself, whilst it would be a great advantage to be able to appropriate the ground floor to waiting rooms, and other offices of a like character. For instance, the way in which the jury department of the law courts was now conducted was most shameful; but, by having proper accommodation, jurors in waiting, and not actually engaged, might see their clerks or the parties with whom they had to transact business, and thus a great deal of time and money would be saved to the country.

The Hon. Auberon Herbert thought these matters of internal organisation hardly came under the cognizance of the Committee.

Sir C. Trevelyan, without questioning the fact that the question of accommodation had been fully gone into, still adhered to the opinion that a further investigation, by independent minds, with the benefit of the recent and much more extensive experience of the ordinary civil departments, would enable still further reductions to be made; and the other part of the argument remained unanswered, which was still more important, viz., that before the office establishments were placed in the new building there should be a thorough scrutiny and revision of those establishments themselves.

Mr. Field remarked that this had been done, not only having regard to present requirements, but also to future probabilities. One of the first questions considered by the Commission was, whether the three great branches of the common law—the Queen's Bench, the Common Pleas, and the Exchequer—should be treated as one court or as three, which would make a considerable difference in the nature of the accommodation required. He did not see how more information was to be gained, by going to people who were entirely ignorant of the details of the law, than had already been given by those best qualified to speak on the subject.

The Chairman asked Mr. Field if, taking it that the accommodation at present provided for was the minimum necessary, supposing the same amount, and of the same kind, could be provided, and still leave room for shops, he would then object to such an appropriation of part of the building.

Mr. Field, looking at it simply from a suitors' point of view (and the suitors had to bear all the expenses), did not think the saving effected would be of such an amount as to be worth considering. He had not thought much of the matter, but he did not consider the pecuniary advantage would be appreciable, or that it would add to the appearance of the building.

Sir C. Trevelyan thought there would be an advantage in having a row of law-stationers' and other similar shops facing the Strand, quite irrespective of any idea of economy.

Mr. Gregory, M.P., did not understand, if the calculations of the Commissioners had been so elaborate and exact as had been represented, how it came to pass that the sum of £1,500,000 named in the Act of Parliament had been reported by them to be actually sufficient, not only for the purchase of the land, but for the erection of the buildings.

Mr. Field said that Mr. Gregory's remark showed that he had not informed himself of the matter.

The scheme brought before Parliament was a very restricted scheme compared with that now contemplated; the certificate required by the Act was that the site and money were enough for the restricted scheme, and the present commission had certified that such was the case. They gave the certificate after examining witnesses and the government plans and schedules of accommodation, required for the restricted scheme. But when the Act under which the commission was appointed was before the House of Commons and Liberal members (he was not sure Mr. Gregory was not one of them) suggested very wisely that the Government scheme as suggested in the Bill might not be extensive enough, and procured the insertion in the Bill of clauses requiring the appointment of a Commission to consider this very point of whether any and what additional offices and departments ought to be included, and authorising all the extensions they might find requisite so far as these could be made without a new compulsory purchase bill. The same Act which named the £1,500,000 appointed the Commissioners, who, therefore, began their labours afterwards and reported, very wisely, in favour of a much more extensive consolidation of the law courts than had been at first proposed. For his own part, he was quite convinced that the principle ought to be carried even further. For instance, the Charity Commissioners might be advantageously added. If they were there they ought to have a good deal more work than mere charity cases to do in aid of the law. In fact, all the legal business in London ought to be conducted on the same spot. With regard to the extra expense thus incurred, it must be remembered that every fresh department thus associated with the others would have to contribute a quota of the expense, and, therefore, enlargement, in the result, would be really economical. He had forgotten to say before that he did not think it was correct to speak of the light and air being obtained for nothing in the Embankment case; it was all included in the cost of the site in either case. If there ought to be any reduction in the offices it would only be on the ground that Sir C. Trevelyan had suggested, that there would be a process of decentralisation, a great deal of the law work being sent away from London. He did not think any statesman could act on this speculation, and place the courts on a site which would not be large enough if the metropolitan work remained as extensive as it is now, and which would allow of no extension whatever. He had no doubt that the work would be done quicker and better when the common law and equity branches were amalgamated. There would, no doubt, be great consolidations. Some were obvious. For instance, all the monetary business of the law would be conducted by the office now known as that of the Accountant-General in Chancery.

Sir C. Trevelyan said that great economy might be effected in every department by drawing a broad line between the mere mechanical work, which might be done by youths or copying clerks, and that requiring intelligence and special knowledge, and by employing no more highly-paid officers than are absolutely necessary.

Mr. S. Redgrave felt satisfied that the amount of accommodation stated to be necessary by persons connected with the law, when revised by outsiders competent to judge, could, as in other cases, be reduced by one-half.

Mr. Street, A.R.A., remarked on this point that, when he was appointed architect to the new law courts, he had suggested the appointment of a sub-committee of the Commission, in order to see if any reduction could be made in the amount of space required. Every room was gone through in this way, and a large reduction had been made, amounting to no less than 37,000 superficial feet; and he much doubted whether further reduction was possible. He was sorry to hear Sir C. Trevelyan suggest that it would add to the cheerfulness of appearances if the new courts had a row of shops on the ground-floor. It seemed to him that any public building so treated would be absolutely ruined. He did not know how the shops would be occupied, but probably neckties and similar goods, would form a prominent feature in the windows, and whatever might be said as to the cheerfulness of the result, he had no doubt as to its being paltry. The Royal Exchange was an instance of this sort of thing, and was not very encouraging. Nor did he see any necessity for having shops. The only side where they would be of any value would be along the Strand, and there were a number of offices which could be placed there, the business of which would not be materially affected by the noise of the street. On the present site, owing to the intervention of the churchyard, a large portion of the ground-floor would be fairly quiet, and there was no reason, therefore, why it should not be used for offices. Sir C. Trevelyan spoke of this site as being square, but it was in fact about 750 feet by 500, which gave a fair proportion of length to breadth.

Mr. Dilke, M.P., remarked that if the Embankment site were adopted, two-thirds of the building would abut on the narrowest part of the Strand, the widening of which would, therefore, be absolutely necessary, which, in the other instance, would not be the case, although no doubt desirable.

Sir C. Trevelyan conceived that the widening of the Strand would be as necessary in the one case as in the other, because, if the Carey-street site was adopted, there would be no other convenient means of access to the courts from the westward.

Mr. Dilke said it was not a question of access, but whether in the one case the street would not be too narrow to allow of the building being ever seen.

Sir C. Trevelyan remarked, in reference to the occupation of the shops, that of course there would be some authority which would have control over the whole building, and which would decide on all applications. Such shops as Butterworth's, Spottiswoode's, Hansard's, Stevens and Sons', and Waterlow's, for the sale of law books, parliamentary papers, &c., could not be considered incongruous, or unsuitable.

Mr. Westmacott, R.A., said this left Mr. Street's strongest argument untouched, that it would be impossible to make a public building of any pretensions with such a front as that.

Sir C. Trevelyan said there would be a purely architectural front towards the Thames, but that a row of first class shops would be quite in harmony with the character of the Strand; and that it would be hard if, with the help of cast-iron or granite pillars, and other modern appliances, the façade of shops below and offices above could not be made extremely handsome.

Mr. Street remarked that the Strand itself was much dignified by Somerset House, the view through the arches of which into the quadrangle was one of the best points of view along its whole length.

Mr. Westmacott, said that although England's national greatness was built upon her shops, it would be a great mistake to make them the foundation of her public buildings. It would be absurd and impossible to erect anything like a sound superstructure on a foundation of shops, which must be open and exposed.

Mr. Seymour Teulon remarked that it was hardly worth while to discuss the matter further, since it had been authoritatively stated that the space could be more advantageously employed in other ways.

Mr. Field wished to remark, on the question of area, that all past experience showed that the legal establishments were continually growing rather than diminishing, and, therefore, any perfect scheme ought to contemplate the possibility of enlargement. The Embankment scheme proposed to cramp the legal establishment in what may be looked at as an iron coffin.

Sir C. Trevelyan said his scheme provided 76,000 square feet more than was afforded on the Carey-street site, which would meet the additional requirements of the next twenty years, but the tendency of law reform

was towards decentralization, and the only enlargement heard of from year to year was in the jurisdiction of the County Courts. What we should soon arrive at was, that, with the exception of the appeal cases, the London courts would be local, like all the others, and would include the metropolis, with its three millions of people, and the surrounding district, now provided for by the Home Circuit; and that courts would be established in Manchester, and other great centres, in which all cases locally arising would be tried, whatever might be the amounts involved.

Mr. Field said if the courts were to be for all times, growing beautifully less, then the supposed need of access to the public would be always growing less also. He thought it would be very foolish to adopt a site which might hold the courts and offices if all these wonderful changes in the administration of the laws so took effect as to diminish metropolitan litigation, but otherwise might soon prove too restricted. In reply to a question from the Chairman, he said that he had made no calculations as to the amount of additional accommodation which 70,000 square feet would afford, but he objected to any site which was strictly limited on all four sides, and his contention was that the chambers of counsel were as much part of the law offices as the courts themselves. On the Carey-street plan, in which the courts were placed on the first-floor, all the streets were to the courts in the nature of subways only, which could be bridged over on the court level. In this way the Carey-street building could be enlarged, so as to reach all over London, if necessary.

Mr. Redgrave did not like the idea of the law offices spreading all over London, but his observation had been to the effect that the tendency was in the opposite direction. The increased powers and jurisdiction given to County Courts must tend to diminish the pressure of business in the Supreme Courts. He believed the area required would diminish.

Mr. Field said they had just had three new judges appointed, and might soon have more. There had also just been a number of new Chief Clerks and subordinates for them. The occurrences of the law all pointed at increase and growth.

Mr. Gregory, M.P., said that only the previous day a very influential member of the Judicature Commission, in speaking to him on the subject, remarked that the question would not so much be one of extension as reduction; and that when the report of the Commission now sitting was published, it would not be found that any increased accommodation would be required.

The Hon. A. Herbert remarked that, even were extension eventually found requisite, he saw no insuperable objection to the buildings being continued on the north side of the Strand, if the Embankment site were selected.

Sir C. Trevelyan thought that, in such an event, the Probate and Wills department might very well be separated from the rest of the offices.

Mr. Street said the whole 70,000 square feet additional area could not really be utilised for building. When viewed from Waterloo bridge, or the opposite side of the river, the lines of the building proposed by Sir C. Trevelyan would not at all harmonise with those of Somerset House. He should be very glad of any additional space, but he should wish to use it in throwing back some portions of the building. It must also be remembered that on the Embankment site there was a fall of about 32 feet from the Strand, which was a very serious difficulty; whereas, on the Carey-street site, by a slight alteration in the level of Carey-street the whole fall from front to back had been reduced to about 12 feet.

Sir C. Trevelyan observed that the fall was the same in Somerset House, and although a great deal of space was there wasted in the basement, it need not be so in the new structure. The basement or substructure would be of the greatest possible value for providing accommodation for jurymen and witnesses; and the stamping of legal documents might, with great convenience, be carried on under the law offices. These arrangements would allow of the courts and offices being placed on the Strand level.

The Chairman asked if the architectural requirements of a building on the Embankment site would be such that the additional 76,000 feet would not be sufficient to provide for them.

Mr. Street said that, in order to get this additional space, he noticed that Sir C. Trevelyan encroached considerably on the Strand, opposite St. Clement's Church, whereas, he (Mr. Street) had been required to set back his building in order to avoid doing so. He did not know whether, if both sites had been open to him, he should not, on architectural grounds, have selected the Embankment, but he believed the other was the most convenient.

Sir C. Trevelyan remarked that if the Embankment site were adopted, in addition to the clearing already made of the Carey-street site, the parish of St. Clement Danes would be nearly improved off the face of the earth; and a little interference with a long-disused churchyard was not now considered of much importance.

Mr. Street said that it would not be possible to build close up to the Temple, as proposed by Sir C. Trevelyan, on account of the rights of light.

Sir C. Trevelyan said the houses there were of a very antiquated, trumpery character, and would be removed by the Templars themselves.

Mr. Field asked if there was to be a thoroughfare from the Embankment, through the building, up to the Strand?

Sir C. Trevelyan said there would be a covered way leading to the Strand and Holborn, through the basement, opposite the steam-boat pier; but that the carriage entrances into the interior of the building, from the Strand and the Embankment, would not be open to the public.

Mr. S. Teulon thought it would be very objectionable to have a fine roadway like the Thames Embankment ending in a tunnel rising 32 feet to the level of the Strand.

Mr. Field—Then all the through traffic of London which desired to pass from the east part of the Strand on to the embankment would go through the internal streets of the courts, and send all the traffic noise into every one of Sir. C. Trevelyan's courts and offices.

Sir C. Trevelyan, after remarking that this would only be a lateral communication, and that the main embankment roadway would go on straight to the Mansion House, proceeded to read what he had written on the third head, viz.:—

Accessibility of the Site to the Public.

The Council of the Incorporated Law Society state:—"The access wanted is for the legal profession, not for laymen; and from the private chambers and offices of the bar and solicitors, and not from railway-stations." To this I entirely demur. In a common law case there may be 1 judge, 3 officials, 4 counsel at the outside, 2 attornies, 2 attornies' clerks, or 12 in all; whereas, besides the grand jury, there would be 12 jurymen, 10 witnesses on an average, and 2 parties, or 24 in all, besides an indefinite number of spectators. These last were not ignored and discountenanced by the eminent men who composed Sir George Lewis's Commission, as they have been by the majority of those who have managed the detailed business of the Courts of Justice Commission. The manner in which this class of occupants of the courts is alluded to in Sir G. Lewis's report is very significant—"The public, meaning by the latter term, and especially with regard to the courts themselves, the suitors, the witnesses, and such a number of persons coming either to learn or merely to satisfy a reasonable curiosity and interest, as the indispensable character of open courts requires to be provided for." There is no building in London in which so many persons will assemble, or in which the whole country is so much interested, as the new courts and offices of law. Those who are actually present or assisting at any particular suit are few compared with those who are waiting till the suits in which they are

interested are called on, and this waiting is naturally in greater proportion on the part of the strangers than of the profession. Another circumstance which gives an advantage to the "profession" over the "laity" is, that persons regularly practising in the courts naturally choose their residences, chambers, and offices with reference to those courts, whereas the rest of the world are only casual visitors, and the more public and frequented quarters of the town are the most convenient for them. There are next to no hotels for strangers frequenting the courts on the Lincoln's-inn side, whereas on the other three sides are the principal districts from which strangers come, and to which they return.

There is no building in London which will be so much resorted to by people from all parts of the country as the law courts. The cases to be tried, whether in the first instance or on appeal, originate in every part of England; and every case brings crowds of people in the capacity of parties, grand, special, and petty jurors, witnesses, and spectators. To the great majority of these the most convenient access will be by the Metropolitan Railway, the Embankment-road, or the river steamers. To those who come from the south, and have to cross the river by one of the bridges, the Embankment site will, of course, be the nearest and most convenient. But the convenience will not be confined to them, for the Metropolitan Railway is in communication with all the other railways, and with every part of the metropolis, and will set down passengers from every quarter at the door of the law courts. The advantage of this will be still more felt when the Home Circuit is consolidated with the stationary London courts, which is likely to be recommended by the Judicature Commission.

The City merchants value the privilege of the Guildhall sittings, as they are convenient for them while waiting or attending on special juries. The Embankment site, with the railways in progress, will enable them to run down to the court in five minutes; or, while waiting, they can remain in their counting-houses and await a telegram. It will, in fact, with the help of the railway and telegraph, be better for them than the courts in Guildhall. The railway would offer similar convenience to West-end jurors, and to the small but important class of judges who are also members of the House of Lords, and barristers who are also members of the House of Commons.

Carey-street has no railway communication. The difficulty in taking a branch line to the Strand or Carey-street would be excessive, owing to the necessary interference with the Embankment, and the want of space for stations; and, even if it were done, it must be at a lower level underground than on the Embankment.

The grand entrance on the court level will be attained on the Embankment side by a roadway with a gradient of 1 in 30. A corresponding advantage cannot be obtained on the Strand side, if the courts are placed on the Carey-street site, because—

1. It has been settled that the courts on that site are to be on the first floor.

2. Even if they were on the ground floor, there must be a basement story to bring the ground floor on a level with Carey-street; and the space is too contracted to allow of a carriage entrance on the Strand side.

I will conclude this part of the subject with an extract from a private letter written by Mr. Whitmore, treasurer of the Inner Temple to Mr. W. H. Gregory, M.P.:—

"I cannot conceive that any doubt can be entertained as to the superior advantages to suitors held out by the Embankment site. Surely, *they* are to be considered; and if considered, figure to yourself any suitor having the choice of resorting to the one or the other locality. If he came from the country, or if he came from town, to which would he have the readier and pleasanter access, or in which would he be more likely to employ his time healthily and pleasantly? Look at him *eundo, morando, redeundo*, and his task would, in the one case, be difficult, slow, bewildering, and disagreeable, whilst, in the other, I can fancy much that would be even a pleasure in his business."

Mr. Street thought the amount of alteration in buildings and streets required to give access to the Carey-street site was very much exaggerated.

Mr. Teulon, referring to Mr. Shield's report, said its main feature was the revival of an old plan for a thoroughfare from Piccadilly to Paternoster-row, one of the first requirements of which would be to remove the new Record-office in Fetter-lane. In some respects he considered the Carey-street site more accessible than the other, being nearer Holborn, the second great thoroughfare. The Embankment would also be available, as parties would only have a short distance to go, in order to reach the Strand entrance. By removing one or two houses at Great Turnstile a direct communication would be opened with Holborn, and the same thing might be done at the other end of Lincoln's-inn-fields.

Mr. Street said that by a comparatively small expense, at the western end of Lincoln's-inn-fields a straight thoroughfare might be opened up Southampton-row to the Euston-square, and other great railway stations. Mr. Shield's plan would be enormously expensive, and he believed unnecessary, particularly as he had made no calculation of the effect which would be produced on London traffic by the Embankment when completed. However, a very good route might be obtained, at much less expense, from Piccadilly, up Long-acre and Great Queen-street; turning into Holborn at the eastern end of Lincoln's-inn-fields. This would give a good main road east and west, from which access to the law courts would be easy. He should mention that the approaches which he had provided for in his competition designs, must not be taken to be essential to the completion of the present plans.

Mr. Hyde Clarke remarked that one great advantage possessed by the Embankment site, would be that the traffic would be 32 feet below the level of the ground-floor, so that the noise would hardly be perceived.

Mr. Street said that would hardly be so, if there were a thoroughfare through the building up to the Strand, which would in fact occupy the whole ground-floor of one side of the buildings; whilst the noise and vibration from traffic in such a covered street would undoubtedly be felt in the rooms above it. It would be necessary, he thought, to put this at the end, which would of course reduce the area of the site by 30,000 or 35,000 feet.

Mr. Field said it was a great mistake to suppose that access was required by the public. The Law Institution had ascertained that 92 per cent. of the persons attending the courts and offices came from the chambers of solicitors and counsel. Before anything was decided, that point ought to be inquired into and settled as it easily might be. It was a matter of fact of the utmost importance to the decision of the whole subject.

Sir C. Trevelyan said there could be no doubt that the Thames and its Embankment would be the finest thoroughfare in the world; there would be a footway, carriage way, rail, and river steamers. The great mass of people attending the courts were the public, and this site, with its excellent ready-made approaches, would afford them the maximum of advantage with the minimum of inconvenience. If the courts were erected in Carey-street, it would be absolutely necessary to have a direct communication westward, to Long-acre and Piccadilly, and others leading to Holborn, at the north-west and east corners of Lincoln's-inn-fields, besides a direct communication with the City across Farringdon-street.

Mr. Gregory, M.P., said it would be much more economical to bring witnesses coming from hotels to the Embankment site by the underground railway, than to the other site in a cab.

Mr. Field begged wholly and emphatically to deny that the great mass of people attending the courts were the public. Here was an issue of fact. Try it as such,

like sensible men. He also said the witnesses generally went to the solicitors' offices before attending the court. As to the public, it was a great mistake to suppose that they frequented the courts of law. There were a few habitués both in the City and at Westminster, idle, dirty people, who had nowhere else to go to, and were a positive nuisance. Dr. Percy had stated that one of the greatest difficulties in having pure air in the courts at Westminster was the filth of the persons who returned day after day, as they found a warm and comfortable place to pass the day in. The new plans proposed to give all these people stalls, so that at least the air might pass round them and between them. He begged that every member of the Committee would be very careful before he proceeded to form opinions about the extent of access required by the public, as distinguished from the legal profession and the suitors and others who went to court from their chambers.

Mr. Hyde Clarke remarked that when he was subpœnaed to Westminster, he did not go to Bedford-row first.

Mr. Field said, No, because in the present situation of the courts it would be sometimes impossible, but the object of concentration was to bring them into proximity with chambers. What was the history of the local changes which had taken place in the administration of the law? No man was less inclined to depart from ancient tradition than Lord Cottenham, and few thought more of the importance and ease of the Lord Chancellor's office; but in 1848 he was, for mere shame's sake, obliged to remove the sittings of the Chancery Court from Westminster to Lincoln's-inn, no doubt at considerable inconvenience to himself, simply because it was found impossible properly to conduct the business so far from the chambers of counsel. It was of the utmost importance to the speedy and proper administration of the law, that the moment a counsel had finished the matter in which he was engaged in court, he should be back in his own chambers. There should be the facility of having an electric bell to every counsel's chambers from the court, and so a power of getting him into court in two or three minutes' summons. At one time it was proposed to build courts in Lincoln's-inn-fields, which was offered for nothing, but although he himself would have been a considerable gainer by the scheme, he could not conscientiously give evidence in favour of it, because of the injustice which would be committed upon counsel whose chambers were in the Temple, and, what was the same thing, because of the mischief that injustice would do to the suitors. Of course the suitors were to pay for all these improvements, and why should their business be delayed by being taken away from the Carey-street site, which was the very Acropolis of the law? Sir C. Trevelyan's scheme would no doubt benefit the Middle Temple, and that was why they supported it, but no one else did. At present Lincoln's-inn had a great advantage over the Temple, and had even opposed the present scheme for some time on that very ground. In all these matters the interests of the suitors ought primarily to be considered, and there could be no doubt that these would be best consulted by a thorough concentration of all the offices connected with the administration of the law in one spot, where the officials would be constantly under supervision. The business of the Middlesex Registry, for instance, could only be controlled by the three Chief Justices and the Lord Chancellor acting jointly, and, practically, these four judges would not meet together once in 25 years. The real law reform to benefit the nation would be a reform, not in abstract law, but in procedure, one by which all disputes would be settled speedily, and this could only be accomplished by concentrating the courts and legal offices in close proximity to the chambers of counsel. There was a circular issued that morning by the Metropolitan and Provincial Law Society, in which these points were fully stated. They referred to the decadence of Gray's-inn as a *habitat* for counsel, members of that inn being obliged to take chambers elsewhere, so as to be near the courts, and also to the failure of the Equity Exchequer, which actually offered an inducement to solicitors to take business there, by an addition of 20 per cent. to their fees, but, owing to the inconvenient distance, that court had to be abolished. They also referred to the removal of the Chancery Court from Westminster to Lincoln's-inn. When all these things showed that there was a power of attraction between the courts and counsel's chambers as strong as that of gravitation, it would be absurd to attempt to separate them. The Master of the Rolls had even doubted whether he should be able efficiently to control his officers who had charge of the records if his Court were removed so far from the Rolls Record Office as to the Carey-street site, probably not 100 yards.

Sir C. Trevelyan said he agreed with most of the principles enunciated by Mr. Field, but differed from him as to their practical application. What he had written on this point was as follows:—

Accessibility of the Thames Embankment Site to the Legal Profession.

For the reasons already given, the Embankment site will be much the most convenient to those members of the profession who reside, or have their offices, or both, in the City, the West-end, Southwark, Lambeth, or any part of Kent or Surrey. With the exception of Hampstead, the suburbs to the north of London are not popular; but Surrey is full of the suburban residences of lawyers, and especially of solicitors.

The Inner and Middle Temple will be greatly benefited by the change from the Carey-street to the Embankment site, because, instead of having to ascend the hill to the Strand, and then to climb from a lower level to a bridge over the Strand—which has been directed to be made "loftier than the existing arch at Temple-bar, in order that the traffic of the Strand through the arch may be facilitated"—the Templars will pass and repass, in their wigs and gowns, between their chambers and their courts, with nothing but Fountain-court to cross.

Those who have chambers or offices in Lincoln's-inn, or other places to the north of the Carey-street site, will be farther from the new courts *only by the width of that site and of the Strand*, which will be relieved, by the opening of the Embankment road and railway, and by the improvement of Holborn, from the excessive traffic with which it is at present crowded.

So far, I have assumed that the change will be confined to the substitution of the Embankment for the Carey-street site; but it is certain that, if this measure is resolved upon, other changes must follow. In answer to question 713, Lord Westbury stated to Sir George Lewis's Commission:—"It is right that the Commission should know that probably the reason of the great distinction between the wealth, the numbers, and the extent of Lincoln's-inn and the other societies is due to the circumstance that, in Lord Hardwicke's time, an application was made to the Middle Temple by Lord Hardwicke, as Lord Chancellor, for leave for the Court of Chancery to sit in the Middle Temple. The benchers of the Middle Temple of that day were unwise enough to refuse that application; the benchers of Lincoln's-inn, wiser in their generation, received it with pleasure, and the result has been that there has grown around the sitting of the court the greatest possible demand for chambers and accommodation, which has augmented the wealth of Lincoln's-inn twenty-fold above the wealth of the other societies. It is not an unnatural thing, therefore, that Lincoln's-inn should be desirous of preserving that advantage." If "the greatest possible demand for chambers and accommodation" grew up around the Courts of Equity only, how much more will this be the case when all the Courts—Common Law, Admiralty, Probate and Divorce, and Bankruptcy, as well as Equity—and all the legal offices shall be concentrated on the Embankment site. The entire space on the north

of the Strand, from Chancery-lane to Wellington-street, including the whole of the Carey-street site, will soon be occupied by buildings constructed according to the most improved methods, for barristers, solicitors, surveyors, architects, law booksellers, law stationers, printers, lithographers, and other professions and trades connected with the administration of the law. This will be a real concentration, because business will be quite as much facilitated by bringing the solicitors' offices into the neighbourhood of the courts and offices of law and barristers' chambers, as by bringing together the different courts and law offices. The new buildings will also furnish a maximum of accommodation, with every convenient modern fitment of lifts, telegraphs, &c., whereas those which will be vacated are of an antiquated pattern, belonging to a time when the value of land in this part of London did not require that it should be made to bear as large an amount of building as possible.

No one who is acquainted with the scattered nature of the legal settlements in this part of London, can doubt that this concentration will be extremely conducive to the convenience and advantage of the legal profession, and of the public at large in its connection with that profession. If the courts were placed on the Carey-street site, the change would end there; but, if they are placed on the Embankment site, then the Carey-street site will be available for this further great and final consolidation. There will also be a great incidental gain to the public. It is well known that an extensive displacement of the working classes (in which I include not only ordinary labourers and artisans, but small tradesmen and others of like social grade) has already taken place in the direction of Holborn and the City. Owing to the numerous clearings now in progress, or shortly about to be commenced for the railways centering in the City, and other purposes, this process will soon be carried to a much greater extent.

It is a mistake to expect working men to sleep out of town, and to go backwards and forwards by rail. Persons who can afford to keep up two establishments, and to have two meals a day dressed for them in different places, and who profit by the air and exercise of the double journey, owing to the sedentary nature of their occupations, should have their homes out of town. The working man, who works hard all day in the open air should live near his work.

There is room in Gray's-inn and Bedford-row, and the intervening open space of Jockey-fields alone, for a much-needed market for that part of London, as well as for a working man's town, provided with everything necessary for health and recreation. But although the largest, this is only one among many ancient sets of chambers and public and private legal offices beyond or in the immediate neighbourhood of Holborn. They are all shown in the map of the legal district annexed to the report of Sir George Lewis's Commission. How unfit these distant sites are for the purposes to which they are now applied, may be seen from the following remark in the statement of the Council of the Incorporated Law Society on the subject of the suggested change of site:—"The tendency of men engaged in similar pursuits to aggregation is natural and inevitable. Whether their pursuits lie in the direction of law, or commerce, or manufactures, the result is the same. They are drawn together by the irresistible attraction of convenience. This tendency is very strikingly exemplified in the legal profession by the members of Gray's-inn. It is believed that there is not now a single barrister of that inn practising in the courts of law or equity whose chambers are in his own inn of court. Every one of them has been compelled to seek chambers in another inn of court to bring himself within the range of his brethren of the bar."

On the other hand, Clifford's-inn, both Serjeant's-inns, the entire Rolls estate, the Law Institution, New-square, Portugal-street, Cook's-court, Carey-street, Clement's-inn (which would be saved from destruction), Danes'-inn, New-inn, and Lyon's-inn (which, although no longer an inn of Chancery, has not yet been finally appropriated to any other purpose) would be incorporated, with the Carey-street site, in the Consolidated Law District; and buildings of the same character would soon extend along the north side of the Strand, opposite Somerset-house, as far as Wellington-street.

This re-arrangement would be much facilitated by a great incidental advantage, which would be obtained by the adoption of the Embankment site. There is a great want in London of lateral communications from south to north. There is nothing that deserves that name from Farringdon-street to Regent-street. But if it shall be determined to place the law courts on the Thames Embankment site, we shall then have the command of both sites, and shall be able to make a thoroughfare, sixty feet wide, from the steamboat pier opposite Essex-street, through the Embankment site, the Carey-street site, Serle-street, and the east side of Lincoln's-inn-fields, to Holborn, without any additional expense beyond taking down one side of the narrow passage at Great Turnstile. The Cook's-court Company, which has undertaken to widen Serle-street, and rebuild the block of houses between Carey-street, Portugal-street, and the south-eastern end of Lincoln's-inn-fields, will be benefited by the change of site, because, instead of a *cul-de-sac* ending at the law courts on the Carey-street site, they will have an open thoroughfare, which, after passing through the Carey-street and Embankment sites, will terminate in the Embankment-road, the Metropolitan Railway, and the Essex-street steamboat pier. Between the Strand and Lincoln's-inn-fields this street would be constructed with shops below and chambers above; and, unquestionably, both shops and chambers in such a situation would be extremely profitable. This communication should be extended, through Bedford-row and Great James-street, to Guilford-street, from which several streets go direct to the North Western, Midland, and Great Northern Railways, and thus the entire north of England would be placed in immediate intercourse with the Thames Embankment, which will be the centre of the London traffic.

By the incorporation of New-square in the consolidated legal district, Lincoln's-inn would be reduced to manageable proportions; for it is admitted on all hands that Old-square is only fit to be pulled down, while great part of Stone-buildings has been virtually detached from the Inn, by its occupation as judges' chambers and law offices. It has been arranged that all the public offices shall be removed from Somerset-house, except the Inland Revenue, which occupies a detached wing on the side furthest removed from the Embankment site; and the transfer of the Admiralty establishment to Whitehall is actually in progress. All that is really required, therefore, in order that the Society of Lincoln's-inn may be established in Somerset House, is that ranges of chambers should be built on the site of King's College, from the Thames to the Strand, and that the quadrangle of Somerset House, including the unfinished northern front, should be fitted for the same purpose, the latter according to the plan best suited to such a situation, with shops below and chambers above. So great is the demand for accommodation of this description in the immediate neighbourhood of the courts and offices of law, that there would be no difficulty in borrowing, at a low rate of interest, on the security of the buildings themselves, any sum that might be required for providing it. On the other hand, Stone-buildings and the hall and library of Lincoln's-inn would be admirably suited for King's College, while Old-square should be treated with the respect due to its antiquity, and to the many interesting associations connected with it. The chapel and gateway, and a sufficient section of the old chambers to serve as a specimen of this ancient style of domestic architecture, should, of course, be preserved.

The superior direction of the Inland Revenue and Customs will probably be consolidated at Westminster;

but, as I have already said, the stamping of legal documents might, with great public convenience, be conducted in the basement of the law offices on the Embankment site, where this establishment might be much better accommodated than it is at Somerset House. The height of this basement will be equal to that of Somerset House; but, while the Somerset House substructure seems to have been originally intended only as a necessary support for the building, the substructure of the new law courts may be expressly adapted for carrying on the stamping processes, and many other useful purposes.

It is impossible to read the evidence before Sir George Lewis's Commission on the Site of the Courts and Offices of Law, without seeing that the ideal in the minds of the Commissioners and witnesses was that the courts and offices should form the central building, and that the two great inns of court should be the wings. This ideal is very imperfectly realised in the Carey-street plan, for, instead of being placed on either side of the courts and offices, the Temples and Lincoln's-inn are loosely tied to them at two corners by bridges, one of which would be in the highest degree inconvenient. But nothing can be more perfect than the arrangement on the Embankment site. The courts and offices would be in the centre, with Lincoln's-inn and the Temple on either wing, all three fronting the Thames; and, on the other side, would be the Record Department on the Rolls Estate, Clifford's-inn, Serjeants'-inn, the Law Society's-inn, New Gray's-inn, Clement's-inn, New-inn, and the large number of law booksellers, law stationers, printers, lithographers, &c., who are as necessary for the due administration of the law as the barristers and solicitors themselves. This plan completely realises the idea alluded to in the statement of the Incorporated Law Society in the following words:—"All projects for the improved administration of the law that have been favourably received, point, more or less, to one great legal establishment, under an united governing body, all the legal offices being branches under its superintending control."

I will now read another extract from Mr. Whitmore's letter:—

"The professional advantages of the Carey-street site and the professional feelings respecting it, are not to be taken exactly as represented in the solicitors' statement. These gentlemen assume a very high tone indeed. They exclude all the world besides themselves from a right of judgment in the matter. They exclude, also, every embellishment to the metropolis, as foreign to the question. They regard themselves as constituting the whole body of their own profession. They invoke the right of imaginary 'suitors,' whose 'fund,' they say, is the purchase-money of the first proposed site. All this is fallacious. They form, indeed, a very respectable association of persons, having a strong local pecuniary interest in the adoption of the particular site. They, and others like them, are swayed by this and similar interests. Moreover, they have for some time been identified with the project, and cannot be expected to turn with equal favour to any other. Their advocacy of the plan is the fondness of parents for their offspring; the interest which every man feels in his own property.

"But no misconception should exist as to the extent, any more than as to the value of this professional support. The fact is that the profession is divided on the subject. With regard to the solicitors, no doubt the large body clustering around Lincoln's-inn have a leaning towards the site which would put them in closer neighbourhood to the law courts; some, because it would facilitate their business; some, because it would improve their property. But these do not form the whole profession. All who are in the west of London, all in the east, would really be more benefited by the other scheme. There would be no comparison between the accessibility of the two. But the voice of these more distant and scattered practitioners is not likely to raise itself, partly from the want of combination, partly from a reluctance to make a manifestation hostile to their own brethren. I know this as a fact in so many individual instances, that I have no hesitation in asserting it. I also have had ample experience of this state of feeling among solicitors in my advocacy of the Embankment site. "The same reasons and scruples animate in a certain degree my own branch of the legal profession. Barristers do not combine, and, in this case, there is some delicacy on the part of the Templars about an interference with a project so beneficial to their brethren of Lincoln's-inn. To me, the feeling seems a false one, and I have not hesitated about signing a petition to Parliament in favour of the Embankment site. Similar support to it is given by my friend, the present treasurer of the Temple, who some years ago published a pamphlet advocating the site in question. Were the ordinary means adopted of obtaining signatures to such a document, I doubt not that it would be very largely signed, notwithstanding the reserve which, as I said, is entertained out of deference to the opposite interests of Lincoln's-inn."

Mr. Field said that before any decision were arrived at they ought to receive evidence as to what class of people access was really required for. Sir Charles had joined issue with the Law Society on points of fact. Let the Committee resolve itself into a jury and try the issues of facts honestly, and without allowing the architectural *cacoethes* to bias them, and there could not be the smallest doubt what their verdict on the points of fact would be. It was absurd to talk about the residences of the professional gentlemen, because they must all come to their chambers and offices before going into court. The courts were not ordered by the Act of Parliament to be removed from Westminster and the City because the room there was wanted for any other purpose, but simply because they were too far from the law chambers. Solicitors and attornies had the care of the suitors' purse, and were the best and only judges of what was for their pecuniary and official interest. The quicker legal business was got through the better it was for the suitor, and the more profitable to the solicitors. In fact, the great misery and misfortune which attended legal proceedings, in almost all cases, arose from delay; and it had been calculated that treating the judgment of the court as a promissory note or bill due on a certain day, the concentration of the courts would so far accelerate the day of payment that the discount on the amount would pay for the cost of the building. But this would only be the case if they were put in the right place, and it was only on that ground that the suitors could fairly be asked to pay for it at all.

The Hon. A. Herbert asked how far Mr. Field's objection would be removed if Lincoln's-inn were removed to Somerset-house?

Mr. Field said the objection would only be partially removed. There was no getting over this, that in the case of a building on the Embankment, at the utmost, contiguous chambers could only be provided on two short sides, and only one long, whereas in the other case there were four sides available. Then there was the question of level, which seemed to him to be fatal. He might mention that the Commission, of which he was secretary, had obtained from the principal foreign Governments plans of their best courts of justice, and in all these plans the courts were situated on the first floor. Sir Charles Trevelyan had sneered at first floor courts. He (Mr. Field) challenged any fair man to study the question, and to doubt that the first floor and not the ground floor was the right position. It was the only position allowing at once contiguity of courts to each other, and abundant attendant rooms for each. There could be nothing above the courts; they must have air and top-lights. If this first-floor plan were adopted on the Embankment site, the rise from the Embankment road to the court would be about 53 feet, whereas, if the courts were placed on the ground floor, the public would inevitably make them a thoroughfare to pass

through on to the Embankment. Having mentioned foreign courts, he might add that Mr. Street's plans were infinitely superior to anything of the kind abroad, each having no less than six separate diverging modes of exit. It was one of the first points to determine whether courts should be on the ground or first floor.

The Chairman remarked that in the case of persons, professional or otherwise, coming by way of the Embankment, they must rise to the level of the Strand, on whichever site the courts were placed, only in the case of Carey-street they would have an additional distance to traverse, and a further height to climb in order to reach the floor of the court.

Mr. Street said that in the latter case they would come by a sloping road, so that the ascent would not be felt, but in the former they would have to mount a flight of steps.

Sir C. Trevelyan said that, without any sacrifice of architectural proprieties, a sloping road from the Embankment might be made up to the principal entrance of the building.

Mr. Street said it would never do to have the floor of the courts on an absolute level with a great thoroughfare like the Strand.

Mr. Field said his residence was about on a level with the gallery at the top of the dome of St. Paul's, but it was no inconvenience to gradually mount that elevation in driving home, whereas it would be very severe work to have to mount the steps to the gallery all at once. It was the "peck of dirt" story over again.

The Chairman said there might be the alternative of a sloping road to the Strand level and a flight of steps for those who preferred it, and in the former case the two sites would be about equal, except that there would be a small additional distance to go to Carey-street.

The Hon. Auberon Herbert said the result seemed quite plain, from all they had heard, that it would be useless to place the law courts where they could not be easily reached from the chambers of counsel, and, therefore, it appeared that the transfer of Lincoln's-inn to Somerset House must be taken as an essential part of the scheme.

Sir C. Trevelyan said that, even if that were not carried out, the whole of the vacant Carey-street site might be covered with well-arranged chambers, furnishing a vast amount of accommodation.

Mr. Field—At the expense of the suitors?

Sir C. Trevelyan said the result would be a profit, not an expense; and would afford a means of concentration far beyond anything at present proposed.

Mr. Field remarked that in that case it would be necessary to have the courts on the first floor, in order that they might be readily gained by a bridge over the Strand. He ridiculed the idea that all the chambers of counsel and offices of the law now north of the Strand could be moved to, and congregated in Somerset-house, Wych-street, and Holywell-street, and the transaction be accomplished to a profit.

Mr. Street, in reply to a question, said that the ground-floor of his proposed building would be below the present level of Carey-street, and only a few feet above the level of the Strand; the variation of levels giving, in point of fact, the advantage of a ground-floor entrance in Carey-street, which becomes a first-floor towards the Strand.

Mr. Gregory said that by covering the Carey-street site with chambers, the barristers would be brought into closer proximity to the courts than by remaining in Lincoln's-inn.

Mr. Field remarked that the benchers of Clement's-inn, unlike the Doctors' Commons people, instead of putting the compensation money into their own pockets, as they might have done, had unanimously determined, at the sacrifice of several thousand pounds each, to exchange it for other land in close proximity, which was now covered with wretched buildings, on which it was proposed to erect new chambers, so that the inn would remain dedicated for all time to legal purposes, and a great deal of accommodation would be provided close to the courts. He was quite sure that if it were not for the question of ornamenting the Embankment, they would all be of one mind. There was not a doubt that the courts ought to be in the centre of that place where all the chambers were. Why were the suitors to pay for the so-called embellishment of the metropolis?

The Hon. Auberon Herbert had been much impressed with the necessity for having the courts close to the chambers of counsel, but it appeared to him that the adoption of the Embankment site would merely require a removal of the latter from Lincoln's-inn to the Carey-street site.

Mr. Field repeated that you could not put as many chambers on three sides of a parallelogram as on four, and the expense of all these removals must be taken into account.

Sir Charles Trevelyan then proceeded with his written observations, as follows:—

The Comparative Cost of the Two Sites.

After many months' inquiry and consideration, £1,500,000 was named to me by Mr. H. A. Hunt, surveyor to the Office of Works, as the outside probable cost of the Thames Embankment site. This is absolutely the whole, including, not only the actual building area, but also light, air, and approaches, for, as already stated, it is a peculiar merit of this site that the further space required for light, air, and approaches is all ready-made, and can be had for nothing, that is, without any additional payment beyond the sum paid for the ground on which the building will stand. If the principal approach on the Embankment side had been prepared for the express purpose, at any cost, however great, it could not have been better than it now is without any additional cost whatever. The approach by the Strand will also be quite as good as the demand on that side will require, when the street has been widened to 100 feet. The removal of the Holywell-street "middle row" is common to both plans, and should not therefore be charged to either. It is an improvement which is indispensably required, entirely irrespective of any new law courts. Supposing the law courts to be placed on the Embankment site, we should have the command of both sides of the Strand on the Temple-bar side of St. Clement's Church, and the street could therefore be widened in this part without any additional cost.

As the Embankment site is rather more then 10 acres, £1,500,000 is at the rate of about £150,000 an acre. This, as I said, is quite an outside figure. The strong probability is that the actual cost will be much less. The entire site originally formed the town houses of two famous noble families, with their spacious courts and gardens—the Howard and the Essex family—and when these estates were laid out for building, it was done with great liberality. The principal streets are, even according to the standard of the present day, very wide, and most of the houses have back courts. The entire frontage of the Essex estate consists of three properties, one of which is a builder's yard. With the exception of a few houses fronting the Strand, the ground is chiefly occupied by lodging-houses and private hotels, without much custom, so that the cost of the goodwill will not be heavy. The sum paid for the 7½ acres of the Carey-street site, which was very closely packed, and had many very expensive goodwills, not all of the most reputable kind, was at the rate of about £106,000 an acre, without including legal expenses. I doubt whether the average cost of the Embankment site will be much more.

The sum which has already been expended on the Carey-street site, is stated by the Commissioners at £785,000; but this does not include the costs on both sides, which are understood to have been very heavy, or any portion of the expense of the Commission. I am assured that if the accounts were fully stated, it would

amount nearer to £900,000 than £800,000; but in order that it may be seen that I keep within safe limits, I put it at £800,000.

The cost of the additional land which has been reported by the Commissioners to be required, is estimated by them at £668,000. This also, is exclusive of law expenses. Neither does it include a sum proposed to be paid for the compulsory purchase of property for the Cook's Court Company, and arranged to be repaid by them. I will put down the cost of the additional land at £700,000, making, with the preceding item, £1,500,000; being the same as the estimated *outside* cost of the Embankment site, including light and air, and approaches.

But the solid, important building, called the Law Institution, is only about 20 feet from the site of the proposed law courts, and that entire side of Mr. Street's plan has had to be disarranged, in order to keep the eastern entrance clear of it.

The lofty pile of King's College Hospital, with all its disagreeable and not always safe associations, is only from 25 to 30 feet from the new law courts, on the Carey-street site, and Mr. Street has had to cut off a corner of his building in order to prevent its actually impinging on the hospital. I am confident that it would be the general opinion of architects that both these buildings must be removed, if the law courts were erected on the Carey-street site, and that as soon as the great building began to rise, the necessity of this would become apparent to all. The sum which has been actually laid out on the building of King's College Hospital was stated by the Chairman at £150,000; and the Law Institution, with its dependent buildings on either side, cannot be put at less than £100,000, or £250,000 in all.

For £1,750,000, therefore, building area, light and air would be obtained; but there would be nothing for approaches. On this part of the subject I will content myself with quoting Mr. Street's carefully considered report which accompanied his competitive plan. He says:—

"The noisy character of the Strand side will never be changed. It will always be the side from which the greatest number of people will approach the courts; its use in this respect will be increased when the Thames Embankment and Metropolitan Railway are completed, so that, as far as the public are concerned (including witnesses and jurymen), no doubt by far the larger proportion will enter on this side. We have also to provide for the arrival at the courts of all the judges and others who hold the higher situations among the officials. Most of them will come from the West, and, to a great extent, owing to the over-crowded state of the Strand, they will come from the North-West, and so approach the courts on the Carey-street side. It will be a great object, however, not to add at all to the noise of vehicles in Carey-street; and to this end it is essential, in my opinion, that some important alterations should be made in the roads leading to the north-west angle of the site. These alterations should be of such a kind as that all traffic naturally going to the southern or western sides of the building should be diverted before arriving in Carey-street, and this may be easily done. In point of fact, there are existing lines of streets, now crowded with poor buildings, which must improve when the courts of law are all concentrated close to them, and the value of all property in which would be further increased if only the thoroughfares were judiciously improved.

"The alterations which are most needed are:—1. The making a new street from the corner of Long-acre, following very much the lines already occupied by Great Wild-street and Vere-street, until it joins (2) a short new street formed by a prolongation southward by the western alley of Lincoln's-inn-fields. From the point of junction, the two streets will continue on in a south-easterly direction, until they enter Clement's-inn, and so, skirting the western projection of the site, will turn with its boundary, and enter the Strand just at the end of Wych-street. At the entrance to Clement's-inn, a short road to the left will pass between the courts of law and King's College Hospital, into Carey-street.

"Further alterations, of extreme importance, but not so imperatively called for, are:—3. A continuation of the western alley of Lincoln's-inn-fields, through Gate-street, to Holborn, and so in a straight line to Southampton-row, Russell-square; and, 4, a road which, at some distant time, might be found useful, by way of easing the Strand, and which, commencing in the Strand, at the bottom of Wellington-street North, would follow the line of White Hart-street, Blackmoor-street, and Clare-street, cross the new roads (1 and 2) already suggested, and entering Portugal-street, go on into Chancery-lane, and so to the top of the Holborn Viaduct.

"With such streets as these, not only would the traffic receive a much better direction than at present, but, at the same time, the site of the courts of law would become, on most sides, secure from all interruption by noisy traffic, and much easier of access on all sides than it is at present."

What would be the cost of the four approaches reported by Mr. Street to be necessary, viz., two to Holborn, to the north-west and north-east; one to Long-acre, to the west; and another to Wellington-street to the south-west—I will not undertake to say. Those who know any thing about the cost of opening new thoroughfares in London would probably think £1,500,000 an extremely moderate estimate; but, as I have plenty of margin, I will put it at £1,000,000.

Mr. Shields, C.E., in a report which has been laid before Parliament, says that "the great defect of the Carey-street site, which turns the balance against it, is the want of a leading thoroughfare on its northern or Holborn side;" and he proposes to remedy this by making a new wide street "from Long-acre, by Covent-garden and Drury-lane theatres, to pass along the northern front of the Carey-street site, and from thence it would be extended (crossing the Farringdon-street valley by a viaduct) to the end of Cheapside at St. Paul's." Such portion of this proposed new street as is eastward of the Carey-street site is in addition to Mr. Street's approaches, and it would be clearly necessary in order to establish a proper communication with the City (from which a very large proportion of the business comes), if the courts were placed on the Carey-street site. Including the viaduct, it cannot be estimated at less than £500,000, and I will therefore replace the half-million which I struck off Mr. Street's western approaches.

The account therefore stands thus:—

Thames Embankment site, including light, air, and approaches		£1,500,000
Property already purchased for the Carey-street site	£800,000	
Additional property recommended to be purchased	700,000	
Law Institution and King's-college Hospital	250,000	
Western approaches	1,000,000	
Eastern approaches	500,000	
Total for the Carey-street site, including light, air, and approaches		3,250,000

Being £1,750,000 more than will be required for the Embankment site, everything included.

But, according to the statement of the Incorporated Law Society, the abandonment of the Carey-street site "would involve an absolute loss of half a million" upon a total outlay of £800,000, while, according to Mr. Shield, it would amount to £400,000. This I entirely deny. I am confident that, if the courts and offices of law are placed on the Embankment site, and proper precautions are taken to sell the Carey-street site at its real market value, at least as much may be got for it as was given for it. I might accumulate evidence of the high rents obtained for low, small houses in situations by no means so favourable for legal purposes as this would

be. One, in New-square, Lincoln's-inn, was described to me, only about 25 feet in front, with a ground floor, first floor, second floor, and garret, the aggregate rent of it being upwards of £600 a-year. I lately saw two groups of chambers in Paper-buildings, in the Inner Temple, opening upon the same number of staircases. The aggregate annual rent of one group was £1,670, and of the other £1,790. There are 140 names on the list of applicants for chambers in the Inner Temple, and the demand would much exceed this if there was a chance of getting chambers within a reasonable time. The sets of chambers recently built by the Union Bank, at the corner of Carey-street and Chancery-lane, are not at this present time so advantageously situated as those which would be built on the Carey-street site, opposite to the New Law Courts on the Embankment site; but, although the Union Bank Chambers occupy only about half of the building, they yield a sum of upwards of £1,600 a year. If chambers were built with a careful adaptation to the wants of the present time—some larger and some smaller—but all well arranged and fitted with every necessary convenience—instead of being the dog-holes they often are—as the Major's servant said in Pendennis, "a shy sort of place"—the demand would be still greater. But I will content myself with appealing to the knowledge which every person present more or less has of this part of the subject. The crowded names at the foot of the staircases in the Temple and Lincoln's-inn—three or four to each suite of rooms—and the habit of underletting, carried to such an extent that young barristers often pay a considerable rent for a single small room—tell their own story. This subject is well understood in the City, where extraordinary sums are paid per square foot, and fabulous rents are demanded and paid in advantageous situations, but I contend that chambers for barristers and solicitors in situations well suited for legal purposes even now command excessive rents, and when sets of chambers are built with every modern improvement close to all the courts and offices of law concentrated on one spot, they will yield so high a profit that the Carey-street site may be disposed of for at least the sum which was given for it.

Mr. Whitmore makes some observations on this point which are very significant. He says:—

"The distant solicitors may be immense gainers, as would their clients and others, in one event, if the land now purchased were to be re-sold and made available for chambers and offices. That such an employment of it would be highly profitable, no one can doubt who takes the trouble to inquire what are the rents freely given for chambers in the Temple; and what a noble income is obtainable from say ten sets of chambers opening upon a single staircase. Nor would the same inquiry fail to show him how large a demand—aye, how large and urgent a need—exists for such accommodation. There are, at the present moment, some 140 names of applicants on the books of this society for chambers, which it is impossible to supply; and the want is equally great, or greater, for decent offices for solicitors in a central position. These, at present, are not to be had; and, in their absence, the legal practitioner is compelled to plant himself at a distance, and occupy inconvenient rooms in second-rate localities, unapproached by public vehicles, and hardly discoverable by cabmen. These denizens of Bedford-row, John-street, and such northern regions, or even the more fortunate possessors of cupboards in Southampton-buildings, Quality-court, not to say Chancery-lane itself, would be glad enough to exchange darkness for light—eight-foot square for a space in which they could move and breathe, commodiously stow away their papers and deed-boxes, dispose of their clerks, receive their clients—and all this in a locality lying midway between the great Inns of Court, and close to the courts of law. I cannot imagine a greater boon than would result to them, from the opportunity thus given of obtaining suitable places of business, in lieu of the miserable holes in which they are now, perforce, compelled to practice."

The Council of the Incorporated Law Society says:—"It is utterly idle and vain in the general public to imagine that non-professional persons, however intelligent, can form an accurate opinion on the position and arrangement of the courts and offices best adapted to the transaction of the business of the suitors." To this I entirely demur. There is nothing in the conditions of this problem so removed from ordinary experience as to prevent well-informed persons, not belonging to the legal profession, from forming a sound judgment upon it. Every profession in turn has profited by becoming the subject of non-professional criticism. Even the Church has been reformed by external pressure; and at this moment the military profession, which stands more apart than any other profession, is undergoing, without remonstrance, the utmost freedom of public discussion.

The Council also say:—"And here it may be observed, that the solicitors are the proper representatives of, and are identified in interest with the suitors, who are their clients."

To this also I demur, if it be implied, as appears to be the case, that the solicitors are, *in an exclusive sense*, the representatives of those who prosecute or defend their rights in courts of justice. The Government, and Parliament, and even the public at large, to which the suitors belong, are also their representatives and natural protectors. Still less can I admit that the comparatively small number of solicitors, occupying offices in Lincoln's-inn-fields and the neighbourhood, who are understood to have a predominant influence in the management of this subject at the Law Institution, are to be accepted as the representatives of all the suitors in the superior courts of law. The members of this profession are distributed over the City, Westminster, the West-end, the south of London, and the whole of England; and they are all equally to be regarded as the representatives of the suitors.

The only remaining point is:—

Who is to Pay for it?

On this point there is a passage in the statement of the Incorporated Law Society with the spirit of which I heartily sympathise:—

"The Council looked upon the object aimed at as one of national concern, and considered that the expense ought to be defrayed out of the national treasury, but they found that successive Governments repudiated altogether this obligation, and insisted that courts and offices were required solely and exclusively for the suitors, and consequently if they were to be erected as proposed, the whole expense must be defrayed by the suitors.

"The undertaking was thus peremptorily dismissed from the category of national works. It was to be the undertaking of the suitors, because exclusively for their benefit."

The object is undoubtedly one of national concern, and the expense ought, therefore, to be defrayed out of the national treasury. The law courts are not merely for those who at any particular time happen to be suitors in them, but also for all who have any rights to be protected by the due administration of the law; in other words, for the whole people. If anything, those who are so fortunate as to be maintained in the enjoyment of their rights without having occasion to sue, have the greatest interest in the courts of justice; while those who may be presumed to have suffered in their rights, and have to incur extra expenditure in order to obtain redress, are the last persons who ought to have a second exceptional burden placed upon them. All the reasons which follow in the statement of the Law Society, that "concentration is needed for the suitors who are to pay for it," that "it would be unjust to compel the suitors to pay for a site to which their advisers entertain the strongest objections," and so forth, therefore fall to the ground.

So far as the monies popularly known as "the suitors' fund" are derived from sums which have been, or may hereafter be properly paid by the suitors, they are the property, not of the suitors, but of the public. If these monies really belonged to the suitors, they would be given back to them, and would not be employed in building the law courts. The interest, not only of the suitors, present and future, but of the public at large, would be best consulted by paying these monies, as they arise, to the Consolidated Fund, like all other public dues, and defraying the salaries, pensions, and other expenses now charged upon the suitors' fund, as well as the expense of building the courts and offices of law, and all other expenses connected with the administration of justice, from annual grants of Parliament. The public would then have reasonable assurance that proper attention would be paid to the due appropriation of these large sums of public money; and the suitor might hope that the special taxes charged upon him, in addition to the necessarily heavy costs of suits, would attract the attention of Parliament, when, instead of being obscurely merged in a court fund, they were credited, like all other taxes, to the public Exchequer. Towards the end of my first letter to the *Times*, I pointed out that this was the proper mode of dealing with these funds, and it will be a happy incidental result of this discussion if, as I have heard is likely to be the case, this course should actually be adopted. There may be occasional oversight and indifference in the House of Commons, but when taxation and expenditure are subjected to the annual revision of the representatives of the people, real grievances cannot long remain unredressed.

One part of the proposed arrangement is so objectionable that it surely will be at once rescinded as soon as public attention is called to it. A portion of the amount required for the building of the courts is to be raised on a redemption annuity, secured upon fees "to be levied on suitors (other than those of the Court of Chancery) using the said buildings." In other words, fresh taxes are to be imposed upon suitors, and these taxes are to be mortgaged for the next fifty years, until the sum borrowed upon the credit of them has been paid off. We should not deal so with any other class of taxpayers. Why, therefore, are taxes *upon justice* made the solitary exception, and stereotyped for half a century, until a debt, which was never properly chargeable upon them, is paid off?

Mr. Field said there was no time to discuss this last head, but there were one or two inaccuracies which it was desirable to point out. In the first place, it was assumed that the Law Society represented only professional men in its own neighbourhood, which was quite a mistake. A great many members lived in the country, and there were also great numbers of City solicitors connected with it. Besides the Metropolitan and Provincial Society were chiefly country solicitors, and they were just as strong in the matter as the other society. This society had just issued a circular singularly applicable to the points the Committee had been discussing. He (Mr. Field) had really been making that circular the text of what he had been saying. It seemed to him that Sir C. Trevelyan proposed to turn legal London topsy-turvy, and to waste millions of the suitors' money, and, into the bargain, to damage them grossly in point of situation, merely to have a raree-show on the Thames Embankment.

Sir C. Trevelyan said he was ready to qualify that statement, but he believed the members of the Society having offices in the neighbourhood had carried the resolution in favour of the Carey-street site.

Mr. Field said that was a great mistake. There was perfect unanimity. He joined issue most emphatically with Sir C. Trevelyan on the question, what his branch of the profession, country, even more than London solicitors, thought, and he demanded to have that question, which was one of bare fact, tried and determined as a question of dry fact, before the Committee came to any conclusion on this most important matter. If the body which kept the suitors' purse strings was anything like unanimous about the matter, there ought to be an end of all question.

Mr. Street, from an architectural point of view, did not conceive that the building itself, or London in general, would be improved by the Embankment site being selected in preference to the higher one in Carey-street. He had prepared a rough sketch of the general appearance of his design for the Carey-street site which would be presented from Waterloo-bridge. They all knew the great effect which was produced by the upper part of St. Paul's standing up from the surrounding buildings; and his own opinion was that, looking only to his own reputation in time to come, it would be quite as much consulted by putting the law courts on the Carey-street site as on the bank of the river. He believed that the general impression, as to the grandeur of Somerset House, was derived much more from the view of the quadrangle from the Strand than from the river front. He was convinced that it would be damaged by any higher building adjoining it, which would be necessary in the case of courts of justice. There were one or two points which he had hoped would have been touched upon, one being the question of the railway station, which, as sanctioned by the Act of Parliament, would be right across Surrey, Norfolk, and Arundel streets.

Sir C. Trevelyan said it was proposed to move the station to the end of the building, between the lateral communication with the Strand and Holborn and the steam-boat pier. Strong reasons already existed for increasing the height of Somerset House by an additional story.

Mr. Street said it would be necessary to make the railway station a part of the building, in order to preserve anything like a good architectural effect; and there would be the danger of inconvenience arising from the smell of the burning coke, and from vibration. Then, if a rising road were constructed under the building, as was suggested, a great deal of valuable space would be wasted. His own opinion was that the proper way of making an access to the building itself and to the Strand from the railway station would be to have an open thoroughfare at the end, and that would at once get rid of about half the additional space.

Sir C. Trevelyan said that would cut off the building from the Temple.

Mr. Street said that if they built close up to the Temple they would have to pay for interfering with the ancient lights.

Sir C. Trevelyan said there was a great deal of open space there, and the Templars were strongly in favour of the plan.

Mr. Street arrived altogether at the conclusion that the superior height of the Carey-street site gave it the advantage, and the fact of the building being slightly encumbered by other erections he did not consider at all a drawback. On the contrary, it rather tended to make the perspective more picturesque, and to increase the apparent scale of the building. He would further only say at present that the Carey-street site gave a much better and wider opening towards the Strand than the other site; and also that it had the advantage of wide thoroughfares all round its four sides, so as to allow of all traffic to the offices being kept out of the building; whereas Sir C. Trevelyan's plan, by doing away with roads on the east and west points, would necessitate all the carriage traffic coming into the internal quadrangles, and so increasing the noise very greatly.

The Committee adjourned to Tuesday, the 23rd inst., at 11 a.m.

India Conferences.

The adjourned discussion on Mr. C. H. Fielder's paper on "Tea Cultivation in India," was resumed

on Tuesday evening, March 16th, at eight o'clock. Archibald Campbell, Esq., M.D., late Superintendent of Darjeeling, in the chair.

Dr. Barry said the result of the previous evening's discussion, was to show that there was a great want of confidence both here and in India, as to whether the cultivation of tea in that country would pay as a speculation; but this was easily accounted for when they considered the difficulties which for many years it had had to encounter. He would commence by enumerating some of them. In the first place, when the Assam Company was proved to be successful, there was a great rush of the public into tea cultivation, and as it had happened with railways and other things, over speculation had caused a great depression. Those who were entrusted with the selection of land had not sufficient judgment, and large tracts had been bought which were utterly unfit for the purpose. He was speaking principally of Cachar, in which his own experience had been gained. The second cause was the want of seed; they had to rely almost entirely on Assam, and when the cultivation was commenced, there was very great difficulty in obtaining it. The Cachar Company refused to sell it at all, but as he had had the means of rendering valuable services to that company in his capacity as a medical officer, as a personal favour he was allowed 40 maunds of tea seed. A great deal of discussion had lately taken place in the public newspapers with regard to the adulteration in England of clover and grass seeds, but that gave a very small idea of the extent to which the adulteration of tea seed was carried.

The Chairman inquired how the seed was adulterated?

Dr. Barry replied that windfalls were sold, and sufficient care was not taken in selecting the seed, which was of the utmost importance. It also required very peculiar treatment in order to bring it into a fit state for germination. The third cause of failure was that proper men were not selected to carry out the enterprise, and in many cases it was found that when a good man had been secured, owing to the great speculation he resigned his appointment for the sake of a monetary inducement to go elsewhere, and in this way the best plans were sometimes frustrated. It was within his own knowledge that all classes of men, from convicts up to bankers, had been engaged in this enterprise. Fourthly, when he first went to Cachar he was informed that ordinary labour cost about four rupees and three shillings a month, and that the skilled artisan's wages would be six shillings a-month, but the fact was that now he could not get a carpenter under twenty shillings a month, and the wages of ordinary labourers now averaged about fifteen or sixteen shillings. Fearfully great losses were sustained through the plots of agents in Calcutta. It was necessary for every tea planter to employ an agent for selecting his implements. From calculations he had himself made, he found that by exercising great care in this department he had saved one per cent. on his capital. Supposing that every acre represented £40 of capital, which was necessary to bring it into cultivation, 100 acres requiring a capital of £4,000, the saving would be very considerable. Then some of the agents had acted very injudiciously in sending coolies. He had lately had a letter from a manager of a tea plantation complaining that some of the men who were sent up, and who had to cultivate the plants, did not weigh more than five stone; it was quite evident they were utterly unfit for such occupation. Sixthly, they had had a bad market for their teas, the agents in Calcutta not exercising a sound discretion. Only last year he went into the tea marts, and noticing the price at which teas were selling, he had bought in a considerable quantity, which never ought to have been sold there at all, by which he had realised threepence a-pound, which never ought to have gone into his pocket, but if proper discretion had been used should have gone to the tea planter. He had before referred to the labourers being badly selected, and he would add that 20 per cent. of the labourers sent up to Cachar were not fit for tea cultivation. As he had saved one per cent. on the purchase of implements, so he had saved four per cent. by properly selecting his labour, and five per cent, in sending the tea on to a proper market, which, added together, amounted to ten per cent. clear gain, simply through having a proper agency. There were many tea gardens which just paid their expenses, but if they could save these per-centages there would be a clear ten per cent. profit. Then there were causes detrimental to the tea cultivation which affected the government of India. In the first place they required roads. Not being an engineer, he could not say much as to the best method of constructing these roads, but he would strongly recommend a pamphlet which he had seen that day, by Mr. Login, which described the most suitable means for roadmaking, for a country such as India, which could be supposed possible. Then, again, and this was the eighth difficulty which they had had to contend with, different legislation was required. He had been taken to task for finding fault with the Emigration Bill, but he considered there were grave defects in it. They wanted to be under the same conditions as the Ceylon planters; that small courts with stipendary magistrates should be appointed for the purpose of meting out justice between the employer and employed. Instead of that, however, the government had appointed what was called a Protector, and the injurious effect of that was almost impossible to describe. He understood that in Assam, where the agent appointed possessed very great abilities and a very humane disposition, good results had followed, but in other parts they were so prejudicial that for the last two years he believed that part of the Act had been allowed to remain inoperative. He would now venture to make a few suggestions as to how tea cultivation should be made profitable. He had not the slightest doubt that this could be done, for he had done it. The first thing necessary was to have an honest and judicious agent; and secondly, the manager must be not only honest and industrious but intelligent and skilful, and these qualifications were to be obtained. The best men for such positions were skilled gardeners. He had sent out four such men from this country to India, and they were all doing well, and made tea-gardens pay. It had often happened, however, that directors of companies sent out their sons to fill such positions, and that system of nepotism had been one of the greatest causes of failure. With regard to the coolies they would suffer almost any inconvenience, provided they had good water; and it had been found that on those estates where this point was not attended to the mortality had been very great. Then the labourers must be properly housed and fed. Rice and other necessaries must be provided for them at a cheap rate, and they must be properly clad. These matters were of the greatest importance, although they had often been entirely neglected. For instance, the huts were generally made of the most perishable materials, and covered with grass; when the hot months came on they became so dry and parched that the slightest thing would ignite them; and then if the natives were burned out just before the rainy season set in they speedily fell victims to diarrhœa, dysentery, and cholera. He believed that felt, which was most extensively used in England, would form a most admirable substitute for thatch for these huts, as it was not easily ignited; being a non-conductor, it would be found equally as cool as thatch. All these matters must be attended to, from motives of economy not less than feelings of humanity. Again, there were many things to attend to in the culture and manufacture of tea. Great advances had been made in Cachar in the way of trenching, hoeing, and manuring. Last year experiments had been tried on a considerable scale in the way of making an 18-inch or 2-feet trench, and filling it in with manure, which were found to answer admirably, giving an increased crop to the extent of 30 or 40 per cent. Then, in the manipulation of tea, they

had now given over in the best gardens the system of firing, and also of putting the tea in heaps, by which it sometimes fermented and turned sour. It was now dried in the sun, which rendered it flaccid and fit for rolling, and then dried rapidly over charcoal. This plan was found to succeed admirably, the tea being of a very uniform standard. He might mention that he was present at the last sale in October, before he left Calcutta, when the teas of that meeting averaged 2s. 9d. per lb., and he had since been informed that the quality was very superior. With regard to the cultivation of tea, they should not be guided by the opinion of brokers in London who, no doubt, acting to the best of their judgment, sent out instructions as to what kinds of tea should be made. The fact was, they must make the tea as the leaves came. If they found that the plants brought forth a flush of leaves which it would not be injurious to pluck, they should take them and manufacture them into tea, but if it would injure the plant to take them they must not do so; the only safe guide was to follow nature, and by so doing, they could not fail of obtaining the best results. Returning to the road question, he might remark that various memorials had been presented to Government for assistance, but there was one fund on which he thought they had something like a claim. It appeared that there were now 35½ lacs of rupees lying in suspense, raised from the sale of waste lands, which the Government did not know what to do with, and he thought it would be only just that out of this fund some assistance should be given in bringing labour into connection with the land which required cultivation. This amount had accumulated since 1858. He hoped, therefore, that a memorial would be presented to Government for this purpose, and also to alter the system of the Protectorate, or at least not to allow it to remain in abeyance as at present. In conclusion, he would say, that he had no doubt of tea cultivation being made to pay, for he knew an instance in which a tea garden had paid 25 per cent. on the capital only last year; people, therefore, who had invested money in tea should not despair, but they must go in for retrenchment, for honest and able managers, and look well after their own interests.

Mr. Hyde Clarke asked whether there was any system in India with regard to the wages of the labourers, by which the superintendents had the means of diminishing to any considerable extent the earnings of the labourers, either by supplying them with provisions, or in any other shape? They had not yet had brought before them the quantity of tea consumed in India itself. The consumption in England was estimated at 8,000,000 lbs., but it would be very useful to have some idea of what was the amount used in India, and also what was the proportion of Assam tea recommended for mixing with Chinese. He should also like to know if anything had been done in the way of utilising tea seed oil?

Dr. Barry said he had extracted oil from tea seed, but it could not be done at a profit. With regard to the mixing of tea, it was all a matter of taste. He preferred pure Cachar.

Mr. Hyde Clarke would like to have some information on the wages question, and stated that on one occasion, when he had 1,000 labourers employed under him in a foreign country, he found, after some inquiry, that they only got half their nominal wages. The fact was that, out of five coins coming to the men, one was taken by the head man or superintendent, another by the time-keeper or check-clerk, and another went to the "tommy shop."

Mr. Horne said that in Kumâon the sedar, or overlooker, took one anna in the rupee ultimately, which the coolies were willing to pay, but when he was a bad man he very often took as much as two annas, which is one-fourth of a rupee.

Major-General Clarke remarked that this was not confined to tea cultivation.

Mr. Horne said he had seen a good deal of tea planting in Kumaôn, but there was no importation of coolies, the labourers there being, generally speaking, natives of that part of the country, though in some places it was very difficult to get them. The rate of wages averaged from three to six rupees a month, or from six to twelve shillings. The commoner or coarse kinds of tea sold for about 12 annas a pound of eleven ounces, or at the rate of 18 pence per English pound, while the finer qualities sometimes sold as high even as 4s. a pound. It was found that the local sale of tea paid much better than exporting it, and they had lately been trying to imitate the brick tea, so much in use in Thibet. This was found to contain a small quantity of opium, and was mixed up with various gums. It had been successfully imitated, and by the last reports he understood that it was finding considerable favour in Thibet, and even as far as Bokhara. It was also selling to some degree in the Punjaub. He believed that the demand for tea among the natives was incalculable—speaking of the plains, not the hills. The greatest treat they could give a servant was a pinch of tea, and this was one of the things which it was always necessary to keep under lock and key. Mahommedans, Bhuddists, Hindoos, and Tartars, all drank tea, and he believed the demand would be sufficient to absorb the whole amount produced if they could get it at a fair price. It was considered by the natives a cure for all diseases under the sun, and was readily taken by all castes, from the Brahmins downwards.

Mr. Hyde Clarke remarked that, when at Constantinople, he had opportunities of seeing representatives from most parts of Central Asia, and he found that they all possessed tea-drinking populations. There was one street in Constantinople almost entirely occupied with tea shops, and even the Turks themselves had a great disposition for it.

Major-General Clarke said he was not a practical tea planter, but he had an interest in the subject, being a shareholder in a tea company. In speaking of tea cultivation in India, he thought they must separate the great tea-growing districts of the Himalayas and some minor belts, which spread from the Brahmapootra to the Indus, from the lower provinces, such as Assam and Cachar, the conditions both as to the sale and the prospects being very different. He thought that Assam, Cachar, Chittagong, and such districts, must look to Europe and Australia for a market for their teas, and they must consider that these countries were almost undiscovered. There was no local labour available for the cultivation, and he thought it might be worth consideration whether, if inducements were held out to them, the Chinese would not come and take part in this industry, with which they were so well acquainted. They were found to emigrate freely to California, Australia, and many other places, and if some of them could be introduced to the tea-growing districts of India, he thought it would have a very great influence. Mr. Bainbridge had told them that the cost of producing tea would be 1s. 3d. per lb. He did not presume to contradict that, but he thought that such a result must be arrived at under very great difficulties. Cachar and Assam required associated enterprise, there being so much trouble in getting all the necessaries for action, but in Kumâon, Kangra, and Chatanagpoor he thought the conditions were very different; Kumâon was not so well known as Assam, but there and in Kangra, he believed, there was a large tea-drinking population, and they were more favourably situated for supplying it to the neighbouring countries; and it was well known that all the Mongolian races appear to have a craving for it. All the men in the hills who could afford it used it as an article of diet, mixing it with opium, and sold and used it in various other ways. He had the honour of serving in that district for some time, and was informed by the chief engineer that the quantity of tea that came from Kurrachee to Umritsur, and was sent on from there to Cashmere, was 160,000 lbs. weight in 1853. The company, in which he was a shareholder, sold tea at nine annas a lb., and Mr. Fortune estimated in 1851 that tea could be grown for from 4d. to 6d., and in 1853, the

first year in which any attempt was made to grow tea in Kangra, Dr. Jenkinson made the same estimate as to the cost of production. He did not know whether it could be grown for so small a sum, but the opinion at which he had arrived, from the best information he could obtain, was that it could be produced very well for ninepence per lb. The tea cultivation had generally been carried on in these provinces by military officers, who of course worked at a disadvantage. He knew one gentleman in Calcutta who had a large tea garden managed by his brother, a military officer, and who was just on the point of abandoning it, when he sent to England and obtained the services of a nobleman's gardener who came out and very soon put every thing in a prosperous condition, and the tea garden was now answering very well. Another gentleman found that a great deal of time was wasted in sifting the teas, and on sending a specification of what was wanted to Messrs. Ransome and Sims, they sent out a machine at a cost of £25 which did the work admirably. He believed it was only a question of time to make the tea cultivation eminently prosperous. As for the qualifications mentioned by Dr. Barry, they were requisite to success in any business. His own opinion was that one reason for want of success was the great ignorance prevalent on the subject. Mr. Thompson thought tea would not give any yield in cold countries, while Mr. Fortune said the finest kinds of tea were grown in China amongst the snow; that the Kangra tea was superior to that of the Kumâon, and there was no doubt of the climate being much colder. His opinion was that Kangra and Kumâon might furnish tea for upper India, but for capitalists who wished to secure dividends, Cachar and Assam were the best places for their enterprise. If, however, a young man, with a limited capital, wanted an occupation, and a pleasant climate, which would give him work to do and yield him a fair return, he would advise him to go to Kangra or Kumâon where the climate was unequalled. In conclusion he would suggest whether it would not come well within the province of the Society of Arts to offer a medal for the best essay on tea cultivation. He believed it would have the effect of eliciting the information which must be possessed by many men of intelligence in India, but which was not attainable to the general public.

Mr. Theobald said he was part proprietor of a considerable tea estate in Dherra Dhoon, which, he was sorry to say, had turned out anything but profitable, and they really considered that all the capital they had employed was virtually sunk. The Dhoon was a large tract of country of as great fertility as any in India, and within the last 35 years had been cleared from forests and jungle. There were several tea gardens and various properties in the Western Dhoon, and when he was there some few years ago he inquired respecting them, but the general opinion seemed to be that they gave great promise at first, but ended in disappointment afterwards. The Dherra Dhoon Company started some years ago with a large capital, in £10 or 100 rupees shares, but they fell to 50, 40, 30, 20, and, by the last quotation, he saw they were down to three rupees, or 6s. per share, the nominal value being £10. He did not know what was the cause of this failure in that district, whether the growth was slower, or because the rainfall was more uncertain, but such was the fact. The portion in which he was interested was at the eastern side of the country, which had not yet been cleared, but was in great part, even yet, jungle, and, therefore, they had to contend with that disadvantage. Their first failure arose from white ants, and the next from the scarcity of rain. The Dhoon was about 1,900 or 2,000 feet above the level of the sea, and formed nearly a perfect plain; and his own opinion was that some years' cultivation and expenditure of capital and labour upon it would be necessary before the land would be fit for tea cultivation. One of his partners had some property in Kangra, and in a letter he had lately received from him he stated thus:—"I have about 100 acres in the Kangra Valley, and this year I expect to realise about £300, after paying all expenses. I have only a native superintendent, at 20 rupees a month. He makes very fair green tea, which he sells to the natives on the spot for one rupee and two annas a lb., equal to 2s. 3d. a lb., and has no expense for putting it in boxes or transmitting it. I think this is far better than making for the home market." There was no doubt that if tea could be produced cheaply in India it would meet with a very ready sale. He had paid a great deal of attention to the question, and his firm conviction was that it could be made to pay. Mr. Bainbridge's estimate was that land first under cultivation would produce 220 lbs. weight per acre; the Tea Commission stated that the produce of three maunds, or equal to 240 lbs. an acre, might be expected, but he believed that both these estimates were much under the mark. In 1867, the directors of the Assam Company, who were, of course, well-informed in the history of their own gardens, said that in the next year they expected to produce a million and a-half lbs. from their 5,000 acres, which would be equal to 300 lbs. per acre. Now, the difference between 220 lbs. an acre and 300 lbs. would make all the difference between barely meeting expenses and paying a fair profit, and he had every reason to believe that the production of the Assam Company had been much higher than that stated, reaching nearly to 500 lbs. an acre, whilst a letter had recently been addressed to the Tea Commission, stating that, with the aid of manure, 600 lbs. an acre might be produced. The Zoohrat Company in one year produced 400 lbs. per acre, although, owing to the inferior quality of the tea, their enterprise was not commercially successful. The experience of the Assam Tea Company was very much like that of many other companies—a comparative failure until within the last few years; for the capital that was now called up had all, he believed, been called up in the first 13 years of their existence, and during that time they only paid a dividend of three quarters per cent., and he believed a portion of that was paid out of capital. On the same principle, with perseverance, other companies might be expected to prove remunerative.

Sir Charles Trevelyan, K.C.B., said he attended the conference to a great extent as a matter of curiosity, having no modern experience on the subject to communicate. He saw the first germ of what was now being discussed when a young civilian at Calcutta many years ago, when he was appointed by Lord William Bentinck, in the last few months of his administration, one of the members of the Tea Commission, for the purpose of inquiry into the practicability of growing tea in British India. The first thing they did was to send out circulars to all parts of the country, asking for information, but the utmost they ventured to ask was, whether any plants of a cognate character were grown in the neighbourhood, which would hold out some hope that tea might be cultivated. The answers read were various, but from Upper Assam they read the extraordinary reply that tea itself was growing there in whole forests, and although this could hardly be believed at first, further inquiry only proved the correctness of the statement. A Scientific Commission, as it was called, was organised to go and investigate the matter on the spot, and they found, as it had been stated, that the tea plant was growing in Upper Assam in ancient forests, and he understood that even to this day the tea plants in Assam were of a strong, wild nature, and produced tea of a very strong character, while the finer and more delicately flavoured kinds had to be produced from imported plants. He recollected that one of the suggestions made to Lord William Bentinck at that time was, that he should establish an agricultural school, but his reply was that the instruction given in such places was very exceptional even in England, and that the best agricultural school in India would be the establishment of indigo plantations, and the settlement of Europeans in the country. The first great requisite in tea cultivation was an absolutely secure tenure of land; nothing less would suffice, but it should be remembered that there

were two ways of securing this—either purchasing land out and out by the lump sum, or by paying a certain fixed quit rent. The latter plan had been adopted in the Madras Presidency, and it had many advantages—the government were secure of a fixed annual revenue, and the planter was not called upon to cripple himself at the outset of his labours. In Bengal and Assam the Government had required that the land should be purchased out and out by the payment of a lump sum, but that was not found to answer so well, and, ultimately, a variation had been introduced by allowing it to be paid for by instalments; but even this was not so beneficial in his opinion, as a system of a fixed quit rent. The next Government requisition of course was labour. He recollected Mr. Jordan, a member of the firm in Calcutta, being sent to bring over some Chinese labourers, but he did not think that, on the whole, the experiment answered, partly, perhaps, from difference in climate, and partly because the wages were so low as not to offer them a sufficient inducement. There was an abundant supply of labour in India itself, if it could be made available. There were large classes there who would emigrate to any part where labour was required if only their confidence could be secured, and a sufficient pecuniary inducement held out to them. Great exertions had been made by Sir John Lawrence's Government to bring about that state of things, which was beneficial both to the coolies and to the planters, but there was still room for greater efforts in that direction. In his opinion, all the indications pointed to the conclusion that the tea cultivation would ultimately prove a great remunerative industry in India. In the first place excellent tea could be grown; and in the next place, there was an unlimited demand for it, not only in England but in India itself, and, above all, in those extensive Tartar countries to the north, the population of which were much disposed in its favour. Of course it had to struggle, not only with the fluctuations to which all crops were liable, but with many difficulties incident to all novelties, and, of course, judgment must be exercised in the locality selected for the experiment. He doubted himself whether the Dherra Dhoon was suitable for tea production.

Mr. Williamson said he had had about 20 years' experience in Cachar, Assam, and Chittagong, having been manager of the Assam and other companies. He could not agree with all which had been said by Dr. Barry; for instance, he did not think that, as a general rule, the dishonesty of managers had affected the tea cultivation; there might be one or two black sheep, as in all other occupations, but such a cause had had no general influence on the present state of affairs. Undue speculation had, no doubt, had a prejudicial influence, but it must be borne in mind that, however exorbitant the price paid for land, that was no reason why the operations carried on upon it should not show a surplus. The main question was that of labour. He would not go so far as to say that it was the province even of a paternal government to assist in the reproduction of population, but, at the same time, considering the state of Assam, they had a right to ask for a fair emigration act. Some of the defects in that act had been pointed out by Dr. Barry, but there were others of equal importance. For instance, a minimum rate of wages (5 rupees per month) was fixed, which the planter was practically bound to pay, whether the coolie did his work or no, the onus of proof being thrown on the planter, who might have to go three days' journey to the nearest magistrate, and then he would have but a poor chance of getting back his money. Besides that, the employer was bound to provide rice at one rupee per maund, whatever might be its cost, and this sometimes occasioned a heavy loss. A great deal was heard of the misery caused by the famine at Orissa, but little or nothing of it in Assam, because the charity of the government was carried out much more efficiently, vicariously through the planters. Under a proper emigration act, with a little encouragement from government, he had no doubt that tea cultivation might yet become profitable, although he was not sanguine of ever getting 25 per cent. The population of Assam had been much reduced by the Burmese invasions, and their efficiency as labourers was still further reduced by the practice of opium eating. For a long time the growth of opium was permitted, but recently it had been prohibited, the government importing the drug and selling it; and he was sorry to say that 50 per cent. of the entire revenue was derived from this source. The consumption had, he believed, much increased of late; at any rate, the revenue from it had. Another defect in the Emigration Act was that the period of service was limited to three years, all the planters being unanimous in desiring that the term should be extended to five years. The reason assigned was, that the coolies might take service on government works at the end of three years, and thus government came into competition with the planter for the labour which he had been at the expense of importing. If a man refused to work all you could do was to imprison him, which was no disgrace or hardship, and then his contract was broken. They had a right to expect that these anomalies should be removed, and that government should encourage indirectly, if not directly, the emigration of labourers, and then Assam would become one of the most flourishing portions of India; the soil was remarkably fertile, but it required cultivation.

Sir Charles Trevelyan asked if the planters attached much importance to having a strong local authority?

Mr. Williamson said that was so, the reason being the general belief that the government of Bengal had so much work on its hands that it was incapable of properly looking after the interests of the province, but that if a Special Commissioner were appointed whose reputation and future advancement depended on his proper administration of affairs, they would have a better guarantee for their interests being protected. In reply to another question, he stated that it was the fact that the imprisonment of a coolie cancelled a civil contract, and he had known them refuse even to leave the station where they were landed, preferring to go through court, as it might be called, and then take their chance of getting a fresh bonus from another employer.

Dr. Barry said he believed the employer had a civil action against the coolie after his imprisonment, but he pleaded *in formâ pauperis*, and nothing could be got out of him, so that it came to the same thing in practice.

Mr. Arthur Hall said he had been stationed for some time in the Neilgherry Hills, and, although not much had been done there, it was clearly established that tea would grow, the plants attaining a large size, and yielding very fairly. The principal drawbacks to its cultivation were the want of proper means for preparing it for the market, and the great distance from Calcutta. Just when the matter was being taken up coffee was introduced, for which the climate was found very favourable, and it had in fact practically superseded tea. However, the fact which some had doubted was clearly established, that tea would grow well at an elevation of 6,000 feet, and the flavour was very good, very similar to the Assam. The want of labour was the great difficulty, but that was not so much felt as in Assam. Tea had also been grown on a neighbouring range called the Pulney Hills, but it was mostly sold on the spot, instead of being sent to the English market, for want of persons skilled in its preparation. At one time it was proposed to get a few Chinese, and some did come, but the experiment did not answer very well, possibly from the climate being too cold for them. The main reason, however, for the discontinuance of the tea cultivation was that coffee had taken its place. Anyone who was disposed to speculate would find a beautiful climate, and land might be got on easy terms, and with a secure tenure. There were also good roads, and a railway at the foot of the hills. It took about five years, with an expenditure of from £30 to £40 per acre, to bring tea

gardens into proper bearing. He did not know what produce per acre might be expected, nor the cost of cultivation afterwards. He should like to know if this had been calculated elsewhere?

Dr. Barry said that matter had been carefully gone into in Cachar. The cost per acre in 1868, for all expenses connected with the cultivation, was 120 rupees per acre; this year it would be about 90 rupess.

Mr. Hendricks said there was one question of great importance which had not been much touched upon, viz., whether the knowledge and use of tea as an article of diet were at all general in India. Some gentlemen had referred to the demand as unlimited, and they had been told how anxious native servants were to obtain it, but that might arise simply from curiosity. The statistics showed that it was almost impossible as yet that any general knowledge of its use had been diffused throughout India; and upon this, he believed, would very much depend the question whether its cultivation could be profitably conducted. It was not the consumption of the higher classes, but of the million which would make it remunerative. He had been much struck with the extract read by Mr. Theobald, showing that the only profitable cultivation in the district it referred to was where the product was sold on the spot, thus saving all expense of packing and transport. There had of late been some outcry as to the expense of railway transport in India, owing to the costly manner in which the railroads were constructed and it would therefore be well worth consideration, whether some cheaper system might not be devised which would not throw so heavy a burden n the producer.

Mr. Hyde Clarke said there was one economical point to which he wished to call attention. The rise of wages in India had been alluded to as an obstacle to the growth of tea; that was only part of a general rise both in the cost of labour and other things throughout the East, and although it might at first sight appear detrimental, there was another result which must not be forgotten, that the labourer, having more means at his command, would come into the market as a purchaser. There was not time to go into the matter in detail, but when, at his request, the land question in India was brought before the House of Commons by the late Mr. William Ewart, he had much pressed upon him that a land and emigration system was needed. At the present day instead of having a system which encouraged the migration of labour and a proper supply of land for the improvement of the country, the result was to restrict both. He was sorry they had not been able to hear Mr. Login on the question of roads, but certainly something more ought to be done in India than was going on at the present time in that direction. In conclusion he regretted that the discussion had not brought out more fully the immense moral and social advantages which would result to India from the settlement of European planters.

The Chairman said Mr. Fielder's paper had elicited a most useful and interesting discussion, the result of which it would be almost out of the question for him to attempt to summarise. It had been carried on with reference to almost all the provinces by gentlemen thoroughly well acquainted with the subject, and the general opinion—differing from that of Mr. Bainbridge, who thought that tea could not be produced under 1s. 7½d. per lb., which would exclude it from the English market—was that the cultivation might be carried on at a profit. Dr. Barry was very sanguine, and not unnaturally so considering that he had succeeded in making 25 per cent. by the speculation. All persons agreed that the great desideratum was more labour and better roads, and it was suggested that the Government had a fund at their disposal, which might properly be applied to this purpose. He was glad to hear that the prospects of the tea cultivation in Dherra Dhoon were improving, especially as he was the first person to plant tea seeds in that district many years ago, from seeds supplied by the late Dr. Wallich, from plants grown from Chinese seed. They grew admirably 7,000 feet above the level of the sea, and four years afterwards very good tea was made from the plants. After this had been proved, however, it took ten years before any one was willing to risk a farthing in tea cultivation; and then, when speculation spread all over the world, there was such a rush that the thing was overdone, and many were ruined. He did not, however, believe that the past history of the tea cultivation was any criterion for the future. When they began they were utterly ignorant of both the method of making tea and of the value of land. He knew a company which started with the purchase of 40,000 acres, not more than one-tenth of which could possibly be cultivated, and the same ignorance was displayed in other matters. The climate and soil of India were both well suited to the growth of tea, and there was plenty of labour, if it could only be made available, and when these advantages were followed up by European intelligence and capital, they must eventually succeed, and be able to compete with almost any country in the world. Although China had supplied them with tea for so many years, no European had ever seen the tea districts, or the process of manufacture; but now that Europeans were making it themselves, surely their science and skill would do as much for the improvement of that branch of industry as they had for the cultivation of indigo, jute, and other products. He saw no reason to doubt that, in time, Englishmen in India would produce far better tea than the Chinese, and if they could produce it as cheaply, they might drive them out of the market. There were boundless tracts of land at command, the whole of the Himalayas, Assam, and Bhultan, and the only question was how to manage matters economically. They must not begin by paying enormous sums for land, but must remember that the land itself was only of value when labour had been expended on it. There was one advantage, there was no export duty on tea; and in speaking of the Government, they must not forget what had been done by it at the outset. They established plantations in Assam and various other places, to show that tea could be grown, and then, as soon as the matter began to be taken up by private persons, they stepped aside and left it to them. In conclusion, he would say that the demand for tea, if it were produced cheaply, would be almost boundless; both Mohammedans and Bhuddists drank it with avidity, so that the only question was how to produce it cheaply enough to meet the wants of the million.

Mr. Henry Atherton writes:—"I can give no exact particulars regarding the tea cultivation in the Kangra district from my own experience, as I left shortly after my plants were put into the ground. My impression is that the best elevation is about 4,000 feet, but the produce will be very varied. There is the greatest difference in the soil on the Kangra Valley, and in my opinion the tea-plant has in many places been planted where the returns will be very trifling. The richer the soil and the better the cultivation, the better the returns. I had 1,000 acres of land in a very good position, but had I remained in India I should not have planted above 250 acres, my belief being that 250 acres of the best land thoroughly cultivated and manured, by the aid of cattle kept on the remaining land, which would have supplied the Kangra troops with beef, would have yielded a better return than the larger quantity. The Kangra soil and climate, at an elevation of about 3,000 or 4,000 feet, would, I think, answer for silk as well as tea, but the quantity of good land available is not great, and most of that the natives hold and will never part with. The advantage settlers possess in the Kangra valley is not so much in the land as in the abundance of cheap labour, any amount of which almost is to be had on moderate terms, and nothing but just treatment is needed to secure a certain supply of labourers. In the Kangra valley the natives in my

time were eagerly taking to the tea cultivation, and by this time probably the tea leaf may be purchased in abundance, and the proper position of the European, in my opinion, is that of manufacturer; a large tea plantation cannot be well overlooked, and carelessness in gathering the leaves may cause great injury. Men paid by the quantity gathered will strip the branches instead of carefully picking each leaf. I have no interest in any tea plantations, and I know not what the prospects may now be. I used to calculate that after three years a return of 20 per cent. might be looked for on the capital invested. I am convinced that there is no such field as India for the investment of capital, but I would not follow the plan adopted by Europeans of endeavouring to be growers as well as manufacturers. I would adopt the native zemindary plan; locate people on the land; get them to grow whatever paid them best, and for which the land was best adapted, and purchase the produce. When the Europeans own the land, there is no danger whatever in making advances, and just treatment will cause thousands to come on your land for protection. Had I remained in Kangra I could have had my land covered with people, whose payments for locations would have paid me better than by tea cultivation. When I resigned the service, the Chepul people wanted me to take land in Oude, and thousands would have gone to settle under me could I have afforded to take them. The success of all measures for the cultivation of the land in India depends on the conduct of the manager and the treatment of the people. There are no people in the world so easily managed as the Hindoos, and thousands from Behar might now be taken to the waste lands in central India to the certain advantage of all parties. Had I £10,000 I should be disposed to go back to India, for my heart is in the country, and nothing would so delight me as to go back as the agent of a company taking up land in Central India. I would return to Chepul. and soon collect men to form a community. I would have a cattle farm, and take particular care not to have a single young fellow on the property, unwilling to treat the natives as fellow men."

Mr. John C. Wilson writes:—"In reference to the important discussions on the above subject which have just taken place in the Society's rooms under its auspices, I wished to state to the meeting on the 16th, as a colonial engineer (but I had not the opportunity of doing so), that machinery is now available for accomplishing every operation connected with the manufacture of tea; a complete system, worked by steam power, having been lately sent out to Japan which accomplishes all the operations of drying, rolling, sifting, &c., including even the manufacture of the boxes. This fact not appearing to be generally known to the meeting, or, at least, to the speakers on the subject, and the use of such machinery tending to lessen the demand for that labour, and also that skill in manipulation which, as was represented, is often very difficult to be obtained, will form, I trust, an excuse for my troubling you with this note of it."

The *Times* correspondent at Calcutta, under date Feb. 23rd, writes:—"It is long since I wrote of the prospects and condition of the tea districts of North-eastern Bengal. In spite of dull trade and past complications, and under Mr. Grey's enlightened administration, they are improving. As a rule only joint-stock gardens have suffered, and from causes which are patent to all. Private gardens are, in many cases, this year yielding large incomes to their proprietors. It may be said that wherever the capital paid was not excessive (in some cases it was five and even ten times, and in many cases twice the value) there will yet be a fair return. In spite of what all here considered the ill-judged interference of the Government of India with that of Bengal, which has so delayed and complicated the settlement of the labour difficulty, the condition and prospects of the coolies are improving. The last report I have received, that of the Central Cachar Tea Company, which has suffered both from bad management and from paying too much for its gardens, states that all the time-expired coolies are gladly renewing their engagements. A very shrewd merchant, who has just returned from a careful inspection of Cachar, assures me that the labourers are prospering as they do in no other part of India. They hold land, keep stock, and can return from the day's task-work before noon, either to look after their own homesteads, or to do extra work for extra pay. Cachar, I admit, is better than Assam—it is more cultivated, it is healthier, it is nearer Calcutta, and it is recruited by small parties from the labour districts in a natural way. But even Assam is improving greatly. There is now a superior class of managers, too, on the spot, who not only have learnt to manufacture the tea, but that the comfort of the coolie is essential to a dividend."

GOVERNMENT GRANTS TO SCIENTIFIC SOCIETIES.

On Saturday, the 20th inst., a deputation from the Meteorological Society of Scotland waited upon the Right Hon. Robert Lowe, Chancellor of the Exchequer, for the purpose of urging upon the Government the claim of the Society to participate in the grant of £10,000 a-year made by Parliament to the Royal Society.

The deputation consisted of Colonel Sykes, M.P., Dr. Lyon Playfair, M.P., Mr. M'Laren, M.P., Lord John Hay, M.P., Mr. Miller, M.P., Sir D. Wedderburn, M.P., Mr. Maxwell, M.P., Mr. Mackintosh, M.P., Mr. Macfie, M.P., Major Hamilton, M.P., Mr. Robertson, M.P., Mr. D. M. Home, Chairman of the Council of the Society, and Dr. Crum Browne, a member of the Council.

Colonel Sykes, having introduced the deputation, stated that the society had 58 stations in Scotland, the observations made at each of which were forwarded to the Registrar-General of Scotland, and from the deductions made from these observations the reports of the Registrar-General were in a great degree founded. The society was supported solely by voluntary contributions. The result of its operations, however, was to confer great advantages on the public. They felt, therefore, they had a fair claim to a share of the grant made for cognate purposes, and they sought to participate in it to the extent of £300 a-year only.

Mr. Home said that of the 58 stations which the society possessed the Registrar-General had the benefit of the observations made at 55. The Highland and Agricultural Societies of Scotland were so impressed with the value of the society's work as regarded agriculture, that they were annual contributors to its funds. The society endeavoured to discover the laws which regulated the fluctuations of the atmosphere, temperature, rain-fall, also the temperature necessary for growing particular crops, &c. The bearing of meteorology upon mortality was also very important. A difference of 10 deg.—that is to say, a fall from 40 deg. to 30 deg.—produced an excess of mortality of 1,100 per month in Scotland. The society had stations at the Faroe Islands and Iceland, and the observations made were most valuable and important in tracing the progress of storms and other atmospheric phenomena. The Geographical Society, the Academy of Music, the Royal Dublin Society, and other institutions were in receipt of grants, and this society asked for a portion of the grant for scientific purposes, on account of the great public utility of its work.

Dr. Lyon Playfair said he thought it would ensure economy in the administration of the fund if £1,000 out of the £10,000 were devoted to the purpose of promoting meteorological observations at stations that would be of use to the whole country—the observations to be reported regularly to the Royal Society.

Mr. Macfie observed that not only the scientific and agricultural, but the commercial view of the question

ought to be remembered. The Government need not apprehend that there would be anything like jobbing—they were, happily, free from that in the north.

The Chancellor of the Exchequer said—The case, gentlemen, seems to stand in this way. First, as regards the grant to the Royal Society, it was made by the late Government, and it has been made in two years, and the ground on which I understand it was done was this, that there were certain meteorological inquiries which it was necessary to make, not only in this island, but in very remote parts of the world, and which it was supposed no private body would be likely to effect. On that ground alone I believe this very large sum was put upon the estimates. It was then decided that it should be put into the hands of the Royal Society, not as a voluntary institution carrying on this kind of work, but as a sort of agency for the Government, the Government feeling itself incompetent to carry on these scientific inquiries. I am not responsible for that proceeding. I do not approve of it. I think it a very bad plan for any government to select societies as their agents, and to give them large sums of money, because the tendency is to give large salaries, and they give rise to a suspicion of jobbing. I give no opinion as to the scientific object. The matter has been entered upon, and I suppose a considerable number of observations have been made. I presume, therefore, it must be gone on with. But I tell you frankly it is a thing I never would have done myself. The grant, therefore, forms no precedent, and has nothing to do with your application. That stands or falls upon its own merits, and it seems to me to be of quite a different nature. The principle you lay down is rather a large one. It is that, whenever a society is formed consisting of highly respectable gentlemen, and which pursues a scientific object, and by that pursuit confers a benefit on the public, it is a case in which Government assistance ought to be given; and you quote certain instances in which Government assistance is given. I cannot say that your instances are wide of the mark. It is hard to discriminate between your case and the case of other public societies which are receiving public money; but I am in principle opposed to all these grants, and it is my intention not to entertain any applications of this nature. We are called upon for economy. Now, the first maxim of economy is that the Government should not be called upon to do that which there is a reasonable probability people will do for themselves; and unless we lay down a rule of that kind, there is no end to the expense into which we may be led. I hold it as our duty not to expend public money to do that which people can do for themselves, and that you can do this for yourselves is very well proved by what you have told me of your proceedings, which are most honourable to you. Perhaps it is not so much for the sake of the mere money that you come here as for the sake of the recognition of Government. Now, if there is one thing I dislike more than the giving of public money, it is being prodigal of Government recognition. I really think people should be content to stand upon their own exertions and the approbation of their fellow-countrymen, without coming to the Government for its approval, as if it were wiser or more able to form a judgment upon these things than the rest of mankind. It is far better to keep the Government within its own limits, and not to involve it in questions of this kind. The Government has no better means of acquainting itself with these scientific matters than have other people. A person may be appointed to high office in the Government who is utterly ignorant of these things, and therefore incompetent to form an opinion, and he must rely upon private opinions probably not very well founded. Therefore my own feeling goes against the system of setting up voluntary societies, pushing them to a certain point, and then coming to Government for assistance, partly in the shape of money and partly in the way of recognition. My experience of it is this, that as long as people are left to their own exertions, like your own Free Church for instance, they do most admirably well, and they make their money go far. You say you can make the money you spend go a great deal farther than the Royal Society would do. Why? Because you are a voluntary society, watched by your members, and you must give a good account to them of what you do or your subscriptions will fall off. My experience of Government grants is this. People found schools, for instance, with the greatest enthusiasm, and the greatest wish to promote the interests of education and of religious teaching; they make great sacrifices and do a great deal of most praiseworthy work, but from the moment they begin to finger Government money it seems as if it produces a revolution in their minds, and the whole object of the schools seems to be perverted from the real intention of the people who found them, and directed to the getting the greatest possible amount of Government money. Nothing impairs or relaxes the efforts of voluntary societies more than the receiving of Government money, and I really believe that if I were to give you £300 I should be doing you the greatest unkindness of which I could possibly be guilty. Your society is a most valuable one. It confers inestimable benefit on Scotland, and if Scotland cannot appreciate, and will not support you, let the thing drop until the want of your operations is felt. If, however, it can, why ask the Government to extend to you that support which you are perfectly well able, if you choose, to secure for yourselves? I hope you will excuse this lecture, but it is my intention to refuse all grants of this nature. It is not from any wish to do anything that is not agreeable to you that I make these remarks; but I wish to make you understand that it is absolutely necessary, if public economy is to be maintained, that I should decline to accede to your wishes. There really is no case for saying that England is favoured above Scotland in the matter of the grant to the Royal Society, because that grant is given for the benefit of the United Kingdom generally. The observations, whether made in England, Scotland, or Ireland, equally redound to the benefit of the three countries. Where the stations should be does not depend upon any preference for one country rather than another, but upon what, in the judgment of the persons who conduct the investigation, makes one place more desirable for the purpose than another. There is, therefore, no sort of pretence for saying that any favouritism has been shown to England in this matter. But you say that this money which is now given to the Royal Society would be better expended by not being in the hands of any single society, and you ask that I should overrule what has been decided by the Government, and break this grant up into several hands. There might be some advantage in that, as it would bring in the principle of local administration; but whether that be so or not, it is a question which has been decided by the Government, and I do not feel competent from my own knowledge, to overrule it. If it were a question between England and Scotland, I would not see large sums of money spent in England for purposes which were common to Scotland, without giving Scotland her fair share. That not being so, and this question having been decided by the Government, I think as long as the grant continues it would be unwise in this department, having no special knowledge, to interfere, and therefore it is with great regret I must decline to comply with your request.

The deputation then withdrew.

TAXES ON LOCOMOTION.

In the House of Commons on Tuesday, the 16th inst., Mr. Alderman Lawrence, in calling attention to this subject, said he should confine his remarks entirely to those taxes on locomotion which consisted of the duty levied on stage-coaches, omnibuses, and vehicles carrying passengers at a single fare, horses and carriages let out for hire by job-masters, and flys and hackney carriages

plying in the streets of our large towns. He was aware of the difficulty which a private member must have in proposing a remission of taxation, for if he did so before the financial statement was made he was told that the Chancellor of the Exchequer did not yet know with certainty what taxes could be remitted; and if he did so afterwards he was told that the financial arrangements for the year could not be varied. In the one case he was too soon, in the other case too late, and it was difficult to hit the exact time for making such a proposal. The right hon. gentleman was the fourth Chancellor of the Exchequer to whom he should have appealed for the remission of these taxes—a result which would be not only for the interests of the trade, but for the advantage of the public generally. In 1866, the First Lord of the Treasury stated that the whole subject of taxes on locomotion required to be revised, and the right hon. member for Buckinghamshire in 1867, and the right hon. member for Northamptonshire in 1868, without denying that the question deserved the attention of Government, merely pleaded their inability to take the matter in hand, as the revenue was declining and the expenditure increasing. With regard to the stage-coach duty and the duty on cabs and omnibuses, it might seem at first sight that they applied simply to the metropolis, but the fact was that every place throughout the country was affected by them. In 1844 Parliament compelled the railway companies to carry third-class passengers at one penny a mile, but Parliament never provided the means for those third-class passengers to be carried to and from the railway stations, and the duties on stage-coaches and flys remaining unaltered, the conveyance of the poorer classes from the railway stations to their towns or villages often cost as much as the fare for a long distance by the third-class in a railway train. In 1866 the duty on stage carriages was reduced from one penny to one farthing a mile, and the effect of that reduction was to increase the amount of accommodation for travellers to an enormous extent, for in 1867 the increase of mileage travelled over was 1,179,000 miles. It appeared that after the reduction of the mileage duty to one farthing, the sum paid for licenses and mileage duty was still twice as great in proportion to profits as the amount of duty paid by railways. The next duty to which he would refer was the post-horse duty. All cabs and vehicles throughout Great Britain, excepting London, were charged to that duty. In London there was a graduated scale of duty, the effect of which was that the smaller the trade the greater amount of duty was paid proportionally, because the duty diminished in proportion to the extent of the trade and the number of vehicles kept. The hackney carriage duty was confined to the metropolis, and was the most oppressive of the duties levied on locomotion. The House would scarcely credit him when he stated that, while the amount of duty paid by the proprietor of 50 horses and carriages in Birmingham or any other country town was something like £170, in London it was £962 10s. If a small trader should set up a four-wheeled waggonette and drive it twice a week to a market town, or take four or six passengers to a railway station, he would have to take out a stage carriage licence and pay the mileage and post-horse duties, and if he wanted to drive his wife and family a little way into the country he would have to pay on that one-horse carriage not less than £10 18s. He had received numerous letters from various parts of the country where persons keeping a one-horse conveyance for family use and letting it to a neighbouring tradesman had been surcharged and compelled to pay the assessed taxes and also the expenses of the appeal; and the Treasury, when applied to, answered that when the carriage was let out the customer paid the duty, and when it was used to drive the owner's family it was necessary that he should pay it. These taxes must fall most heavily on those who had only one or two carriages, and tended to prevent that locomotion throughout the country which was essential to the general comfort, health, and happiness of the people. They were not only oppressive in some districts, but perfectly prohibitory in others. They formed five or six different items of account in the revenue, and his proposal would not only simplify the accounts, but reduce the expenses of management. In 1866, when these taxes were reduced, they amounted to £427,000; in 1868 they amounted to £288,000, and at the end of March, 1869, they would only amount to only £276,000; yet the system of collection and assessment remained the same. He traced the discreditable condition of the London cabs to the unjust restrictions and imposts under which the trade laboured. Continental and even provincial cabs were far superior to those of the metropolis. Birmingham, for instance, was admirably furnished with street conveyances, but the proprietors paid less and were allowed to charge more than their London brethren. He trusted the Chancellor of the Exchequer would not follow in the footsteps of his predecessors and plead for postponement until a more convenient season. No season was so convenient as at the present. The 11th report of the Inland Revenue Commissioners, that for 1867, stated with reference to this matter:—

"We can scarcely add anything to our statement in the tenth report on the taxes on locomotion, except that we are disposed to doubt the expediency of any further alteration in the state carriage and post-horse duties short of such a measure as would allow to every man the free use of his horses and carriages unfettered by fiscal regulations."

This described the object of his motion; he wished the owners of horses and carriages to be allowed to use them or let them on hire without being subject to any fiscal regulation whatever. He accordingly moved that the House resolve itself into a committee to take into consideration the taxes on locomotion.

The *Times* of the 18th inst. in a leader says:—

"The Crimean War taught us many useful lessons, but one of the most useful appears to be forgotten. Mr. Cobden was never tired of throwing in our teeth that we were embroiling ourselves in an affair 3,000 miles off, and that distance was, indeed, one great source of embarrassment and expense. But the main difficulty was of a very peculiar character. To point the moral of the story more emphatically, let us say that Sebastopol was not exactly 3,000, but 3,005 miles away from us. Now, by dint of our Imperial strength, by the command of the seas, by an inexhaustible treasury and an unsparing profusion, we rendered 3,000 miles of this distance secure and easy. From Southampton to Balaclava we went and returned without impediment or harm, but for the odd five miles between Balaclava and Sebastopol we had made no provision, and the gap in the communication very nearly proved our ruin. It was to little purpose that we established and organized a prodigious transport service, so long as that service stopped a few miles short of its end. As a beam is only as strong as its weakest part, so our line of communication was only as good as its least perfect portion, and it was not until we had carried a railway from Balaclava to Sebastopol that we enjoyed the full benefits of the service between our own ports and Balaclava. Nevertheless, in spite of that lesson, we are exposing ourselves to precisely the same disadvantage year after year in the internal communications of these islands. We have constructed and we are maintaining costly lines of railway from one place to another, and we pride ourselves upon the facilities of locomotion which railway enterprise has created for us. But railways cannot be brought quite home to every man's door. Even from the station to the town, and still more from the station to the country village, there intervenes a distance, more or less, which goes far to neutralize all the rest of the service simply because we make it as impassable as we can. On all the means of locomotion between station and residence we place

exorbitant and crushing taxes. Cabs, omnibuses, stage coaches, post-horses, and flies are all burdened with duties so oppressive as in many instances to be entirely prohibitory. We can go almost anywhere by rail so far as the station, but the getting to or from a station is made as difficult as taxes can make it. All this occurs in a country which boasts of its sound principles of finance, and which looks with pity or derision on countries where internal transit duties are maintained as sources of revenue.

"For the fourth time within the last three years Mr. Alderman Lawrence brought this subject before the House on Tuesday evening. He stated the case so simply, and yet so forcibly, that the Chancellor of the Exchequer complimented him upon his speech. His argument, indeed, from beginning to end, was unanswerable; nor did anybody endeavour to answer it. He set the absurdity of the present system in the strongest light by a single remark. So anxious had Parliament shown itself not only to encourage railway enterprise, but to bring the benefits of that enterprise within the reach of all classes, that it compelled the companies to provide trains for passengers at a rate not exceeding a penny a mile. Having done this, however, it stopped; we may almost say it retrograded. No means whatever were provided for enabling the people to reach these parliamentary trains, but, on the contrary, duties so heavy were imposed on hired carriages of all descriptions that, in the Alderman's words, 'the conveyance of the poorer classes from the railway stations to their towns and villages often cost as much as the fare for a long distance by train. It is just the Balaclava difficulty established over again in every country parish.

"There really is not a word to say for these taxes on locomotion, except that at this moment, ill-gotten as the money may be, it cannot be spared. The duties, to make the matter worse, are unequally distributed and levied, but we do not think this point need be raised. They should be abolished altogether, as doing almost the maximum of mischief to the people, with the minimum of profit to the Exchequer. They produce a very little, and they cripple travellers at every step. The Revenue Commissioners themselves give the case up. They acknowledge plainly that there is no room for tinkering or revising, and that they cannot see their way to any further alteration 'short of such a measure as would allow to every man the free use of his horses and carriages unfettered by fiscal regulations.' The truth is the present taxes actually drive carriages off the road. Except for the duty, there might be vehicles of some kind or other within reach of the smallest or loneliest station. Any owner of a wheeled carriage might eke out his own means, and accommodate his neighbours at the same time, if the law would but allow him to do so. The thing, however, is made impossible. In most villages there is a small trader owning a horse and carriage of some description or other. Nothing would be easier or more convenient than to drive it occasionally to the market town or the nearest railway station with three or four passengers, but any man who did so 'would have to take out a stage-carriage licence and pay the mileage and post-horse duties.' Those payments could not be met except from the profits of a regular and extensive trade, such as no village or hamlet could support. The result is that over a wide extent of country the advantages of railway communication are, in a great measure, lost—this loss being endured by an active and intelligent people for the sake of £276,000 a year in a revenue of £70,000,000.

"It is a national more than a metropolitan question; but still we Londoners do suffer especially from the effects of these taxes on the cab service. Our street cabs are anything but what they ought to be, and the reason, or at any rate the excuse, given for their condition is uniformly the cab tax. It is, indeed, almost incomprehensible how taxes on locomotion could have been perpetuated so long in a country like our own. Less obnoxious duties have been attacked before now with the whole force of organized associations, but a system which fetters locomotion—that is to say, education and industry together—at every step is allowed to go on year after year, without defence, it is true, but also without alteration. Mr. Lowe frankly admitted that, whenever it again became possible to remit taxes, the taxes on locomotion would have an irresistible claim to consideration. At present, of course, there is that Abyssinian bill to pay, and a pretty mockery it seems that the money which would have enabled us to get freely and easily from one place to another at home is wanted for the expense of railways and mule roads between the Red Sea and Magdala. Transport, and nothing else, cost us all those millions, and to find them we must keep heavy taxes on the means of transport in this kingdom. It used to be prophesied or apprehended that railways would ruin all other means of communication, drive coaches out of the country, and bring hired horses and carriages within the class of unknown or forgotten things. The very reverse has happened, or would happen except for our own perversity. Many more coaches and vehicles of all sorts are wanted, and many more drivers and horse-keepers might find employment, than in any past times, if we would but allow the supply to meet the demand. Every railway station is in itself a centre of traffic, and that traffic, even in the remotest districts, would call means of locomotion into being if it were not for the obstacle of taxation. Railway reform should begin in village stables and coach-houses. There could be no 'feeders' equal to untaxed vehicles, but all this traffic we shut off by barriers erected on every road to a station. Mr. Lowe could not help himself in declining to entertain the question at present, and Alderman Lawrence knew it. It is a very common predicament, and we have often found ourselves so straitened before; but it really is not satisfactory to reflect that while for the sake of £270,000 we keep up the taxes on locomotion, we actually throw up £250,000 to abolish the tax upon pepper."

UTRECHT INTERNATIONAL EXHIBITION.

The London Committee, in connection with the forthcoming International Exhibition in the Netherlands of articles of domestic economy, held a meeting at the Mansion-house, on Friday, the 19th inst., the Lord Mayor presiding. There were present M. Everwyn, the Netherlands Chargé d'Affaires; Mr. May, Consul-General; Mr. Samuel Morley, M.P., Mr. S. Redgrave, Mr. P. Le Neve Foster, Secretary to the Society of Arts; the Rev. William Rogers, Rector of Bishopsgate; Mr. Hyde Clarke, and Mr. P. L. Simmonds. The Exhibition is to be held in August, September, and October next, and its principal object is to improve the condition of the working classes by bringing together articles of household use, furniture, dress, food, and the like of various countries, at prices combining usefulness with solidity. It was originally proposed to exhibit the articles collected in England at Guildhall, before sending them to Holland, but there being practical inconveniences in the way of that, the intended exhibition in the City of London has been abandoned. The place of exhibition in the Netherlands has been changed from Utrecht to Amsterdam, where the Exhibition can be conducted on a larger scale, in a building already in existence, specially adapted for Exhibitions and similar in design to the Crystal Palace. The jury for the Exhibition will be appointed by the King of the Netherlands, and it will be conducted by a central committee at Amsterdam, of which Baron Mackay is at the head. The Dutch railway between Rotterdam and Amsterdam will carry goods forwards and backwards free of all charges.

Within the last few weeks Mr. P. L. Simmonds, who has had much experience in Exhibitions, has, at the request of the London Committee, visited Manchester, Birmingham, Wolverhampton, the Potteries, Bolton,

Sheffield, and Nottingham, with a view to ascertain to what extent the manufacturers there would be prepared to join in the Exhibition, and at the Mansion House meeting he reported the results of his inquiries. As a rule such of the manufacturers as are disposed to send goods to the Exhibition have an objection to affix the wholesale prices to them, and have few means of knowing the retail prices. The committee thought that a reasonable objection, but were of opinion it was essential the retail prices should be affixed, so far as those could be ascertained. Eventually Mr. Simmonds was instructed to put himself in communication with the Central Committee in Amsterdam on matters of detail, and before the meeting separated a public subscription was set on foot towards carrying out the English part of the Exhibition, the Lord Mayor, as a beginning, contributing £10 10s.; Mr. Samuel Morley, M.P., £25; and the Society of Arts, £25.

Mr. P. L. Simmonds has been appointed Secretary and Manager for the London Committee, and all applications should be made to him, addressed to the Mansion House.

Fine Arts.

Pictures by the Late H. W. Phillips.—The Cosmopolitan Club have kindly undertaken the exhibition of the works of the late Mr. Phillips, a portrait painter of some repute, and an artist of general ability, recently deceased in the prime of life. The large room of the club, which is at No. 30, Charles-street, is completely filled by this collection of oil paintings and water-colour drawings, the latter consisting of a large number of very clever sketches taken during a journey in the East. Amongst the paintings are many excellent portraits of distinguished men.

International Art Exhibition at Munich.—The King of Bavaria has decided that there shall be a universal Fine Art Exhibition held this year at Munich, in the Crystal Palace of that city; it is to take place after the closing of the Paris salon, in June, in order to give French artists an opportunity of presenting their works. The prestige of Munich in matters of art is expected to give additional interest to this exhibition.

Moulins Art Exhibition.—An exhibition of pictures, sculpture, &c., is announced to take place at Moulins, France, in the months of April and May, and the directors, departing from usual custom, announce that they do not intend to award any medals but to reserve all their resources for the purchase of works exhibited.

Manufactures.

New Mixture for Tempering Steel.—A locksmith, of Mulhouse, named Herrenschmidt, claims to have discovered a mixture which is said to give to the commonest steel the grain and the temper of the finest cast metal, and, moreover, to have the power of bringing back the original quality of steel which has beeen burnt. The mixture is composed as follows:—With 16 litres of distilled water mix one kilogramme of hydrochloric acid, 19 grammes of nitric acid at 36°, 21 grammes of sulphate of zinc, and 100 grammes of tripoli. In this mixture is to be placed a piece of cast iron of the first fusion, weighing 100 grammes; when the acid mixture has acted on the iron for twenty-four hours, the composition is ready for use in the ordinary way, and it remains effective till it is all used.

Notes.

The United States Navy.—The number of vessels composing the navy of the United States is 206, carrying 1,743 guns, and manned by 8,500 seamen. Thirty-five of these vessels are of the 1st rate, 2,400 tons and upwards; 37 of the 2nd rate, 1,200 to 2,400 tons; 76 of the 3rd rate, 600 to 1,200 tons; and 58 of the 4th rate, under 600 tons. Fifty-two of these vessels are iron-clad, carrying 129 guns; 95 screw steamers, 938 guns; 28 paddlewheel steamers, 199 guns; and 31 sailing vessels, 477 guns. The European squadron has 5 ships; the Asiatic 9; the North Atlantic 6; the South Atlantic 5; the North Pacific 8; and the South Pacific 6.

Railways in Greece.—The works of the railway between Athens and the Piræus are now nearly completed, and will probably be opened for traffic towards the beginning of April.

Correspondence.

Tea Cultivation in India.—Sir,—Permit me to call your attention to the omission of the word *inefficient*, before the paragraph "Sub-managers were to be avoided," in the report of my remarks on the 12th instant. I endeavoured to explain that if sub-managers were engaged, they must be skilful and trustworthy; and that if the charges of working the estates would not allow of their expenses, in addition to those of the managers, it would be well to give natives the sub-charge.—I am, &c., Samuel Ward.

93, Cannon-street, London, E.C.

MEETINGS FOR THE ENSUING WEEK.

Mon.....Actuaries, 7. Mr. Woolhouse, "On an Improved Theory of Annuities and Assurances."
Wed ...Society of Arts, 8. Mr. E. A. Davidson, "On Technical Education, considered in relation to Female Schools."
Thur ...Linnæan, 8. Dr. Birdwood, "On the genus *Boswellia*."
Chemical, 8.
Fri .....Geologists' Assoc., 8.
Archæological Inst., 4.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb. *Delivered on 9th March*, 1869.
26. Court of Bankruptcy—General Returns.
44. Post-office (Foreign Mails)—Return.
58. Post-office (Mail Service, United States of America)—Three Contracts.

Delivered on 10th March, 1869.
37. Court of Chancery (Enrolments)—Return.
52. Population, Revenue, &c.—Return.
56. India Office—Order in Council.
66. (1.) Harbour Bills—Report of the Board of Trade.
66. (2.) Harbour Bills—Report of the Board of Trade.
Public Petitions—Fifth Report.

Delivered on 11th March, 1869.
12. Bill—Valuation of Property (Metropolis).
64. (1.) Committee of Selection—Second Report.

Delivered on 12th March, 1869.
41. Bill—Representative Peers (Scotland and Ireland).
55. West India Islands, &c., Relief—Account.
68. New Courts of Justice—Report by Mr. F. W. Sheilds, C.E.
70. Under Secretaryship for Ireland—Letter.
72. Fenian Convicts—Return.
75. Army—Order.
Charity Commission—First Report of the Commissioners.
Courts Martial and Military Punishments—First Report of the Commissioners.

Delivered on 13th March, 1869.
39. Bill—Municipal Corporations (Metropolis).
40. ,, Corporation of London.
69. Duchy of Cornwall—Account.
74. Asylums (Metropolis)—Returns.
Public Petitions—Sixth Report.

Delivered on 15th March, 1869.
44. Bill—Inclosure Awards (County Palatine of Durham).
46. ,, Civil Service Pensions.
64. (II.) Committee of Selection—Third Report.
67. Metropolis Turnpike Roads—Forty-third Report.
68. New Courts of Justice—Report by Mr. F. W. Sheild, C.E. (corrected copy).
71. Queen Anne's Bounty—Account.

Delivered on 16th March, 1869.

42. Bill—Civil Offices (Pensions).
49. ,, Seeds Adulteration.
65. Bridgwater Election—Minutes of Evidence.

Delivered on 17th March, 1869.

43. Bill—Representation of the People Act (1867) Amendment.
48. ,, Medical Officers Superannuation (Ireland).
0·29. House of Commons (Arrangements)—Report.
59. Army—Appropriation Account.
77. Postal Contracts—Correspondence.
Public Petitions—Seventh Report.

Delivered on 18th March, 1869.

47. Bill—Game Laws (Scotland) (No. 2).
57. ,, Lord Napier's Salary.
63. Woods, Forests, and Land Revenues—Abstract Accounts.
73. Duchy of Lancaster—Account.
76. Cattle Plague—Return.
78. Members holding Contracts (Sir Sydney Waterlow)—Report and Evidence.
81. Railway and Canal Bills—First Report.
Church Estates Commission—Eighteenth Report.
Ecclesiastical Commission—Twenty-first Report.

Session 1868.

432. (I.) Scientific Instruction—Index to the Report.

Delivered on 19th March, 1869.

50. Bill—Bankruptcy.
55. ,, Drainage and Improvement of Lands (Ireland) (Supplemental).
56. ,, Salmon Fisheries (Ireland).
57. Criminal Offenders (Scotland)—Tables.

Patents.

From Commissioners of Patents' Journal, March 19.

Grants of Provisional Protection.

Animal charcoal, cooling and sifting ground—722—G. H. T. Finzel.
Bedsteads, &c., spring bottoms for—695—H. Tylor.
Boilers—754—H. Ormson.
Boilers, &c., welding and flanging plates and tubes used in the manufacture of—758—T. Beeley and D. Hanson.
Bolts and rivets, machinery for making—659—S. Marsden.
Bottles, &c., covering or capping—3961—J. Marsh.
Buoys, &c.—379—E. W. Hawes.
Capsules—665—W. Betts.
Carding engines—678—W. S. Meldrum.
Casks, &c., tilts for—715—I. Hudson.
Cattle trucks, &c., supplying water to—653—D. Sword.
Cigar cases, &c.—750—W. E. Newton.
Chess and cribbage board combined—706—W. Saunders and C. Smith.
Chlorine, manufacturing—732—W. Weldon.
Clipping apparatus—671—H. Knight.
Clocks—698—H. W. Cook.
Concrete, manufacturing and mixing—736—C., W., and J. Drake.
Corn, &c., preserving—738—G. Spencer.
Cranes—682—H. and J. Ellis.
Dressing-case and bag combined—726—W. Saunders and C. Smith.
Envelopes—685—A. M. Clark.
Fabrics, finishing textile—703—W. B. Thompson.
Fabrics, manufacturing—673—C. E. Brooman.
Fabrics, weaving ornamental—735—R. Rule.
Fire-places, utilising the heat under ordinary—468—W. Smartt.
Fluids, imparting colours to hydro-carbonaceous—744—G. Glover.
Fuel economisers—728—T. Obach.
Gas burners—730—W. R. Lake.
Gas meters, dry—712—J. J. Shedlock.
Gas meters, wet—711—J. J. Shedlock.
Gas, purifying, &c.—661—J. B. Spence.
Gas, purifying, &c.—679—J. B. Spence.
Goods or passengers, conveying from one place to another—737—F. O. Palmer.
Grain, decorticating and cleaning—740—D. Johnson.
Grates, &c., uniting the parts of—716—J. Dickie.
Hammers, operating tilt—709—W. R. Lake.
Injectors—668—C. D. Abel.
Iron and steel—699—J. P. Budd.
Iron and steel—724—J. Henderson.
Iron or steel rings, plates, &c., grinding and surfacing—697—J. A. Jaques, J. T. Oakley, and J. A. Fanshawe.
Leather, compressed—689—W. Burr.
Lifting apparatus—594—T. Moore.
Liquids, wort, &c., utilising steam or other vapours arising from the boiling of—746—J. Waddington, jun., A. Waddington, and F. Bell.
Looms—675—J. Holding.
Looms—714—H. Mason, G. Hartley, and J. Hindle.
Lubricators—686—A. Dixon.
Magic lanterns, slides for—681—T. Ross, jun.
Meat, &c., preservation of during their carriage by railway—319—W. A. Smith.
Metals, &c., drilling, &c.—691—J., J., E., and W. Pitt.
Mules for spinning—225—C. B. Parkinson, A. and J. Metcalfe, and W. H. Heald.
Mules for spinning and doubling—734—W. Knowles.
Neckties, &c., fastening the knots of—672—H. A. Bonneville.
Needles, instrument for threading—680—A. Morrall.
Oils, purifying and clarifying—694—L. M. Ruiz.
Ordnance, &c., mounting and working—3473—T. Berney.
Paper-hangings—700—R. F. Piltz and T. H. Lee.
Paper-making machines, wire cloth for—688—J. B. Rowcliffe.
Pumping and measuring apparatus—687—J. A. McElroy.
Railway trains, communication in—592—H. J. Ledger.
Rooms, &c., regulating the internal temperature of—710—R. Briggs.
Rotary engines and pumps—676—J. Loader.
Rotary motion, converting a reciprocating motion into a—707—W. R. Lake.
Sails, hanks for hoisting and lowering—683—W. G. Simon.
Screw propellers—684—R. R. Bevis.
Shears and scissors—677—R. Badger.
Signals, &c.—701—R. Turnbull and J. G. Piton.
Silk waste, &c., preparing and slivering the short drafts of dressed—752—T. Greenwood.
Soap—720—H. W. Goldring.
Spring mattresses, &c.—631—C. E. Brooman.
Stamping presses—674—W. B. Waterlow.
Steam engines, &c.—623—W. Simpson and A. Gardner.
Steam engines, &c., expansion slide-valve gear for—729—W. Walker.
Stone, dressing—704—A. Mitchell.
Studs or buttons—667—C. Tighe.
Tins or boxes for preserving provisions, &c.—67—W. E. Gedge.
Travelling with ease, speed, and safety, apparatus for—634—J. Farrington.
Tumblers, wine glasses, &c.—3616—T. G. Webb.
Turbine wheels, &c.—718—W. R. Lake.
Umbrella coverings, &c., materials applicable as—719—A. M. Clark.
Umbrellas, &c.—702—T. Baker.
Velocipedes—663—W. Macrae.
Velocipedes—708—F. F. Villepigue.
Warping and weaving machinery—692—C. Mather and W. Rossetter.
Watches, &c.—657—M. G. Cole.
Waterclosets, a self-acting back-wash chamber for—742—T. H. Harrisson.
Whip sockets—748—C. H. Cooper.
Whips—731—B. Britten.
Winding machinery employed in mines, &c.—607—W. Thomas and W. Davis.
Woollen cloths and mixed fabrics, finishing—756—G. Smith.

Invention with Complete Specification Filed.

Spinning and twisting machinery—759—W. R. Lake.

Patents Sealed.

2680. J. M. Hunter.
2902. C. Wheeler.
2921. E. W. Halliday.
2922. H. Lomax.
2924. A. Barclay.
2926. J. H. Glew.
2927. C. Heptonstall.
2929. A. M. and M. A. Wier.
2930. H. Woods.
2931. C. Hengst, H. Watson, J. B. Muschamp, and N. Wilson.
2934. E. Death and J. Ellwood.
2936. J. Fry.
2938. J. F. Wanner.
2953. H. Davey.
2955. J. Sutcliffe.
2972. R. Duncan.
2994. A. Lafargue.
3039. C. F. Galand and A. Sommerville.
3310. Q. and J. Whyte.
3660. J. Grindrod.
3831. F. Ryland.

From Commissioners of Patents' Journal, March 23.

Patents Sealed.

2941. J. Torbitt.
2944. J. Wright and W. H. Williams.
2952. P. J. E. Caron.
2954. J. H. Johnson.
2959. P. Spence.
2960. J. Petrie, jun.
2961. J. Jones and G. E. Wilkinson.
2962. G. F. Morant.
2963. V. Gallet.
2964. H. Gibson.
2965. F. B. Dœring.
2969. W. McAdam.
2971. G. A. C. Bremme.
2973. J. Robinson.
2975. J. Smith.
2978. A. M. Clark.
2983. A. V. Newton.
3008. J. D. Scally.
3018. F. A. Calvert.
3029. Z. Shrimpton.
3048. T. Garnett.
3055. J. H. Johnson.
3056. D. Marshall.
3094. H. A. Bonneville.
3101. H. A. Archereau.
3110. G. P. Grant.
3141. L. Clozel.
3190. A. Clark.
3194. W. R. Lake.
3211. J. H. Johnson.
3215. T. Forster & J. Heartfield.
3403. H. L. Bennison.
3497. A. Clark.
285. A. M. Clark.

Patents on which the Stamp Duty of £50 has been paid.

779. T. G. Ghislin.
780. W. Hutchinson & F. Jolly.
785. W. and F. Bates.
830. F. P. Warren.
837. C. Rozière.
861. W. L. and T. Winans.
935. J. J. Derriey.
1167. A. Borgnet.
853. W. Clark.
815. H. B. Barlow.
859. C. E. Brooman.
907. T. Storey and W. V. Wilson.
868. J. Erskine.

Patents on which the Stamp Duty of £100 has been Paid.

723. G. Hamilton.
744. T. Myers.
752. W. Tongue.
836. R. Boby.
841. W. L. Winans.
765. R. Wilson.
785. J. Newall.

Journal of the Society of Arts.

FRIDAY, APRIL 2, 1869.

Announcements by the Council.

Ordinary Meetings.

Wednesday Evenings at eight o'clock :—

April 7.—"On the Theory of Boiling in connection with some processes in the Useful Arts." By Charles Tomlinson, Esq., F.R.S., F.C.S. On this evening W. Bridges Adams, Esq., will preside.

April 14.—"Spain Commercially and Economically Considered." By E. M. Underdown, Esq., Barrister-at-law.

April 21.—"On Trade Marks." By W. Wybrow Robertson, Esq.

April 28.—"On the Duties of the Architect with reference to the Arrangement and Structure of a Building." By Roger Smith, Esq. On this evening Sir Digby Wyatt will preside.

May 5. "On the Formation of Industrial Settlements in our Colonies." By Col. Francis C. Maude, C.B.

FINAL EXAMINATIONS, 1869.

In order to avoid holding these Examinations on the same evenings as those of the Department of Science and Art, it has been decided to hold them, in 1869, on the evenings of

TUESDAY, the 20th APRIL,
WEDNESDAY, the 21st ,,
THURSDAY, the 22nd ,,
FRIDAY, the 23rd ,,

From 7 p.m. to 10 p.m., instead of on the 27th, 28th, 29th, and 30th April, as announced in the Programme of Examinations for 1869.

Cantor Lectures.

The Third Course of Cantor Lectures for the present Session will be "On Applied Mechanics," and will consist of Four Lectures, to be delivered by John Anderson, Esq., C.E., Superintendent of Machinery to the War Department, as follows :—

Lecture I.—Monday, April 12th.

Applied Mechanics in relation to Art and Science.

Lecture II.—Monday, April 19th.

Applied Mechanics in relation to Natural Properties of Materials.

Lecture III.—Monday, April 26th.

Applied Mechanics in relation to Natural Laws in processes.

Lecture IV.—Monday, May 3rd.

Applied Mechanics in relation to Natural Power.

Each lecture will begin at eight o'clock. These Lectures are open to Members, each of whom has the privilege of introducing two friends to each lecture. Tickets for this purpose are forwarded with this week's *Journal*.

Committee on India.

Six Conferences are now in course of being held for the discussion of the following subjects, viz. :—

Tea Cultivation in India.
Hill Settlements and Sanitaria.
Waste Lands in India.
Trade with Central Asia, Thibet, and South-Western China.
Indian Fibres.
Silk Cultivation and Supply.

The following evenings have been fixed for the remaining five conferences :—

Friday, April 2nd.
,, April 16th.
,, April 30th.
,, May 14th.
,, May 28th.

At these Meetings the chair will be taken at 8 o'clock, and the discussion will be opened by a paper.

This evening (Friday), April 2nd, a paper, "On Silk Cultivation and Supply in India," will be read by P. L. Simmonds, Esq. Dr. Forbes Watson will preside.

Members of the Society interested in Indian questions are invited to attend.

Piscicultural Committee.

On Friday evening, the 9th inst., a meeting will be held, when a paper, "On Salmon Laws and Salmon Rivers," by Dr. Wm. Peard, of Bath, will be read and discussed. The chair will be taken at eight o'clock.

Members of the Society interested in Pisciculture are invited to attend.

Subscriptions.

The Lady-day subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Thames Embankment Committee.

The third meeting of the Committee took place on Tuesday, the 23rd ult., at 11 a.m. Present—Lord Elcho, M.P., in the chair; Sir Charles Trevelyan, K.C.B., the Right Hon. Wm. Cowper, M.P., Lieut.-Col. Ewart, R.E., Messrs. Samuel Redgrave, Seymour Teulon, W. H. Gregory, M.P., George E. Street, A.R.A., Hyde Clarke, Edwin Field, C. F. Hayward, and W. R. Drake.

Mr. G. E. Street, A.R.A., commenced the proceedings by reading the following observations on Sir Charles Trevelyan's scheme—

Whether Courts and Offices should be on the same Site.

Sir C. Trevelyan agrees, with all who have studied the question, in thinking that they ought to be. He has not observed, I think, that in my plan the entrances to the offices are all from the outside of the building, so that the whole traffic to the offices is kept distinct from that going to the courts, and the internal quadrangles are consequently very free from noise. I hold this feature in my plan to be of the utmost value, and one which ought to be attended to wherever the building is placed. There would, of course, be no difficulty in so altering Sir C. Trevelyan's plan as to make roadways east and west of the building, but this would reduce his building area very largely, and bring it to about the same as that of the Carey-street site, and the great fall of the ground would make it much more difficult to make the accesses so convenient as they would be on the Carey-street site.

Whether the area of the Embankment site is sufficient for the Courts and Offices.

The large map which has been prepared from the Ordnance Survey will show that Sir C. Trevelyan's figures are not accurate, and cannot be made a basis for his conclusions. The Carey-street site, including the eastern and western approach road, is 850 feet from east to west. And it is impossible that more than 850 feet can be obtained on the south side of the Strand without taking the site of King's-college, as well as the site Sir Charles Trevelyan professes to take. The dimensions from north to south are about the same on both sites, if the front of the courts is allowed to be built in advance of Somerset-house, and in a line with the terrace below it. The Embankment site may have additional depth on the east side. This is, however, no great advantage. It is clearly much better to have a regular parallelogram like the Carey-street site than an irregular one like the Embankment site. I am also strongly of opinion that a building on the Embankment of so great length would be felt to be very tame and monotonous if it were to be a continuous line of building with no break. It ought to have some grand recesses, showing something of the internal quadrangles of the building from the river, and so giving some opportunity of obtaining striking light and shade, and good architectural effect. The object of putting the building on the Embankment being chiefly an architectural one, it is clearly absurd to think of building on so economical a system as to ignore architectural effect; and, as the architect of the building, I think I may fairly claim additional space on this site, in order to give what is asked for, a grand architectural composition on the banks of the Thames. Greenwich Hospital appears to me to offer a far finer illustration of what is required than Somerset-house; and the very fact that the latter building has an unbroken façade, seems to me to make it very desirable to aim at a different sort of effect in a building which is to be next to it, but whose lines will not be parallel with it.

A carefully prepared map of the two sites to a large scale shows clearly that if approach roads are left on the east and west sides of the building (as they must be), there is just space for a building of the area I have planned on the Embankment site. But there is no more than proper space, and Sir C. Trevelyan's estimate of an excess of 76,000 feet is evidently an entirely mistaken estimate.

Accessibility of the Site to the Public.

On this head I have only to remark that the Carey-street site is very easily reached from the Embankment by roads practicable for carriages, whilst a very slight alteration of approaches on the north of Carey-street will make the access to the building more easy from all the great railway stations — the Great Western, North Western, Midland, Great Northern, and Eastern Counties—than it would be if the building were on the south side of the Strand. Sir C. Trevelyan's scheme would bring the whole of the traffic through or under the building itself. My view is, that though the building ought to be accessible on all sides, the less it has to do immediately with vast thoroughfares the better.

Sir Charles Trevelyan has referred with approbation to the suggestions for new streets which I made in my report as one of the competing architects, and has based his calculations as to the cost of approaches upon this report. It is only right, therefore, to say that this report has never been sanctioned by the Commission, and that I have made my final plans with a view to much simpler and cheaper alterations of existing thoroughfares, and which would, I believe, be quite as satisfactory as those I originally proposed. The wants which I think ought to be provided for are, first, a better approach from the north side of London; and second, a good new thoroughfare from west to east, sufficiently near to the courts to bring people to them without being so near as to make a noisy traffic close to their walls.

The first want would be very easily met by continuing my new western approach road by a short new street running N.W. until it meets a prolongation of the western side of Lincoln's-inn-fields. It would then pass on to Holborn, over the site of Gate-street, and then on to the north of Holborn, until it intersects Southampton-row. It would then only be necessary to remove the gate on the Bedford estate in Woburn-place to give a very straight and most convenient roadway from Camden-town, by Seymour-street, to the embankment, passing just to the west of the new building.

The second approach would be even more easily made, and would give another great thoroughfare east and west from Piccadilly to the top of the Holborn-viaduct. To accomplish this, it would only be necessary to make slight alterations at the east and west ends of Great Queen-street, and to continue on the roadway on the northern side of Lincoln's-inn-fields into the wide part of Holborn. This road would give an admirable access both from the west, and from the east and north-east, would be short, and would involve very little interference with valuable property. Looking, moreover, to the very small cost of making such a street as Garrick-street, I cannot doubt that such alterations as I have proposed would be made at an extremely small outlay, whilst all of them are absolutely required for the general purposes of the City, and would not, therefore, be fairly chargeable to the new courts of law. They would have the incidental advantage of diverting much of the traffic along Chancery-lane and Carey-street, and of leaving the vast mass of chambers in and about Lincoln's-inn almost untouched, and yet easily approachable on all sides.

Sir Charles Trevelyan assumed that an alteration of the Strand opposite his site would equally be required if the Carey-street site were adopted. I do not think this would be the case. It would, no doubt, be in any case a very desirable metropolitan improvement, but my plan has been made so that it may be carried out without the slightest necessity for touching any of this block of buildings beyond what has already been applied for. The Commissioners impressed on me the necessity of so planning my building as to make such expenditure unnecessary, and this I have been most careful to do.

I do not see much advantage in the opening proposed by Sir C. Trevelyan from the eastern side of Lincoln's-inn-fields to Holborn, as it could not be continued north of Holborn.

Mr. Shields has proposed a scheme of approaches in his report to the Chancellor of the Exchequer to which I object most strongly. It is not only a very expensive scheme, but it brings all the traffic of a great main street and of a railway along Carey-street, so that there would be hardly a quiet spot in the whole building area. Moreover, the roads by Fleet-street and the Embankment give two good means of approach from the City, and I cannot think that a third main road is required, leading to the same quarter, as Mr. Shields proposes. The real want is

the communication with the north-east, which my scheme provides by means of its connection with the new street leading from Holborn by the New Cattle Market to Finsbury.

The Comparative Cost of the Two Sites.

Upon this head I have no observation to make, beyond referring to what I have just said on the subject of approaches, as to the cost of which I think Sir C. Trevelyan has formed a most exaggerated estimate. I may also observe that the experience of any architect would enable him to say that it is always more costly to build on a steep incline than on a nearly level site, and that I believe the building on the Embankment, if it is to be really worthy of its position, would cost more than one on the Carey-street site would. I agree with Sir C. Trevelyan in desiring very much to see the western side of the Law Institution somewhat altered or remodelled. Its lines are not square with the lines of my building, and though it is not so close to my front as Sir C. Trevelyan supposes, it is undoubtedly too near. It might, however, be altered, or even rebuilt, if such a strong measure were held to be desirable in connection with the new courts, at a vastly less cost than Sir C. Trevelyan estimates, and it is no nearer to my building than the buildings in the Temple would be to one on Sir C. Trevelyan's plan for the Embankment site, the nearest point being 30 feet.

The Fitness of the Strand Site on Architectural or Æsthetical Grounds.

I cannot but think that the Carey-street site has been most unnecessarily disparaged. It appears to me to have some very great advantages, which may be allowed without the slightest disparagement of the Embankment site. The ground on which it stands is so well raised above the river, that any large and lofty building erected on it ought to add enormously to the architectural effect of London in all distant views, and even in all views from the bridges. The building would stand on ground which is as high above the river as the ground on which St. Paul's stands; and we all know how magnificent an effect such an elevation produces. We have all, I suppose, recognized the misfortune under which Sir C. Barry laboured in having to build on such a site as the river side at Westminster; and, though I do not compare the Embankment site to that of the Houses of Parliament (to which it is very superior), it has to some extent the same defect when compared with the Carey-street site. As I have planned it, the building would be fairly well seen on all sides—close at hand, as well as from the distance. On the south side the Strand is so wide (no less than 220 feet at the widest part) that an admirable view of its principal front would be obtained. And it would be no small advantage that the general public would mainly keep the southern side of the Strand—as they always have done—and so would usually see the south or sunny front of the building; whilst the professional public would keep to the northern side of the Strand, and so largely relieve the crowded pavement. In contrast to this, the Strand front in Sir C. Trevelyan's plan would be on the shady as well as on the already too-crowded side of the street, and would cause additional obstruction by bringing so much additional traffic to the same side of the street. I believe the consequence would be that a very large proportion of people going along the Strand would never get a good view of the building, even if the Strand were so widened as to make any general view at all possible, whilst in any case one may be sure that so grand a width as that of the Strand in front of Carey-street is scarcely likely to be obtained, owing to the enormous cost it would involve.

If my plan is carried out in its integrity, the upper part of the great central hall would be as well seen as is the upper part of the western front of St. Paul's, and it would be seen not only from the south, but generally also from the north. The site is at a happy distance from St. Paul's and Westminster, and just where so great a city requires some striking architectural feature to relieve its monotony. The detail of architecture is better seen in near views than in distant ones, and the streets I have provided all round my building will admit of near views of every part of it. I should contemplate with considerable sorrow the adoption of any site which really involved eastern and western fronts without any thoroughfares along them (as Sir C. Trevelyan proposes); and I cannot see why, if the Embankment site is chosen, it should be saddled with this very unnecessary drawback.

The value of a site in an architect's eyes depends upon three considerations, first, its fitness for its purpose; second, its fitness for enabling everyone to study with the greatest ease all parts of the building; and, finally, the appropriateness of its surroundings. Now, as to fitness for the purpose, I cannot think the question admits of further argument. We have heard, I presume, all that can be urged in favour of the Embankment site, and beyond contest I think it has appeared that the greatest convenience of position is found in the Carey-street site. But hitherto very little has been said as to the convenience of the levels, and yet here again the Carey-street site has very great advantages. A slope of 12 feet from north to south in a space of 500 feet, is one which presents no serious difficulties in arrangement. It gives the advantage to the Judges of being able to enter the building at such a level that they will only have to rise to the level of the bench, the same height that most of them rise whenever they go to the drawing-room of the Athenæum Club, an ascent which Sir C. Trevelyan knows is not very formidable. This slope of the ground being so very moderate, I am able to make all the internal streets or quadrangles throughout the building on the same level as the Strand; and so, with the greatest economy in construction, I am able to say with no little satisfaction to those who are to occupy and use the building, that there is scarcely a working room throughout its whole extent which is in the basement. If you contrast this statement with what must happen on the Embankment site, you will see the very great disadvantage under which the latter lies. On its western side, in a length of about 450 feet, the rise is 35 feet 6 inches, and the rise from north to south is nowhere less than 30 feet. Now, one of two things must happen where there is such a rise as this. Either an enormous basement story must be constructed at vast expense, in order to raise the whole building to something like a uniform level; or a vast number of rooms must be provided in basements, which would not only be very inconvenient as regards light, but equally as regards access. I presume that Sir C. Trevelyan would agree with me in assuming that the building should be raised, so that its real base should be at about the level of the terrace in front of Somerset House; but if so, I hardly think he ought to have omitted to make some calculation of the enormous cost which such an erection would entail over and above what would be necessary on the Carey-street site. Something has been said about the difficulty of ascending to the court floor. But it has not been observed that if we assume the crowd of people to arrive by railway at the courts they will be set down in a station platform at least twenty feet below the embankment road level. Then, if the courts are placed as little as eight feet above the Strand they will have to rise an additional forty feet—in all sixty feet, or 120 steps of six inches each. It is all very well to talk of inclined planes, but it would be necessary for the architect to provide staircases, and, in spite of their inconvenience, people would no doubt use them rather than lose ground by following the lines of inclined planes. Another important element, in the question of fitness of the site for its purpose in the case of such a building, consists in the power which it gives the architect to design his building so as to prevent all unnecessary traffic through it, and to confine its use mainly to those whose business it is to use it. Few know how

much difficulty such a problem presents. I believe I have accomplished it for the Carey-street site, and in this way. I have made all access to offices on the exterior of the four sides of the building, so that the thousands of persons who daily frequent these offices will have no more inducement to enter the courts or central hall than, *e. g.*, the passengers in Chancery-lane have to go into the Master of the Rolls' Court. In the next place the offices occupying in this way all the enclosing shell of the building are separated by broad streets from the kernel, in the heart of which is the central hall, round which are grouped all the courts and the rooms connected with them. The central hall is the great difficulty. If the main entrance to it were on the Strand, every one would go into it on all sorts of excuses or occasions; and if it were level with the street, or led from one street to another it would infallibly be used as a common thoroughfare. What I propose, therefore, is to raise its floor about twelve feet above the street level, to make the entrances at the east end in Bell-yard, and at the west end into an internal quadrangle, and as I make no corresponding opening through the western side of the enclosing offices, the hall will afford no such facility to the public as to lead to its being used as a short cut or a thoroughfare.

I said that, in the second place, the fitness of a site for a building depended on whether it allowed of the building being approached and seen from all sides. And this fitness the Carey-street site undoubtedly does possess. It will have broad streets on all four sides, and, as I have shown, the levels are such that the whole of the internal streets or quadrangles are level and convenient of access. It has the great advantage also that as the ground rises from the principal front in the Strand up to Carey-street the most dignified view is obtained from the Strand. Architecture, to be really grand, must be full of interest. There never yet was a really fine building which did not possess on all sides, in every part and in every detail, something that rewarded study and examination. Thus interest is excited in every part, and each inspection discovers some new beauty. So a fine building requires not only such a position as will enable its outline and grouping to be seen from a distance, but facility of access on all sides, in order to study its detail, and to get views of it from every possible point.

Now, Sir Charles Trevelyan does not feel this, apparently, and proposes that we should make a building with two grand fronts, one towards the river, another towards the Strand, but with no side streets on the east or west; and this radical defect in his proposition would involve, if it were allowed, an amount of traffic through or under the building from the Strand to the embankment which would be intolerable. There is no reason whatever why the embankment site should be saddled with such inconveniences. If it is adopted it must be, of course, with the same precautions, and the same conveniences which are required on the Carey-street site, and, fortunately, if the whole of the ground which is said to be available is so, there would be exactly room for a building and its approaches of the same size. But there is no more than just enough room; for the 76,000 feet which Sir C. Trevelyan talks of, must, unless the building is to be a complete *fiasco*, be given up at once to eastern and western approach roads similar to those which are to be provided on the Carey-street site.

Finally, it is important that the surroundings of a great building should be worthy of it; and there seems to be every prospect that they will be so on the Carey-street site. On the west the authorities of Clement's-inn propose, I believe, to build a grand row of offices of the same length and character as my western façade, and from the designs of Mr. R. Brandon. On the north another grand mass of offices is to be built, under the equally competent direction of Mr. Waterhouse. On the east Mr. Hardwick is going to make additions to the Law Institution, and we shall rebuild a pile of offices between Chancery-lane and Bell-yard, so that the new courts will stand in the centre of a great square of new buildings, nearly all harmonious with them in character. It is a magnificent opportunity for making the greatest improvement which has yet been made in London; and, so far from the site not affording facilities, I am bound to say that it is in every respect an admirable one. No doubt an equally magnificent building could be erected on the embankment, but if I may offer an opinion, I may state that I think, looking to the curve which the river makes at this point, to the existence of a railway station on it, and to the position of the ground between the regular straight front of Somerset House and the irregular gardens and buildings of the Temple, a succession of buildings on a more moderate scale would better adapt themselves to the site, whilst several streets leading from the Strand would better serve the necessities of traffic than one. I cannot doubt that, whatever is done on the embankment will be worthy of its magnificence; and that if it does not secure the new courts of justice, some means may still be found to save it from anything which will ruin its effect. If, however, the result of the discussions on the subject were to be the removal of the courts to the embankment, I would suggest, as a necessary condition, that the Metropolitan Railway Station should at the same time be removed to the front of the Temple-garden, where it would be equally convenient, and where it would ruin no great public building.

Sir Charles Trevelyan said, with regard to the difference of level between the Strand and the Embankment, the difficulty had been got over in the case of the Adelphi and Somerset House, and, with the experience thus afforded, *à fortiori* better arrangements could be made in future. The substructure of Somerset House was merely a substructure, the arches having been converted to use by means of artificial light and ventilation, simply from the great necessity for additional accommodation; but, when built specially for the purpose, the basement of the new courts could be so arranged as to afford every necessary accommodation. Mr. Street was mistaken in supposing that he intended to put all the law offices in the basement. He proposed to provide there for jurors, witnesses, the post and telegraph, lost property, cause lists, commissionaires, refreshments, lavatories, &c.; and only for so much of the offices as Mr. Street proposes to place in the basement, as shown in his plan No. 3, which had been approved by the Commissioners. This would be so much space saved, as Mr. Street had provided accommodation for these objects above the level of the Strand. The stamping of legal documents, which forms part of the legal business of the country, might also be advantageously conducted in the same locality, so that when the solicitor's clerk has obtained his writ, or other legal document, he may go down-stairs at once and have it stamped without delay. He conceived, therefore, that the difference of level would really be a cause of economy and convenience, especially as it would enable the courts and offices to be put on the level of the Strand. He took an entirely different view of the central court from that entertained by Mr. Street, believing that its appropriate use was to act as a safety-valve, to prevent the over-crowding of the courts themselves, and to be a general rendezvous for barristers, solicitors, clients, witnesses, &c., as Westminster Hall had been from the time of the Plantagenets. Complaints were made of the courts at Westminster being crowded, but not of the Hall, and every reader of Pepys knows what a general resort it has always been for the transaction of business.

Mr. Street remarked that he did not object to the use of the central hall for such purposes, which were quite legitimate, but to its being made a thoroughfare or short cut from one place to another by people who had no legal business on hand.

Sir Charles Trevelyan said that in the Four Courts, Dublin, *La Salle des pas perdus* in Paris, and in the Parliament-house, Edinburgh, the hall was on the ground-floor; and he did not see why the courts or the central hall should be made less convenient than they would naturally be; and it would evidently be a

source of economy to be enabled to provide for witnesses, juries, parties, &c., below the level of the Strand, inasmuch as the room obtained below was saved above. The idea of traffic through the structure was altogether inconsistent with his plan. There would be a public approach to the Strand from the Embankment at Wellington-street, and another at the eastern end of the new law courts, through their basement at Essex-street; but the carriage entrances to the courts themselves would be entirely private, one on the Strand, and the other on the river front; arrangements could easily be made to prevent these from being used as public thoroughfares. There would also be an entrance on the Somerset House side which would be, as regards carriages, a *cul-de-sac*, terminating in a flight of steps towards the Embankment. On the Temple-bar side there would be another private entrance. There would be merely a private way from the Temple on one side, and from King's College, or new Lincoln's-inn, on the other. For the public it would be quite sufficient to have two north and south communications between the Embankment and the Strand, one at Wellington-street, and the other through the basement of the new building into the Strand, and so on northwards to Holborn, and, through Bedford-row, to the North Western, Midland, and Great Northern Railway stations. The Metropolitan Railway station, which at present was designed to occupy a place in front of the centre of the new building, would be removed two hundred feet to the eastward, and be placed opposite the steam-boat pier and the Embankment end of the northern lateral communication, and would be built against the terrace, forming part of one architectural design with it.

Mr. Street thought the constant passage of vehicles through the covered way would occasion a very unpleasant noise and vibration in the building.

Sir Charles Trevelyan said the roadway would not be paved with stone, but with Seyssel-asphalte or wood, so as to deaden the sound; this plan was successfully acted upon in Paris. The rise would only be 1 in 30, which was less than the rise from Charles I. statue to St. Martin's Church.

Mr. Street observed that as there were 32 feet to rise, and only about 500 feet length of road, the real rise would be less than 1 in 20.

Sir C. Trevelyan replied that the distance from the crown of the Embankment road to the crown of the Strand road is 850 feet, and the difference of level between these points is 28 feet. This gives a rise rather more favourable than one in thirty.

The Chairman remarked that 1 in 30 was the Parliamentary gradient allowed for roads over railways. Sir Charles Trevelyan seemed to assume that King's College and Somerset House would be appropriated for legal chambers; and as this seemed a very material part of the scheme, he should like to hear the data on which the supposition was founded.

Sir Charles Trevelyan said the only thing he assumed was that the courts would be placed on the Embankment; all the rest would follow. As the rise in the value and importance of Lincoln's-inn had followed the establishment of the Court of Chancery in its midst, *a fortiori* the concentration of all the Courts—Equity, Common Law, Probate, Divorce, Admiralty, and Bankruptcy—would lead to still more striking results in the same direction; and the members of Gray's-inn, which had been pronounced by Mr. Field to be dead, would be glad to see it revive on the Carey-street site, immediately adjoining to the new courts.

The Chairman inquired what provision was to be made for the public departments which at present occupy Somerset House?

Sir Charles Trevelyan said that for more than two years he assisted upon a Commission, appointed by Lord Russell's Government and continued under Lord Derby's and Mr. Disraeli's, the object of which was to arrange for the concentration of the public offices in connection with the Houses of Parliament. The report was presented last autumn, and it provided, in his opinion, very satisfactorily for accommodating at Westminster the whole of the public offices, with the exception of the Inland Revenue. At the present moment, a considerable exodus was going on from Somerset House, the greater part of the building being occupied by the Admiralty, which was now migrating to Whitehall. The Inland Revenue department was principally, if not entirely, located in the western wing, which was apart from the rest of the building, and could easily be entirely separated from it.

The Chairman asked if the Concentration Commission contemplated the vacating of Somerset-house, with the exception of the Inland Revenue Department.

Sir Charles Trevelyan said the instructions to the Commission did not include any provision for the Inland Revenue Department. But a plan which had been germinating for some time in the minds of the more advanced class of public officers was now likely to take effect, namely, that the superior direction of the Customs and Inland Revenue should be consolidated at Westminster, leaving the establishment in Thames-street to conduct the business of the Port of London, on the same footing as the Custom House at Liverpool, all the Commissioners of the two Boards being fused into one supreme direction, with secretaries, and, possibly, a deputy for the Inland Revenue and another for the Customs. It was evident that a great saving of money, and increase of efficiency would result, and that so important a financial department as this would be could only be satisfactorily conducted at Westminster, under the immediate control of the Chancellor of the Exchequer. The stamping of legal documents, as he had before remarked, might, with advantage, be carried on in the basement of the new law courts.

The Chairman asked if there was a probability of the Inland Revenue Department being removed from Somerset-house, irrespective of any question of the new courts, or the removal of Lincoln's Inn.

Sir Charles Trevelyan thought there was a great probability; but even without the removal of that department there would still be plenty of room for Lincoln's Inn at Somerset-house. On the site of King's-college alone, taking it from the Strand to the river, with the improved modes of construction now adopted, central staircases, lifts, telegraphic bells, &c., there would be accommodation for the whole of Lincoln's Inn. Then there would be the noble quadrangle of Somerset-house; and the hall, library, &c., would be much pleasanter facing the river than in their present situation. The chapel of Lincoln's Inn was a very inferior building, to which no one attached much importance, and a handsome new chapel might be built at the Embankment end of the King's-college site. Then, in addition, there would be the unfinished northern front of Somerset-house from the corner of Wellington-street to the commencement of the new law courts.

The Right Hon. Wm. Cowper, M.P., remarked that for that purpose it would be necessary to buy the houses facing the Strand.

Sir Charles Trevelyan said the property belonged to the Duchy of Cornwall, and would be of much greater value if converted into shops below and chambers above than as at present.

Mr. Gregory, M.P., asked if it were absolutely necessary that the carriage communication between the Embankment and the Strand should pass through the building.

The Chairman understood that it would be only partially under the building, with an open arcade facing the Temple-gardens.

Sir Charles Trevelyan said he proposed that it should be more or less open; but this was a matter for architects to determine; he was sure it could be done in some way.

Mr. Street said he never disputed that it could be done.

Sir C. Trevelyan contended, not only that it could be done, but that it would be both a great public convenience and a public ornament.

Mr. Field inquired how the road would be lighted.

Sir C. Trevelyan said it might be lighted from either side, but he presumed the Temple side would be preferred.

The Chairman said that evidently, whatever rooms could be built over the roadway, which, of course, would be fewer at the Strand end than the other, would be so much space saved.

Sir C. Trevelyan remarked that the two great objects which he had in view were to provide a good thoroughfare for the convenience of the public going from the Embankment to Holborn, and so on, through Bedford-row, to the three great northern railways; and, at the same time, to allow the Templars to pass on a level to and from the new courts, which they could do at Fountain-court.

The Chairman inquired whether there would be any architectural difficulty in making such a road.

Mr. Street said it would be difficult, but not impossible. His objection to such a plan was, that a considerable expense would be incurred for no adequate reason. The street could only be lighted on the side, as Sir Charles Trevelyan proposed to raise the internal streets to the level of the Strand; it would occupy the ground-floor of one side of the building from N. to S.; and would be open to the objections of, and very similar in use to, the arched street under the Adelphi. With a building 500 feet long there would be an immense number of party walls, which would require very strong arches to support their weight, so that the expense entailed would be enormous; and, in spite of the Chairman's view, any practical architect would tell him that the space really gained would be next to nothing. Moreover, they had no right to assume that the Temple would allow them the privileges as regards light, which Sir Charles Trevelyan assumed by proposing to build up to his boundary line. The best architectural arrangement would be a wide road, such as would be required, with a bridge across to the Temple if necessary. There would then be no difficulty about light or access.

Mr. Teulon remarked that an experiment had been tried, under very nearly the same conditions, at the Charing-cross hotel. At the further side there was a carriage entrance passing through the building, which was paved with wood, the greatest care being taken to so pave it as to avoid vibration as much as possible, but it was all to no purpose, and the noise and vibration were infinitely less from vehicles passing over the stones in front of the building than in going through the wooden-paved passage, in which case they were plainly perceptible up to even the third floor.

Sir C. Trevelyan said that, early in life, he had been strongly impressed with the beauty of this mode of architecture in the case of the arcade at Delhi, and he had admired it more than ever when he saw it again a few years ago. He must defend the Embankment site against the attempts which were made to dismember its territory, and he therefore protested against the idea that there was any necessity for a road at the western extremity. The one at the eastern end could be made without interfering with the building. It would be in the most convenient situation for the public midway between Waterloo and Blackfriars bridges.

Mr. Street observed that Sir Charles Trevelyan assumed throughout that King's College and Somerset House were to be obtained, and they ought to have been coloured on his map. He was glad that they now distinctly understood that Sir Charles Trevelyan proposed to raise the whole of the internal streets to the level of the Strand, which would be an artificial elevation of 30 feet.

Sir Charles Trevelyan contended that, if the law courts were built on the proposed site, all the rest would follow; there would be no expense incurred in the conversion of Somerset House and King's College into chambers for barristers; on the contrary, it would be a very profitable investment. Nothing paid better than building improved barristers' chambers and solicitors' offices, with the exception possibly of offices in a few choice spots in the heart of the City. He had no doubt that the Society of Lincoln's-inn could borrow the money on the security of the buildings at 4 or 4½ per cent., and that that there would be a return of 8 or 10 per cent. He spoke from having inquired into the rentals of various sets of chambers in the Temple and elsewhere.

Mr. Edwin Field remarked, in reference to the proposed arcade, that he understood one of Sir Charles Trevelyan's objects was that the Templars might walk into the courts on a level, but if the courts were on the level of the Strand, and the arched road led up to the same level, there must necessarily be an ascent and descent to cross the road.

Sir C. Trevelyan thought there might be a level crossing at Fountain-court.

Mr. Street said Fountain-court was only 12 feet below the level of the Strand.

Mr. E. Field said that all the difficulty would be avoided by having the courts on the first floor, which was the only proper place.

Sir Charles Trevelyan said this would increase the difficulty as to the level, because the Templars, as well as the judges and everybody else, would have to climb so much higher to get at the courts:

The Chairman remarked that this question of the arcade or open road was only a subsidiary one, and might easily be arranged when the site had been decided upon.

Mr. Cowper said he thought there must a street at the western end in order to get light and air. They could not open the windows directly on to King's College; and although it was part of the scheme that King's College should be pulled down, he did not know whether allowance had been made for the necessary vacant space.

Sir Charles Trevelyan said there would be plenty of room on the King's College site for light and air, still leaving sufficient building space to pay well for the expense of alteration. On the æsthetic aspect of the question he should like to make one or two remarks. Mr. Street appeared to object to any solid structure on the Embankment site, as he thought it would not harmonise well with Somerset House. But there were three elements to be considered, Somerset House, the Embankment site, and the Temple. Now the Temple buildings were of a particularly open character. He had suggested that the terrace of Somerset House should be extended to the end of the Inner Temple, and he understood that designs were being made for the extension of Paper-buildings, Harcourt-buildings, and Plowden-buildings down to the terrace, with ornamental façades fronting the Thames. In order to appreciate the true character of this part of the plan, he would suggest that the members of the Committee should view the site from the Temple Gardens. Looking upwards, they would see the hill crowned with a diadem of towers, the beautiful lantern tower of St. Dunstan's, and the tower of the Rolls; and, turning to the westward, supposing the new building were placed on the Embankment site, there would be the towers of Mr. Street's beautiful structure. Of these three elements, therefore, the Temple at the east-end was laid out in an open style, while Somerset House at the western end was built on a solid principle; and, no doubt, if the courts were built on the intervening space, Somerset House would be raised a story, and would become a more imposing building. There remained the question how the Embankment site was to be laid out, and on this he would quote a passage from Mr. Whitmore's interesting letter. "In truth, take it how you will, it is really a question for posterity. Few of us who are now battling it, can hope to see the judicial work of the country, or hear future trials between Saurins

and Starrs, in either of these localities. The elderly gentlemen who are so animated in the solicitor's statement will be gone, and, alas, unremembered, when this mighty fabric is reared and occupied; but their successors will have to criticize their acts and opinions. And what will those successors—that posterity—say? I wish that others like myself, were called upon to traverse the bridges that span our river between Westminster and Blackfriars. From either of these let anyone with a grain of intelligence, with a particle of taste, look upon the gap now dividing Somerset House and the Temple. Let him figure to himself this gap filled up with some appropriate continuation of Somerset-house facade, or, on the other hand, cut up into fragments, and filled with inharmonious specimens of private speculation, and what conclusion will he arrive at?"

The only remaining point was as to the shops. If the courts were placed on the Carey-street site, he agreed that it would be improper to interpolate shops into the building, because, there being, in this case, only one façade, it ought to be preserved for purely public objects. On the other hand, if the courts were placed on the Embankment site, there would be two handsome façades, the one fronting the river being much grander than that towards the Strand. No one would propose that the river front should be occupied in any other way than by architecture in the fine old English style, which would carry the mind back to Coke and Magna Charta. The eminently commercial character of the Strand, however, might well be preserved, both in the interest of beauty and utility, by the construction of shops below and chambers above. Upon this point he would quote the *Quarterly Review* for July, 1867. He did not know who was the author of the article, but it was written before any idea had been raised of altering the site from Carey-street to the Embankment:—"On this front then we would place a range of really noble houses, with shops, all life and utility, along the street; their upper stories (which might contain chambers and legal offices), enriched with delicate and varied work, and all crowned with those picturesque gables which would give us the only skyline fit for a London street, and the restoration of which is as essential to the very beginning, as to the completion of a revival in our street architecture. Let any one who doubts it give one look at the few gables still left us in London, or those at Rouen, Hanover, Frankfort, or on the Grande Place at Brussels. Such a varied line of distinct houses designed, not with symmetry of form and detail, nor yet without suitable combination and consistency of effect, if entrusted to a dozen or score of our best Gothic architects, might be made so charming a display of the beauties and capabilities of our native English style, that a swift and sweeping revolution of our street architecture would be the inevitable result." The Strand front of the law courts on the Embankment site was Mr. Street's domain, but there would be abundant scope for the genius of other architects on the other side of the Strand, and on both sides of the street between the Strand and Holborn and the three northern railways.

Mr. S. Redgrave said that mention had been made incidentally of raising Somerset House a story; he should strongly object to any such arrangement.

Sir Charles Trevelyan said he did not propose it, but he believed it would be done. The only objection made by Mr. Pennethorne was that, although the walls looked so solid, green timber had been used in them. The original design of Sir William Chambers seemed to require that there should be another story; and now that the basement had been raised by the Embankment, the building was, in fact, dwarfed to that extent.

Mr. Field was quite sure that if Somerset House were given in exchange for Lincoln's-inn, unless a Parliamentary restriction were imposed, it would be raised immediately not one but two stories; particularly as the new building could only be surrounded by chambers on three sides. The need for chambers would necessitate such addition of stories.

Sir Charles Trevelyan said there was a large available space on the northern or Strand front of Somerset House, and he thought that the public interests might safely be entrusted to the Society of Lincoln's-inn, for, in their new hall and library, they had shown that they were capable of meeting every artistic requirement.

Mr. Street said he was not responsible for the level, which was decided by the Commission, but he might mention that the *Salle des pas perdus* at Paris was on the first floor, 20 or 25 feet above the ground.

Sir Charles Trevelyan said there was a double objection to the plan as imposed upon Mr. Street by the Commission, for not only was the central hall on the first floor, but the courts would be one story higher.

Mr. Street said he believed the floor of the courts would be as nearly as possible on the same level as that of the courts in Paris.

Mr. W. H. Gregory, M.P., said the Four Courts in Dublin were on the basement floor. There was always a considerable concourse of people there, but it was no impediment to the barristers conducting their business. There were no loungers there, but there was a considerable amount of traffic.

Mr. Field said he had spent some weeks in attendance there, but it was one of the worst places in the world for witnesses; there was a constant draught. People could not stop in it in cold weather.

Sir Charles Trevelyan remarked that the nave of old St. Paul's had been a constant place of resort for similar purposes. He did not think that a great national building ought to be so arranged as to afford as little accommodation as possible to the public. With regard to the widening of the Strand, it seemed to him equally necessary or unnecessary for either plan; it was a quantity common to both. He thought it was necessary to both plans; others might deem it equally unnecessary. If anything, it was more necessary for the Carey-street, than the Embankment site, because the Carey-street site had no other good approach, whereas the Embankment site had a far better one, in addition, on the Embankment.

Mr. Field could not agree to that. There was only a distance of 22 feet from the churchyard to the wall of Sir C. Trevelyan's proposed building, and if the churchyard were thrown into the roadway there would be but 42 feet. On the other side there was plenty of room.

Sir C. Trevelyan said that the distance from the southern side of the courts, on the Carey-street site, to the railings of St. Clement Danes churchyard, with which the Commissioners did not propose to interfere, was 40 feet; and even this was obtained only by setting back the opposite portion of the building. The distance from the northern side of the courts, on the Embankment site, to St. Clement Danes Church was 50 feet, and this might be increased by setting back a portion of the opposite building in a similar manner. Sir C. Trevelyan proposed that the roadway should be carried close to St. Clement Danes Church, as in the case of the adjoining church of St. Mary-le-Strand.

The Chairman said he had understood Mr. Street to give, as one reason for preferring the northern side of the Strand, that the southern side was much more crowded; but did not that arise from want of convenient access to the north side? Would not the contrary be the case if Holywell-street and the slums were removed, and a convenient access made from Holborn?

Mr. Street believed that the embankment would be a constant feeder to the south side of the Strand, which would, in consequence, always be the most crowded. One side of most streets was constantly found more crowded than the other.

The Chairman said that probably there was always some good reason for such a state of things, and he did not think the present state of the Strand was any criterion of what it might be under different conditions.

Mr. Street said that no doubt it would be a great metropolitan improvement to take away the block of buildings between Holywell-street and the Strand, but it was not in the least degree essential to his scheme. But such a building as Sir Charles proposed would not really be seen unless the Strand in front of it were widened. On the other hand, the natural configuration of the Strand from Temple-bar to St. Clement's Church afforded ample room for seeing the buildings on the Carey-street site.

Sir C. Trevelyan said that, whatever the width of the Strand might be, it would afford equal advantage for seeing the buildings on either side of it.

Mr. Gregory remarked that a statement had been made that if the Carey-street site were not appropriated as proposed, a loss would be entailed of £400,000, which was nearly half the value. He should like to know how that fact was supported.

Sir C. Trevelyan entirely repudiated such an idea. Anyone who possessed any knowledge of the value of such land must know that such a statement was inaccurate. The cost of the Carey-street site was only £800,000, and the Council of the Law Institution assumed that there would be a loss upon that of £500,000. He was convinced, from the inquiries he had made, that chambers might profitably be built upon that site. Such investments in the Temple, in Chancery-lane, and elsewhere in the neighbourhood, had proved eminently successful, and he had no doubt that capitalists and builders would be found to take the ground off the hands of the Government at the same price which had been given for it.

Mr. Field said the Government surveyor, Mr. Pownall, who had been concerned in the purchase of this site, had written a letter, in which he stated that from the expense of laying out new roads for rebuildings, and otherwise dealing with the land, the loss would be, in his opinion, at least £500,000. He thought all persons must be guided by such an opinion as that.

Sir Charles Trevelyan said Mr. Pownall, when he made that estimate, could not have had present to his mind the supposition that the New Law Courts would be placed exactly opposite the Carey-street site.

Mr. Teulon said he had formerly had considerable experience in the purchase and resale of property, particularly when he was on the Board of the South Eastern Railway Company. He believed the loss in connection with St. Thomas's Hospital was about £300,000. That of course was in a different situation; but with reference to the Charing-cross Station, they had estimated that the arches under the station would let for 5 per cent. on the outlay, but in the result it was needless to say that this proved quite fallacious, and very few of them indeed had been let at all.

Sir C. Trevelyan said that everything depended upon the situation. The rents obtained from chambers in the Temple and elsewhere showed how extremely profitable this investment is.

The Chairman said, putting Mr. Field's objections aside for a time, and putting all the lawyers, suitors, and witnesses out of sight, he should like to ask Mr. Street a question with reference to the architectural improvement of London. Taking it for granted that a building on the Carey-street site would have a greater architectural effect on London at large, he would ask supposing the choice simply rested, as to the æsthetic improvement of London, between the Carey-street site and the Embankment, and supposing always that the former would be covered with improved buildings, such as Sir Charles Trevelyan suggested, supposing also that if the new courts were not placed on the Embankment, no other public building would be erected there, and that in the words of Mr. Whitmore, the Embankment would be cut up into fragments and filled with inharmonious specimens of private speculation—in such a case which would be most for the improvement of London, that the Embankment should be left as Mr. Whitmore described it, and that the new courts should be erected according to the present plan, with towers rising high above the surrounding buildings, or that the new hall of justice should be transferred to the Embankment? He put the question entirely disregarding any question of expense.

Mr. Street said he should like to know first of all whether that was the only alternative.

The Chairman said he wished an answer first to the question as he had put it. He wished Mr. Street to assume that there was no alternative; that the question as to the embellishment of London was between the beautiful towers they had heard of on the Carey-street site, and the transfer of the law courts to the Embankment.

Mr. Street said that, supposing the question lay between putting any great public building on that site, and allowing every little landowner to put up whatever unsightly building he thought fit, he should say unquestionably it would be very much better to put the public buildings there, but he could not admit for an instant (especially since the action which Lord Elcho had taken with reference to the Embankment westward of Waterloo-bridge) that the country would ever tolerate that that part of the Embankment should be dealt with as if it were mere private property. True, two or three sessions ago an act had been passed authorising a railway station on the Embankment, which would be, in his opinion, quite destructive of its beauty, and this had operated very strongly on his mind in considering the question of the two sites, but he hoped some alteration might yet be made in the arrangement, as, at present proposed, it appeared to him to be quite fatal to the use of the Embankment site, unless Parliament interfered to alter it.

Mr. Cowper believed the greater part of what was called the Embankment site was in the hands of the trustees of the young Duke of Norfolk, and it was not likely that they would allow any ugly or inappropriate buildings to be erected upon it.

Sir C. Trevelyan said the remaining portion belonged to three proprietors, one of whom was a timber merchant, who had informed him that, previously to the commencement of this discussion, he had intended to do away with his timber-yard, and build three houses.

Mr. Field said he conceived the work of the Committee had now proceeded so far that it was time to ask what was the question they had to determine. The question was very simple. The Chairman had, playfully and temporarily, Sir C. Trevelyan had, seriously and permanently, proposed to put the suitors in the basement of Somerset House in order to deal with the decoration of London. Was it right and fair that these jurors, witnesses, and so on, should be put into a place like the basement of Somerset House at a great expense, and that the suitors should pay for it? That was the real question, and he trusted the Committee would give a plain answer to it. He was perfectly satisfied in his own mind that somewhere or other there was a property or compensation interest at work at the bottom of this movement. He had reason to believe that large funds were forthcoming if necessary; and they had been led to understand from Sir Charles Trevelyan that he had been favoured with professional assistance. He did believe that somewhere or other there was a money vendor interest at the bottom, and that it behoved the Committee of a Society of such importance, antiquity, and social value as the Society of Arts to be very careful that they were not made catspaws of by any such parties. Sir Charles Trevelyan took up the scheme under what he might venture to call a sort of architectural intoxication. Several passages had been read from Mr. Whitmore's letter, and he would venture to add to that a few words he had just received from a gentleman who was not long ago treasurer of the Inner Temple, who had filled some of the highest offices in the law, and who, from his varied experience, having risen from the ranks, was singularly well qualified to express an opinion upon

the subject. He had been a lawyer's clerk, and was therefore well acquainted with all questions of legal convenience, and had also been a member of the Commission, and thoroughly appreciated the importance of putting the law-courts in the very centre of the law district. It was a private letter, but there was one short incidental passage bearing on this subject:—"With the law courts in hand, I should not have troubled you with a private letter, but you have invited it. I fear that between patriots on the one hand, and scheming and opinionated *dilettanti* on the other, the law courts, and suitors' fund, and the interests of the public will go to the wall." He named the writer to the Committee, and urged that when such competent judges spoke in this way every nobleman and gentleman, and especially all members of parliament, ought not to do anything to force the suitors to pay for that which would be of no value at all to them. It was useless to disguise the fact, the scheme which the Committee was invited to give its sanction to, had for its object to decorate the metropolis at the expense of the suitors, than which nothing could be more unjust. He was sorry to see there were members of parliament who seemed inclined to take this view of the subject, that there was an important metropolitan improvement, which the public would not pay for; but as a building was required for the administration of the law, which the suitors would have to pay for, they should be told if they did not abandon the site which had been already selected, and go somewhere else at a great additional expense, they should not have what they wanted at all; and that this was done in the hope that rather than that they would accede to the terms proposed. Then it was said that those who had advised the suitors were ignoramuses, and that experts (which meant those who knew nothing whatever about it) were the people who should give instructions what should be done. He did not think Sir Charles understood the difference between the chambers of counsel and the offices of solicitors; it was the former which it was so important should be immediately contiguous to the courts. It was true, as he had said, that Gray's-inn was dead as an inn of court for barristers' chambers, but it was not to be thence inferred, as it had been by Sir Charles, that Bedford-row and all the neighbouhood was obsolete as a place for attorneys and solicitors. It was essential to the speedy transaction of legal business that the chambers of counsel should be within bell-pull of the courts; and in order to obtain this on the Embankment site it would be necessary to go through all these wonderful transformation scenes which they had heard so much about, and which no one would ever see the end of. He hoped such a scheme would not receive the sanction of the Committee, particularly when there was £30,000 being wasted per annum merely for the rental of the ground which was lying idle. He had been invited to become a member of this Committee, and in doing so his only object was to protect the interests of the suitors and of the public against what had been described, by the authority which he had quoted, as the schemes of opinionated dilettanti. He did not propose to say anything on the artistic side of the question, but having lived all his life amongst artists, from the time of Fuseli, Stothard, and Flaxman, he had not been able to avoid forming artistic opinions for himself. He believed there was one infallible and invariable canon in architecture—that the highest art was the highest utility most nobly clothed. Let it once be proved that the Embankment was the most useful site, and he would take it as a thing incontrovertible that upon that site could be raised the grandest architectural design. If they went to work as Sir C. Trevelyan's scheme proposed, they would be beginning from the outside and working inwards, putting the building there first, because they wanted to fill up the Embankment, and then forcing inside that building the suitors and all connected with the bar, which was just like an army clothes' man making the uniform first and then padding the man to fit it. Of course he did not attribute any of the interested motives to which he had referred either to Sir Charles Trevelyan or to any member of the Committee, but he believed there were others behind them—wire pullers—who were in a different position.

Sir Charles Trevelyan said if he explained the nature of the advice which he had taken, it would be a sufficient answer to Mr. Field's imputations. He had consulted all sorts of people, barristers—several of whom were among his friends—solicitors, surveyors, and architects, and he did not know where else he should seek advice. The gentleman who had given him the greatest assistance in all that concerned architectural and land measurement details could not possibly, from his position, have the slightest interest in the scheme. He was a draughtsman in a public office, on a salary of £500 a-year, although, from his genius and ability, he deserved a great deal more. Sir C. Trevelyan, however, entirely repudiated the idea that architects and surveyors, or even capitalists and builders, were necessarily influenced by sinister motives. This objection seemed to have been founded upon the idea which he had put forward, that a profit would be derived from the building of new chambers and offices in suitable situations, but on this point he had consulted chiefly solicitors and barristers, architects scarcely at all.

Mr. Hyde Clarke said he had heard the sort of stories to which Mr. Field had alluded, but he had not been able to trace any solid foundation for them, and the Committee must not, from a groundless fear of being made tools of, overlook the importance of the question.

Sir Charles Trevelyan again denied that there were any improper influences at work. He had been twice assured by Mr. John Abel Smith, one of the trustees of the Duke of Norfolk, that if the site were required for public purposes no unnecessary obstacles would be thrown in the way, nor any attempt made to obtain more than a fair amount of compensation.

Mr. Gregory said he had received very numerous communications on this subject, many of which contained similar insinuations to those which had been referred to, but he had never paid any attention to them, because he felt that if dirt were thrown on one side it would on the other, and, therefore, they ought to confine their attention to the main principles of the question.

The Chairman thought that, after what Mr. Field had said, it was only due to the Committee that he should repudiate the notion that, so far as they were concerned, there was any such influences at work as had been suggested by Mr. Field. He denied this in the strongest terms. For his own part, he could only say that he had long ago given up any idea of seeing London improved, and had quite made up his mind that the embankment was going to be a bungle, when his attention being accidentally called to another part of the embankment, he had felt it his duty to introduce a deputation to Mr. Layard, and a Committee of the House of Commons had subsequently been appointed on the subject. Then Mr. Cole, who took an interest in this matter, proposed the formation of this Committee, and he had been invited to become a member of it. Soon afterwards, happening to meet Sir Charles Trevelyan, he was made acquainted with his scheme, of which previously he had been quite ignorant, having not even read the reports of the Commission. He thought Sir Charles had thoroughly investigated the subject, and that his proposal would tend to vastly improve a large portion of the metropolis, and *prima facie* it appeared that even *qua* the lawyers, if Somerset House and King's College were appropriated, everyone would be benefited, except perhaps those who had chambers elsewhere. He did not know whether the Committee would come to any definite decision, but the impression left on his mind was unquestionably that if they looked solely to the improvement of London, the plan of putting the new law courts on the Embankment

would be infinitely preferable to the other, and he had no doubt that Mr. Street would be able to erect a building worthy of the site. He thought it quite reasonable for the House of Commons to say here was a great chance which ought not to be thrown away, provided that the cost of the change of site would not be much greater, and that the inconvenience to the lawyers and suitors was not excessive. It was also to be borne in mind that those who were suitors were not so always, but were permanently members of the British public. He was not prepared to say that the new site would be inconvenient, but if it were clearly manifest that the inconvenience would be excessive, the question of improving the Embankment would have to be put on one side. On the other hand, if the inconveniences were not excessive, he himself, as a possible suitor, and as a member of the British public, would be quite content to risk the possible inconvenience, and, with a view to the embellishment of the metropolis, take what was to his mind clearly the best place and the most complete plan. These two points, the extra expense and the inconvenience, were the only possible drawbacks to the scheme. As to the architectural part of the question, Mr. Street knew perfectly well that he, or any man of genius, would be as capable of erecting a beautiful building on the Embankment as anywhere else; and as to the convenience of access, whether by means of an inclined plane or by flights of steps, these were mere matters of detail which could be easily arranged. As to the level of the courts, his own opinion was rather in favour of having them on the ground floor, as they were in Edinburgh and at Westminster, where, from his own observation during a recent celebrated trial, he did not see that any inconvenience was occasioned by the level of the courts, although he was much struck with the wretched accommodation for the jury. He thought the public ought to be as much considered as the lawyers. He did not know whether the Committee would come to any definite resolution, or whether they would pass one conditionally, subject to the question of expense, or, again, whether they would think it right to go into the question of private rights, but certainly, whatever course they might take, they would not be made the cat's-paws of anyone.

The Right Hon. Wm. Cowper, M.P., said a question of some importance had been raised as to what line the Committee should take. The Chairman rather suggested that they should only take a very partial view, and looked at what he called the dilettanti side of the question, but he did not think that such a course would be worthy of the Committee. He rather thought they ought to view the matter in its whole bearings. If they considered the new law courts to be merely an appendage to the Embankment, and if convenience and cost were to be subordinate to the embellishment of the river side, they would like to have the courts of law placed on the Embankment. He had more reason than most people for being anxious that the Embankment should be really the great ornament to the metropolis, having introduced the Act which constituted it. He thought, however, they could not take that view. He could not for a moment suppose that the courts of law were to be considered merely subsidiary to the Embankment; and if an enlarged view were taken of the architectural effect which this new building would produce over the whole of London, he could not doubt but the higher site was the better. Mr. Street had told them that some of the towers on his plan would be of the same height as the pinnacles on the western front of St. Paul's Cathedral, and would be visible wherever those pinnacles were visible. They would form striking objects of view from all the northern parts of the metropolis, from the river, and from the Embankment itself; and, although they would not be seen to so much advantage from the quay as though they stood on the Embankment, still, standing on the greater height, they would produce a similar effect to the upper portion of St. Paul's Cathedral, so that the new building on the Carey-street site would be seen as well as St. Paul's from the Embankment, and would have the advantage of being more generally seen. Then on the next point, that of convenience. There could be no doubt that whatever advantage might be gained by putting the law courts on the Embankment would be obtained at a very great sacrifice of convenience. He would not occupy time by dwelling upon that point in detail, but the general result was that the new site would be far less convenient for the administration of the law, and for all the purposes for which it was intended, than the Carey-street site. Then came the question of finance. The peculiarity of this question was that the funds were not provided from our public revenue, but from the suitors' fund, which was a chancery fund, and from the rent of court fees, which was a common law fund. These funds were limited, and could not be extended indefinitely, whereas, if Sir Charles Trevelyan's scheme were adopted a very large additional expense would be incurred. This could not be supplied from the suitors' fund, and certainly it could not be got from Government or from Parliament. The difficulties, therefore, were undoubtedly very great, and he did not think it would be wise of the Committee to put them aside, as they were, after all, the turning point of the case. Sir Charles Trevelyan, with all the ability which he had shown in endeavouring to meet every objection, had, so far as he was aware, not stated where the additional funds were to be found which were required. He need not go into the amount, but it was evident that the cost would be much greater on the Embankment site than the other, because they would have to make a very large basement, quite equal in size to that of Somerset-house. It was said that it could be utilized for the accommodation of jurors and witnesses, and for the stamping of deeds, but the space required for those purposes would be comparatively very small; about 32,000 feet would be ample, whereas the area of the central block was 150,000 feet, leaving 120,000 feet useless. which showed that this would be a very unnecessary and costly piece of building. It was admitted that it would not do for offices, and that they did not want so much space for purposes for which it would be suitable. The expense which must necessarily be incurred for carrying out other parts of his scheme would be a million of money at least. Upon all these grounds, therefore, considering the architectural effect, the convenience, and expense, he thought they must part from this beautiful dream, for beautiful it certainly was, and they were obliged to Sir Charles Trevelyan for suggesting it. It was very pleasant, but he was afraid that it was but the baseless fabric of a vision, and they had much better do what was practicable, and do it at once, which could be done if they went on with the site which had been secured. Otherwise they must postpone their work, and their grandchildren alone would have the enjoyment of the new building.

Mr. Gregory said there was one very important point in the remarks which had fallen from Mr. Cowper. He had said that the expense of carrying out Sir Charles Trevelyan's scheme would exceed by about a million that of carrying out the authorised plan; he should like to know on what data Mr. Cowper formed that estimate.

Mr. Cowper said King's College would have to be removed.

Sir Charles Trevelyan said that would be done at a profit, because the site would be covered with chambers yielding high rents.

Mr. Cowper remarked that it was a very common thing in building arrangements for people to propose a profit before it was commenced, and for the result to turn out very different to their expectations.

Sir Charles Trevelyan agreed that this was the case in reference to public buildings, but the class of structure he proposed formed the most profitable employment of capital possible.

Mr. Cowper said that people at present occupying valuable chambers would have to give them up.

Sir Charles Trevelyan said it had been admitted that Gray's-inn was already dead for legal purposes, that is, it had become useless and unprofitable for legal purposes. He contended that it would be much better to sell this property in the open market, at thirty or forty thousand pounds an acre, for the erection of houses so much needed for the lower middle-class and work-people who had been displaced by recent improvements.

Mr. Cowper said Gray's-inn was not occupied by barristers, and would not be affected by the proposed change.

Sir Charles Trevelyan said that the Carey-street site would be principally occupied by solicitors from Gray's-inn, Bedford-row, Lincoln's-inn-fields, &c., and the barristers would chiefly settle in Somerset-house and King's College.

Mr. Cowper said, when people came to occupy chambers at King's College they must leave those elsewhere, so that what was gained in one way would be lost in another.

Mr. E. Field said that the rental of all the law chambers might probably be roughly taken at half a million, and if these chambers were all brought down to the Strand the rental would be but half a million still; it would not create a new rental of half a million.

Sir Charles Trevelyan thought that, even supposing that the aggregate rent of the law chambers remained as at present, there would be a great increase of value in the direction of Gray's-inn, Staple's-inn, Jockey-fields, Bedford-row, and other obsolete legal settlements on either side of Holborn, owing to the changes which he proposed. These ancient establishments were so distant from the inns of court, as well as from the courts and offices of law themselves—whether in their present situation or on either of the new sites proposed for them—that the chambers had to be let at rates which, so far from allowing of their reconstruction according to the improved methods of the present day, barely maintain them in a decent state of repair; but if they were sold for any of the many general social purposes for which they are so much wanted, they would at once rise to their full market value, and the price obtained for them would be more than enough to provide a much larger amount of better and more profitable accommodation on the Carey-street site. This would be a real consolidation, not only of the courts and offices of law, but also of all that portion of the legal profession which ordinarily practises in them, and this consolidation would be obtained, not only without pecuniary loss, but with great pecuniary profit.

The Committee then adjourned.

Sixteenth Ordinary Meeting.

Wednesday, March 31st, 1869; The Rev. W. Rogers, Member of Council, in the chair.

The following candidates were proposed for election as members of the Society:—

Abraham, Philip B., 6, Old-square, Lincoln's-inn, W.C.
Andrews, James, 10, Northampton-park, Islington, N.
Arnott, Neil, M.D., F.R.S., 2, Cumberland-terrace, Regent's-park, N.W.
Clare, Edwin, 104, Guilford-street, Russell-square, W.C.
Cockerell, G. J., Upper Sydenham-hill, Kent.
Death, F., Woodstock-house, Hendon, Middlesex.
Fowler, William, 30, Lombard-street, E.C.
Gwynn, William James, Manor-house, Forest-hill, S.E.
Hambro, Charles J. T., M.P., 14, Cavendish-square, W.
Haynes, W. J., 9, Westbourne-villas, Forest-hill, S.E.
Kemp, Edward Owen, 7, Lincoln's-inn-fields, W.C.
Lascelles, W. H., 121, Bunhill-row, E.C.
Layard, Right. Hon. Austen Henry, M.P., 130, Piccadilly, W.
O'Neill, Lord, 19, Belgrave-square, S.W., and Shanes Castle, Antrim.
Pegram, Orlando A., 13, King-street, Cheapside, E.C.
Rabbits, W. Thomas, Selwood, Mayow-park, Forest-hill, S.E.
Ricketts, Charles R., 13, Albert-road, Regent's-park, N.W.
Seabrook, Charles, Grays, Essex.
Smith, George Mence, The Chesnuts, Bexley Heath.
Waterfield, O. C., Temple-grove, East Sheen, S.W.
Weguelin, Christopher, M.P., Ranelagh-house, Arabella-row, S.W.

The following candidates were balloted for, and duly elected members of the Society:—

Airlie and Lintrathen, Earl of, K.T., Airlie-lodge, Campden-hill, W.
Cadogan, Earl, P.C., Chelsea-house, Cadogan-place, S.W., and Nascott-house, Watford.
Collier, Sir Robert P., M.P., Attorney-General, 1, Mitre-court-buildings, Temple, E.C.
Collyer, Colonel George C., R.E., 57, Kensington-gardens-square, W.
Croft, Sir Herbert G. D., Bart., M.P., Oxford and Cambridge Club, S.W.
Cromwell, Rev. J. G., St. Mark's College, Chelsea, S.W.
Denison, Edward, M.P., New University Club, S.W.
Dodds, Joseph, M.P., Reform Club, S.W.
Egerton, Hon. Wilbraham, M.P., 67, Lowndes-sq., S.W.
Exeter, Marquis of, P.C., Engine-court, St. James's-palace, S.W.
Forster, Charles, M.P., 15, Great Queen-street, Westminster, S.W.
Hall, Arthur, 35, Craven-hill-gardens, W.
Henry, J. Snowdon, M.P., 142, The Terrace, Piccadilly, W.
Lancaster, John, M.P., 6, Strand, W.C.
Lusk, Alderman Andrew, M.P., 64, Westbourne-ter., W.
Northbrook, Lord, Stratton-park, Winchester; and Manor-house, Lee, S.E.
Russell, Earl, K.G., F.R.S., 37, Chesham-place, S.W.
Wright, Philip, 3, Kidbrooke-terrace, Blackheath, S.E.

The Paper read was—

TECHNICAL EDUCATION AS APPLIED TO FEMALE SCHOOLS.

By Ellis A. Davidson, Esq., Science and Art Lecturer to the City of London Middle-Class schools.

Having some time ago had the honour of presenting to this Society a paper on "Technical Education," I have thought that a short essay on its application in schools for females might not be deemed out of place, especially as the subject has received so very little attention in this country.

The encouragement given to the promotion of Technical Education in secondary schools, and the daily increasing feeling that the instruction in primary schools is not of a character to be of real service to the pupils in after life, lead to the hope that an alteration in our educational system is at hand, and it is in order to open up the subject for discussion, with the view of obtaining for the female portion of our population the benefit of any such improvement that I have ventured on my present task.

All who have been present at the Educational Conferences recently held, must have heard the constantly repeated question—"What is Technical Education?" and I therefore think it will save repetition of this, if I state at the onset, that by this term I understand that systematic training in the sciences on which the practical arts are based, and that in its broader and more comprehensive sense it means a sound and useful education, such as shall fit the pupil for the active duties of life, in opposition to the theoretical and mechanical routine which so often forms the sum total of the education given in our schools.

If this view of Technical Education be admitted, it follows that the earlier it is begun the better; that

questions which may be of practical use in daily life should take the place of the fabulous problems in arithmetic, &c., so often given; and that at least the soil should be broken up and prepared to receive the seeds of scientific instruction. However early may be the age at which the pupil is withdrawn from school, certainly the education may, from the very first, be such, that although elementary to the last degree, it may be sound and of such a character as to engender a love for the subject, and a spirit of inquiry which may sooner or later prove of service to the children, and enable them to start in life with some of the rough stones which might have lain in their paths removed, and furnished with the means of removing others by their own efforts.

Now it will be remarked that I have here drawn no distinction as to businesses, trades, or professions. I simply aver that education in schools should be of such a practical character as to cultivate the faculties, and develop the mental powers of the pupils, so that they may be able to grasp the higher and more intellectual branches of the work in which they may subsequently be engaged; in fact, that they may leave school fitted in some degree for the duties of daily life.

And where, in all this, is there anything that does not apply to girls equally with boys? Is it not just as necessary that the one should be educated for her position as the other? Assuredly, females of every grade have, sooner or later, to take their share in the work of life — to exercise an influence which it is impossible to overrate; and therefore, whilst we are educating our boys, who are to carry on the work of this great country in the coming period, it is our bounden duty to extend equal care to their sisters; otherwise, whilst we shall render our future men more intellectual, and qualified to elevate their positions, we shall be laying up a store of unhappiness for them, for, as they become more advanced, they will all the more require that those whom they may select as their companions in life should at least be able to appreciate their acquirements, and to sympathise with their labours.

The system of education which has until very recently existed, and which, in some cases, still obtains in ladies' and female schools, has been such as to fit a girl for the vapid conversation of an evening party, but how very few of the victims of it can speak rationally on any important subject of the day—be it art, science, politics, or literature—unless, indeed, it be the light, ephemeral matter contained in the novels or some of the periodicals; how few have been, whilst at school, so interested in any one of the studies as to desire to continue it when the "last term" is over. Music may, perhaps, form an exception to this. Young ladies do mostly prosecute this study, because it is not only pleasant to themselves, but gives pleasure to others—a trait in the character of woman which is so constantly the mainspring of her actions, and which spreads so unselfish and so refined an atmosphere over all she does. But, unless there exists in the individual mind a strong desire to excel, the music young ladies generally practise is only in character with the other branches of their education. We find but few who have been taught the principles of harmony—very few who can do more than play a given number of pieces after much practice.

But within a recent period the instruction in ladies' schools has wonderfully improved; and we find able and earnest gentlemen and professors in colleges engaged as visiting lecturers—a step which will, no doubt, in a few years, produce good results; and any one who has visited the schools of the period just past, and has seen the painfully lackadaisical manner of the pupils, would be surprised and rejoiced to see the young ladies fortunate enough to be placed in a school the principal of which has been bold enough to introduce sound scientific teaching, quite regardless of the question, "What do girls want with science?" It would amaze them to observe the interest of the pupils in geology, astronomy, natural history, physiology, perspective, model drawing, &c., when these are practically taught, and when they are embodied in the regular school studies, instead of being given as extras, or treated as mere accomplishments.

Thus far I have spoken of the schools for the daughters of the upper classes; and at the head of these must no doubt be ranked the ladies' colleges, which are no doubt doing a great work. I fear I cannot say anything favourable of the private day schools for girls of the middle classes. Kept, for the most part, by the widow or daughters of a deceased professional man, sometimes by a lady whom misfortune compels to work for a living, at others by the daughters of a tradesman, whose entire education has been received in a similar school—all being utterly untrained for, and some being grossly ignorant of, their duties. The girls, cooped in a close sitting-room of a dwelling-house, receiving just as much instruction as they can glean from the books furnished them, leave school, mentally and physically enervated, sickened of books, tired of lessons, and ignorant of every single thing that could be of service to them in life. Yet will these girls become the wives of the great mass which is daily becoming of greater importance in this country, and from whom thousands of children are to receive their earliest impressions and their home training; it is these who are to be the companions of those whom we are now striving to educate usefully; it is these who are to be the heads of thousands of the homes of England, and, as such, employers of servants, now pupils in our National Schools, receiving by far a better education than their future mistresses.

Having already treated this subject more fully in a short pamphlet, called "The Girl of the Period," a few copies of which are on the table, it is unnecessary here to enter further into its discussion.

But even in our National Schools the instruction is very far from being practically useful. It is however, zealously and honestly imparted, and if once an enlarged scheme were propounded, and the teachers were allowed to carry it out, there is no doubt that the result would be all that could be desired, and the effect on the future industrial classes would be most important.

How, then, can technical instruction be applied to female schools? in other words, what means can be taken to give to girls an education which may be practically useful to them in the various positions which they may be called on to fill, whether as wives, mistresses of houses, mothers, teachers, nurses, servants, or as workers? The question, What can females learn? will no doubt occur to some of my hearers. I do not, however, intend addressing myself specially to this point, firstly, because I can distinctly assert that, during an experience in teaching extending over twenty years, I have never found any difference in the power of receiving instruction to exist between pupils in schools of either sex, whilst the interest and the desire to learn evinced by girls have always equalled and often surpassed those of boys; and, secondly, because the question of the equality of the mental faculties of women as compared with those of man has been so often discussed, forming, in fact, a staple article for youthful members of debating societies; of chivalrous young knights anxious to win their spurs. I think, however, that whatever may be the opinion as to the equality, it will be generally admitted that there is a natural dissimilarity; that, from various reasons, the action of the female brain takes a different direction to that of the male, a beneficent ordination of an All-wise Power who has assigned special duties and spheres of action to each.

It has been wisely said, man's home is the world, woman's world is her home; but I must add that proper, and I may call it technical, education is required for the efficient discharge of the relative duties of each; and further, that as many females are compelled by the force of circumstances to make the world their home, before they have a home in which to make their world; as many have to enter the field of industrial work, it is necessary to inquire how these may be best fitted for the sphere

in which they are to be placed—how they may be best armed for the battle of life.

I purpose, then, to direct your attention to the inquiry as to the branches of study which would be most useful in our schools for females; but I must here say that I consider that the whole subject of education has not in the recent discussions been treated in a sufficiently wide or goneral sense. The "education of the people" and "primary schools" have been spoken of, but I maintain that "the people" should comprehend the whole of her Majesty's subjects, not merely the poorer classes; that the term "primary" should be allowed its proper meaning—first schools—and that these should exist either as separate schools, or as classes in other establishments for the rich and middle classes as well as for the poor, otherwise the assumption necessarily obtains that because the parents of the pupil are rich, she is independent of rudimentary knowledge; that because they can afford to pay for a handsomely-ornamented structure, proper foundations are unnecessary.

I therefore urge on all engaged in this great work of improvement the necessity for a system of practical education for girls which shall bear upon all classes of society; and that, as the Sub-Committee on Technical Education appointed by this Society have in their report proposed separate courses of instruction for the civil and mechanical engineer, the architect, the chemical manufacturer, the agriculturist, the metallurgist, the miner, the merchant, and officers in the army, navy, and mercantile marine, so might a similar sub-committee inquire into the system most advisable for the instruction of girls of every grade. This committee might form the nucleus of a board of education, so much required for this country, and might consist, not only of gentlemen, but of ladies holding leading positions in education. Such a body should propound to the world definite views on the practical education of females, should examine and grant diplomas to female teachers, should sanction certain existing text-books, and encourage the publication of others. I feel convinced that the principals of the schools for the upper classes to which I have referred would readily fall in with any well-considered plans, that many would voluntarily submit their schools for the inspection of the board of education, and would only be glad to employ teachers holding the diploma.

A scheme then is required for the practical education of each of the great sections of society—the upper, middle, and industrial—and I will endeavour roughly to shadow forth a general idea for each, but must ask the members to bear in mind that the practical education of females is not so much a mere trade question as it is one concerning the well-being of society generally; that it is not so much a problem affecting our position in Arts and Manufactures as compared with other nations, as it is one of internal improvement, of domestic happiness, and of mental and moral elevation. And as I hope at a subsequent stage of this paper to draw attention to the necessity of training teachers, I will only here urge that if we wish to rear honest, affectionate, and zealous teachers, we must educate those who are to be the mothers of our future population. These are the teachers whose privilege it is to cultivate the soil whilst pure and holy; these are the teachers whose lessons leave an impression which neither time nor circumstance can erase.

I suggest, therefore, the following subjects for instruction in girls' schools of the upper class:—

First Course.

Reading.	Outlines of the History of England.
Writing.	Elementary drawing.
Mental arithmetic.	Common things.
Ciphering.	Elementary music.
Outlines of grammar.	Plain sewing.
" geography.	Calisthenics.

Second Course.

Arithmetic.	Universal history.
English grammar and analysis	The elements of physical science.
English literature.	Elementary chemistry.
Languages.	Natural history.
Object drawing.	Music.

Third Course.

Chemistry of common life.	Physiology in regard to health.
Botany.	Natural philosophy.
Geology.	Domestic economy and accounts.
Perspective and practical geometry.	Needlework, cutting and making.
Elements of astronomy.	

It would be foreign to my purpose to offer any suggestions as to the mode of teaching any of these subjects. I would merely say that in the elementary stages the instruction should, wherever possible, be given orally, and that even in the upper course the text-books should be simple, clear, and pleasantly written, and that the lectures should be explanatory and illustrative of broad principles, so as to lead the pupils to think, to inquire, and to read further on the subject.

And thus we reach the consideration of the means to be taken for introducing scientific and practical instruction into girls' schools of the middle class. But here we are, at the outset, met by the difficulty already alluded to, namely, that little or no provision for the education of the girls of this important section of society exists. Public middle-class day schools for boys have only just been established in London; but the manner in which those for whom they are intended have availed themselves of their advantages, proves how great was the necessity which previously existed; and even now the increase of such schools is demanded.

Were anyone, whilst watching the merry throng of seven hundred boys trooping out of the admirable Middle Class Schools in Bath-street—established through the energy of our reverend Chairman—to ask, "Where are the sisters of these boys educated?" the answer would at present be difficult, but the problem is one which must soon be solved, or the girls in our national schools will be sent out better educated than the daughters of tradesmen and clerks.

Assuming, however, that such schools will be ere long established, I may state that the whole of the scheme of instruction already sketched out can, with but few modifications, be adapted to them; thus, since many of the daughters of our tradesmen, as they grow up are found useful in their fathers' business, it is necessary, in order to qualify them for this, that the subjects of arithmetic, account-keeping, and correspondence should receive extra attention, to the exclusion, if necessary, of some of the sciences comprehended in the third course. And further, that as from this class we hope to recruit our ranks of teachers in schools, resident and visiting governesses, the art of teaaching should be practised by those girls who show capability and taste for the occupation. And this might be done by allowing the elder girls, in turn, to take classes of the juniors, under the superintendence of more experienced teachers; the teaching, in this respect, would thus be absolutely technical in its character; these girls might afterwards proceed, for special instruction, to one of the training colleges, and thus middle-class schools for girls would obtain the advantage of trained teachers, now possessed by national schools only.

That properly qualified resident and visiting governesses are sadly wanted at this moment is beyond a doubt. A gentleman, who had been in communication with a highly-respectable scholastic agency, in order to obtain a visiting teacher for his daughter, received six applications. Not one of these had been in any way trained for the office. One was the widow of a deceased tradesman, who deplored that she was reduced to teach-

ing, but who knew no more of arithmetic than that she used to make out bills for her late husband. Another could "see" the pupil draw maps, but had never drawn one herself, and did not know what latitude and longitude meant. A third thought two hours a-day too much to be devoted to English subjects; she could not divine how the time could be filled up, and what would become of the accomplishments? The others had never attempted to teach, but, wishing to earn their living, they thought the occupation the lightest or most genteel they could adopt.

This proves that whatever arguments may be advanced against bringing female industry into the market to the injury of the interests of men, in this branch, at least, there is plenty of scope.

The question of the application of technical education to females must necessarily lead to some remarks on the employments fit for them, since the purpose of one should be to train for the other; and it may therefore not be considered out of place here, if I venture to suggest that the occupations to which females are trained should be such as are adapted to their sex, that clerkships in telegraph or other public offices and similar positions are without the sphere of woman's action, as tending to jar with that feminine reserve and modesty which is so characteristic of their sex, but that proper technical education will enable them to take up other branches, such as drawing on wood, wood-engraving, lithographic drawing, etching, designing, &c., which, whilst securing an honest independence, may be conservative of that delicacy which we so highly prize.

I will not here enter more fully into this subject, forming as it does a vexed question between two classes of political economists, some of whom advocate perfectly free trade for female industry, whilst others dread injury to the labour market if such were permitted; I simply say, educate, develope to the full the faculties which Providence has bestowed; and I may be allowed to repeat the words of Mrs. J. S. Mill, already quoted by Professor Houston in his admirable lecture on the emancipation of women from existing industrial disabilities. These words, in answer to the question as to what is woman's proper mission, are, "The proper sphere of any rational being is the highest which that being is capable of filling." Agreeing with this, but drawing from it conclusions different from those of the learned professor, I say, let us educate sensibly and practically; let us cultivate the intellect and the feelings; let us give to our females a knowledge of science and of art; and I am convinced that whenever they may be drawn into the arena of industry, the "girls of the period" will not bring discredit on their country.

It is, however, principally on the schools for the industrial classes that technical education can be brought to bear; and it is impossible to speak of these schools without deploring the action, nay, the very existence of what is called the "revised code." This measure compels the masters and mistresses of schools to present children of a given age for examination in a given standard; failing in this, the school (however conscientiously the teacher may have worked) loses the Government payment; and this is the more unfair, because those children who fail are in most cases such as are naturally dull, and, so far from having been neglected, have, in reality, given the teachers more trouble, and have required more of their care and attention than many of those who have "passed." But this is not the only evil resulting from the code. Technical education, of the character adapted to the locality, is thereby impeded; the teachers cannot work out their own ideas, however good they may be. They are bound to teach certain subjects up to a given standard, and this they do with a zeal and conscientiousness not surpassed by the members of any other profession, but they have not time, nor (to use the words generally applied) would it pay to introduce even the elements of the very sciences on which the industry of the locality depends.

In an admirable school, connected with one of our largest seats of industry, from which the boys are drafted into the works, where their rise is in a great degree dependent on their knowledge of mechanics, mechanical drawing, &c., no time at all can be afforded to the one, and I believe only one hour a week to the other; whilst in the girls' school the excellent mistress—a lady of many years' experience, holding the first certificates, and who is capable of giving the best instruction that a school of the kind could require in either science or art—can only squeeze in such lessons edgewise.

It is evident that this requires modification, and that the Government aid should be afforded, not by examination according to a universal standard, but that the managers should be not merely the administrators of the funds, but should in reality be the school managers; that they should draw up the scheme for the education of the pupils according to the requirements of the district; and that, when this has been submitted to the Council office, and has received the sanction of "My Lords," the payment should be made for the whole school on Her Majesty's Inspector certifying that the school is in active and proper operation, and that all the children are being honestly taught. The course of study in such a school should comprise:—

First Course.

Reading.	Arithmetic (mental and slate).
Writing.	

Second Course.

Elementary grammar.	Common things and domestic work.
Outlines of English history.	Elementary drawing.
Elementary geography.	
Vocal music.	

Third Course.

Plain needlework.	regard to health, food, and nursing the sick.
Natural history of animals and plants.	Elementary domestic chemistry, in the highest class.
Elementary physiology, in	

The last subjects form the adaptation of technical education to national schools—that is to say, they are as much portions of the future avocations the girls are to follow, as mechanics and mathematics are of that of the future engineer; and, as in addition to any other business to which the girls may be apprenticed, an immense proportion of them will become general servants, cooks, nurses, or nursery governesses, the subject of "Common Things" should form a most important branch in their course of training. Thus, under this head, instruction might be given in general domestic work, such as lighting fires, cleaning stoves, furniture, &c., making beds, cooking, waiting, &c.; and most of these may be practised in the school, or in the mistress's residence, where the school-house is attached to it. Elementary drawing should be employed not only for the study of form, but as a mental exercise as well; to induce habits of exactitude and neatness in arrangement, and as an additional language by the aid of which the nursery governess may instruct her young charges, whilst the lessons in the natural history of animals and plants will foster a love of nature and beauty, the influence of which will be refining and beneficial in every way. Elementary lessons on the chemistry of food, nursing the sick, and the management of infancy, all come under the head of an education which is to fit the girl for her duties in life.

It must be remembered that the subject of common things is not a new one, but has for many years past constituted a portion of the examinations in the training colleges for schoolmistresses; still, the teaching has not become general; and it is to be hoped that in the coming changes in the educational systems a new impetus may be given to a branch of study which is calculated to confer such lasting benefit on the children of the industrial classes.

The following questions from such examination papers show that a basis has been laid, to which further scientific and economic instruction can easily be added:—

"What direction would you give with respect to female clothing in order to the preservation of health? State and clearly explain how it is that health suffers for want of outdoor exercise, and of water for the purpose of washing the body."

"Three of the first-class girls of an ordinary national school go out to service as housemaid, nurserymaid, and kitchen maid respectively. Write down suitable directions for one of the three.

"Mention the chief vegetable and mineral poisons from which children are especially in danger; what are the respective remedies to which immediate recourse should be had?

"What diseases arising from want of cleanliness are commonly met with amongst the children of the poor? what is the proper treatment of each?

"Describe accurately the best system for teaching needlework, including the fixing and cutting out."

During the year 1854 Miss Burdett Coutts paid frequent visits to Whiteland's training school for schoolmistresses; and with that benevolent spirit in which she so constantly acts in the promotion of the welfare of her fellow creatures, that excellent lady offered prizes for teaching common things according to a scheme given in a volume since published by Mr. Hatchard, entitled, "A summary account of prizes for Common Things, offered and awarded by Miss Burdett Coutts, at Whiteland's Training Institution." This scheme received the sanction of the Bishop of London and of the Committee of Council on Education.

Amongst the subjects on which the schoolmistresses were required to write essays were:—

1. Food—Its preparation and economical use.
2. Clothes—The value of materials, cutting out, making, mending, and altering.
3. Household arrangements generally — The best means of preserving health by purifying the air in close situations, especially in times of sickness.
4. Duties of servants—Showing the duties of the cook, laundry-maid, &c.; instructions to servants in the country, especially in regard to their treatment of animals; how they can best manage and dispose of their wages, &c.
5. Management of children—Instructions to nursery maids, &c.
6. Management of the sick—The preparation of food for them, and the use of simple remedies; ventilation of the sick room, &c.

The competitors for the prizes gave lessons also, in the presence of Miss Coutts, on the following subjects:—

1. The clothing of a workman's family.
2. The general qualifications of servants.
3. Cooking.
4. Bread making. The coffee plant.
5. The duties of a daughter in attending to the care of a family supposing the sickness or death of the mother.
6. The breakfast table.
7. Washing.
8. The general duties of servants of all work.
9. Lighting a fire.
10. The duties of a nursemaid.
11. Salt.
12. Shirtmaking.
13. Sago.
14. Attendance in a sick room.
15. Dress.
16. Sweeping a room.
17. Cleaning a house.

That all these subjects are of the greatest possible importance cannot be denied, and we can only regret that such teaching has not become universal in the country. That it is very far from this is proved by the utter incompetency of most of our domestic servants and nursemaids, and the lamentable absence of economy which is so painfully obvious to all who are accustomed to visit the homes of the poorer classes. Still, to use a common expression, the narrow end of the wedge has been inserted; and such seeds as have been sown by a lady who, up to this very moment, labours for the benefit of her fellow creatures with a zeal and affectionate care which entitle her to the gratitude and respect of the whole nation, have not been cast upon barren soil. It is only required that the country at large shall with one common voice declare that the years spent at school should not be lost, but that as every day brings the girl nearer to the time when she must become a responsible actor on the great stage of life, the hours should be economised, so that each day may make her more qualified for the position she is to take.

The very circumstance of my having dwelt thus long on the subject of "common things" will I am sure protect me from censure, when I say, that common things are not all that should be taught in schools for girls. True, such knowledge will tend to making them good servants, and will teach them the economy of daily life—and great indeed will be the blessing to the country when this shall be achieved—but, of the human mind, who shall dare to say, "thus far shalt thou go and no further." And as each of these children is endowed with a mind susceptible of knowledge, I believe it to be our bounden duty to develope the intellect to its utmost capability. Of course it is right to give to each child the knowledge which will make it efficient in its station of life, but in this country no child is born a slave, bound to remain for its life in that condition; and as in this age of commerce and emigration the fathers or brothers of many of these girls are likely (at least we hope that the education we are giving them will enable them) to rise in the world, it is only fair that we should give them the rudiments of an education which, whilst it may assist them in bettering their condition by their own exertions, may at the same time prove a source of happiness to them under any improved circumstances to which they may attain. I would, therefore, teach them not only common things, but the elements of physiology, chemistry, and drawing to elevate their thoughts, to lead them to think of the grand principles of science evinced in the operations of nature which are daily going on around them; and I cannot but think that this would tend to refine their minds, and to strengthen their hearts in the love of the Great First Cause, and even in a utilitarian point of view, such higher instruction would enable those girls who can take it, to select some occupation for which they may be fitted other than domestic service.

That the teachers of schools for all classes are only longing for some system which shall release them from the thraldom of the present routine, I am convinced; nay, even in schools for the upper classes the very pupils are becoming anxious for higher and more scientific instruction.

In proof of this assertion I beg to be allowed to quote the following, extracted from an article published in the *Bayswater Chronicle* of January 30th last, headed "A Girl's Thoughts on the Education of Girls." The fair writer says:—"That education is the foundation of character, not the mere acquirement of knowledge, is a fact which is almost universally overlooked. What a woman knows is not of nearly so much consequence as what a woman is. The mere cramming of a head with knowledge as you cram a cushion with stuffing is not education. The heart must be enlarged as well as the mind, and the thoughts ennobled as well as the reasoning faculties developed.

"Almost all children consider learning a hardship, and regard it as a sort of mental rack, from which they are released with their limbs cramped and stiff, and their brains in a cloudy condition. Why? Because their life

at school consists almost wholly of lessons. Lessons are considered almost always the sum of education. Oh, if the teacher would sometimes throw aside the books that little heads have been poring over for so long, and direct their attention to the great book of nature which has been lying before them all their lives unnoticed, and from the pages of which more beauty and instruction can be gained than even from Lindley Murray, or Carpenter's spelling. The interest of children once gained, their impressions sympathised with, and they would regard their teachers as friends, not dragons. In the first place, they should be taught to love knowledge, by having it imparted to them in such a manner that they cannot fail to be interested, and afterwards, when the glory of the light begins to illuminate the darkness of their minds, they will 'grapple it to their hearts with hooks of steel' as their best and truest friend."

In conclusion, the young lady remarks in relation to the mission of the female sex, and the necessity of proper training, "They little think of the tremendous responsibility resting upon them, of the wide influence either for good or evil that they are exerting. They are founding a train of causes which will descend through all coming time. Long after they have gone to their eternal home their words and actions will be aiding in the formation of character. We cannot then arrest the causes that our lives have set in progress, and they will continue urging mortals onward in passion, sin, and woe, or elevating them to virtue and heaven for ever."

When I mention that the writer of this article is at this moment a pupil in a ladies' school, and that it was written merely as a school essay, not at the time intended for publication, it will, I am sure, be the opinion of most who have heard these extracts, that it is creditable to her intellect and feeling, and to the establishment in which she is a student.

I am fully aware that the scheme I have thus roughly sketched is likely to call forth two objections. Firstly, that the hours of attendance, and the time a girl remains at school, are too short to admit of an enlarged system of education.

That these are difficulties cannot be denied; but I think that, by a thorough revision of the hour-table, much time might be saved, some subjects being excluded altogether, and the system of teaching others being much simplified. That children remain by far too short a time at school is a real evil, the amelioration of which deserves the best consideration of all connected with education. I venture to submit, that when the parents find that, on reaching the upper classes, they are taught practically useful subjects, and in consequence obtain better places and earn higher wages than they would otherwise have done, many—at least the most sensible ones—will make an effort to allow the children to remain at school as long as possible; and further, if the school fee were reduced each year, or each time the girl is promoted to a higher class, so that when she reaches the highest she would be admitted free, an inducement would be held out which I have seen producing excellent effects in one of the best schools with which I am acquainted.

The second objection which we are likely to hear is, "You will over-educate the working classes;" but I must maintain that as the law provides that children shall not be allowed to die of hunger, so it is the bounden duty of the whole nation, as it is the best policy of the state, to give to all children the benefit of such an education as may fit them for their duties in life, and enable them to improve their condition.

I cannot but think that the term "national school" is one wrongly applied. Why should only such schools as receive eleemosynary aid be considered national? Ought not "national education" to include the whole nation? and should not such a system touch all classes of society?

We require then a complete series of public schools, for upper, middle, and industrial classes, for males and females; such schools to be governed by local boards of education, which should, to a certain extent, be responsible to a minister of education; and the law should enforce that all persons keeping private schools should hold the diploma of an examining body, should employ certificated teachers, and should conduct the school on a well-considered plan.

This system is already to some extent in operation in the schools for the poor; and are not the children of the upper and middle classes entitled to the same protection?

But, it may be said, this would interfere with the liberty of the subject; but with all due deference to the love of freedom inherent in the mind of every Englishman, I urge that liberty is only to be permitted to the individual until it becomes injurious to society, and as neither the professors of law nor physic are allowed to practice without the necessary diploma, as it is not deemed safe that we should apply for advice to a lawyer, or for relief to a medical practitioner, unless each is known to be properly qualified, it is monstrous to think that the moral welfare and intellectual progress of our children should be intrusted to those whose competency for the high and sacred duty they undertake has never been inquired into. Nor would this system affect injuriously those of the private establishments in which the teaching is already well conducted. I know from experience that the proprietors of many of these would only be glad to submit to any ordeal that could be proposed, and would join in any movement that should tend to improvement in education. This feeling has, no doubt, been fostered by the admirable working of the College of Perceptors; and when I mention that one private schoolmaster in Wales, in addition to regular systematic examinations in his school, sends up parcels of examination papers on science and art to London, paying a fee for their being reported upon, it will be seen that certainly no opposition is to be expected from heads of similar establishments, especially as this is but one of the numerous examples I could quote.

The sooner then that such movement is set on foot the better, for I feel convinced (and I am sanguine in the hope that I shall be supported in my view) that no new system of education will be of any real service in this country unless it is brought to bear upon all ranks of society, and unless it provides instruction of a sound and practical character for girls as well as for boys.

Nor are the mere subjects which are to be taught to girls the only matters which are to be considered. The reasoning and practical tone given to the mind, the general training, the regularity of habits, and the economy of daily life, are all most important in the education of those who are to be the wives of the present and the mothers of the future generation; and if we would have the influence they will assuredly exert productive of good, we must let their instruction be such as will fit them for the important positions they are destined to occupy.

It is on his mother's knee that the child, "eyes raised to heaven, and small hands folded fair," is taught to raise his voice to "Him who all things sees;" it is whilst walking at her side that he learns to turn his foot aside lest he should injure the worm, so marvellously made, and to watch the opening of the budding leaf; it is of her he asks, "What is the sun?" and to her he says, "Mother, what is there beyond the skies?" And she reads to him out of this fair book of nature, and the instruction she gives him is wrapped in veneration for that Great Power whose law, by which all around is governed, is science; and the boy starts as a student, with the best of all incentives to the acquirement of knowledge—the love of inquiry. Thus, then, does woman lay the foundation of all education, and therefore it is that I have ventured to bring this subject before the members, in the hope of calling attention to the absolute necessity of an improved system of female instruction.

The Society of Arts, to whom the country already owes so great a debt of gratitude for its efforts in promoting the education of artizans, and for the intellectual

advantages it has afforded to all classes of society, may be fairly asked to add the weight of its influence in this cause, and with such aid there can be no doubt that some methods will be devised for the promotion of Technical Education in Female Schools.

DISCUSSION.

Mr. Hyde Clarke said, the very clear and able statement which had been put forward by Mr. Davidson, supported as it was by fact and reasoning, could not fail of producing a deep impression, but he wished to show the necessity of some immediate action being taken, for he remembered being called upon 30 years ago to take part in an agitation of precisely the same kind, when a Parliamentary Committee was obtained. That agitation was not confined, as was generally supposed, to the subject of schools of design, but took up the whole question of technical education as it had been defined by Mr. Davidson; nevertheless he regretted that no remedy was provided for the wants which were shown to exist, although the remedy was pointed out. A Government School of Design was formed in Somerset House for female instruction, not only in drawing but for the extension of technical education generally, and that became an example for the female schools of art which had since been established throughout the country, but the rest of the subject had not been dealt with even up to the present day. Amongst the many points which had been touched upon in the paper, few were of more importance than that of payment, which it was suggested should be decreased in amount as the pupil progressed; but if a careful survey were made of the whole question of education generally, he believed they would arrive at the conclusion, not only that school fees should be reduced, but that they should be abolished altogether. He was sure that it was a mistaken view of the subject to regard the payment of fees as a necessary inducement to the obtaining of education, and to suppose that in England alone, of all countries in the world, education would not be valued unless it were paid for. He was convinced that the exaction of even a small fee served as a discouragement to education, whilst it was no real gain to the community, because, whether national education—using that term as it was used in the paper, to include all classes, from the highest to the lowest—were paid for immediately from the pockets of the parents or not, it was paid for by the country; there was no means of avoiding that conclusion; and the only means of providing it effectually and economically was to provide it from the general funds of the country, under a proper system of supervision. It was not and could not be necessary to exact a price for schooling in order to ensure its advantages being appreciated; for instance, in the Royal Academy, men laboured year after year with often but small prospect of remuneration, and there the instruction was gratuitous; and could anyone believe that in other branches of instruction there would not be an equal inducement? When they considered the many many circumstances which tended to restrict education, it was evident that it was desirable to remove every obstacle as far as possible. There should be no tax upon knowledge in any shape; it should be offered to the public in the most universal manner possible; and he would therefore go farther than Mr. Davidson, and advocate a general gratuitous system of education, which all might receive on an equal footing. With regard to drawing, considered as a part of technical education, he was surprised that Mr. Davidson, after so clearly showing its importance, should have introduced it only in his second course. Drawing, as was said in the paper, was equivalent to an additional language, and was one of the most powerful means of increasing, improving, and correcting the faculties of observation, and should therefore be introduced at the earliest possible period as an essential part of education, and not left to an after period, when it might be looked upon merely as an accomplishment, instead of as something essentially necessary. If it were to be taught properly, however, it must be taught carefully, and proper time allowed for it. Only a few days previously he had been looking at a drawing by a pupil in a middle-class school; at first sight it appeared a very good copy of that from which it was taken, but a little closer examination showed that almost every line was out of place or out of proportion. On drawing attention to these defects the excuse given was that so little time was allowed for drawing, that the pupil could not properly finish his work, nor could the master properly examine it. The principle laid down by Mr. Davidson must be constantly borne in mind, that both males and females were unequal in mental power, and that the dull must be provided for as well as the bright, a matter which was far too much forgotten. He was much pleased to find that reference had been made to those practical subjects which really were to be kept in view in the technical education of women, as had been done by Miss Burdett Coutts in Whiteland's Training Schools. In order, however, to succeed, they must awaken and endeavour to direct public opinion. This, rather than the views of schoolmasters, directed the course of instruction in all our schools, both public and private, which in almost every case was grossly defective. They must therefore act upon public opinion, which could only be done by continuous and combined agitation. In referring at the outset to his own past experience, he had simply been actuated by a desire to impress upon the meeting that a whole generation had already passed since a discussion on this subject had been evoked, and still nothing had as yet been done; and that unless they wished another generation to pass in the same fruitless way they must set on foot some organisation for carrying out the object in view, allowing neither the Government nor the public to go to sleep upon the matter, but agitating for this moral reform in the same way which had proved successful in political and fiscal matters.

The Rev. A. J. D. D'Orsey said that, as one who had had thirty years' experience in teaching, he had listened with the greatest satisfaction to the paper, with nearly every word of which he cordially agreed. Technical education really meant education in an art, and that word art would require to be qualified by the position of the person to be educated. Mr. Davidson, therefore, had taken a part of the whole, which whole required a little consideration, for it was apt to be lost sight of when considering details. Education must be, not mere teaching, but a training of the whole human being, morally and religiously, physically and intellectually. If anything short of these three things were kept in view, true education was not accomplished, though the result might be a complete athlete, a wonderful development of intellect, or a remarkably good individual. Almost all "educationists" (using this term as distinguished from "educators") lost sight, more or less, of this grand, comprehensive principle; very naturally, they looked for one particular part of the whole, and cultivated that assiduously. Nothing was more difficult than to reconcile the conflicting views of educationists on this point. It was hardly the time or place to go in detail into the great religious question upon which so many were divided, but, speaking as a clergyman, as well as a schoolmaster, he must say that the religious question had always appeared to him to lie in a nut-shell, and that the true solution lay in taking from the schoolmaster all concern with the dogmatic part of religion, and leaving that to the clergyman—who might reasonably be supposed to be better acquainted with it—and thus the former would have more time to devote to the moral, physical, and intellectual education of his pupils, and ample time would be found for all those studies, which the non-practical man might fancy could not possibly find place in an ordinary course of instruction. Time must be economised, as it could be to an enormous extent, by adopting some of the educational machinery

which their German neighbours had introduced—maps, blackboards, natural objects, &c.; by such means more could be taught in a few minutes than under the old system in an hour. When you put a book into a child's hand, and said—"learn that, or you will be flogged," there was no inducement to learn beyond the dread of punishment, and though the child might accomplish the task, he could not be said to be *taught*. The good teacher was independent of books, and with his chalk and black-board, or with his natural specimens, he demonstrated what he wished to convey, and the children, so far from looking upon it as a lesson, would crowd round and pour questions upon him faster than he could answer them, and thus a real interest was excited in the acquisition of knowledge. Thirty years ago he went to Germany, to see their plan of education, and his eyes were then completely opened; he found that a real system of education was being pursued, not only *words* taught well—quite as well as in England, for the best Greek and Latin dictionaries and lexicons come from Germany—but *things* themselves were taught. Instead of describing a thing, they showed either the thing itself or a drawing of it, and thus a clear idea was rapidly conveyed to the pupil's mind. This kind of teaching was now beginning to permeate England, and this was what was wanted, not as contradistinguished from verbal teaching, but as auxiliary to it. To teach words well you must present to the child the objects which they represented, and a much deeper impression was thus made than by merely finding out the words in a dictionary. For instance, a model or drawing of a mill would convey a much better idea to the mind of a child than the definition given in Johnson—"a machine or engine erected for the purpose of comminuting matter." Mr. Hyde Clarke was quite correct in saying that public opinion required to be educated, for all enlightened teachers were far in advance of public opinion. Mrs. Jones wondered what was the use of teaching her daughter geology; she had never heard of primary and secondary, stratified and unstratified rocks; and having a dim idea that there was something dangerous and heterodox about it, gave instructions that no lessons should be given her daughter in such subjects, and in this way children were deprived of the instruction which school teachers provided for them. As long as public opinion was in this state, teachers could not carry into effect the schemes which they would fain see realised, and he believed that they would never have education in this country on a proper basis until the educator, as such, was recognised—until he was registered and diplomaed, just in the same way as a lawyer, physician, or surgeon, and until it was possible for a village teacher, if properly qualified, to become Minister of Public Instruction. The present system of putting a peer or a great politician into this office, and excluding from every position of trust and emolument the practical educator, was a great mistake, which England must rectify as soon as possible. The educator must be put in his proper place, and promotion must be open to all. The lawyer could rise to be Lord Chancellor, the poor curate might become Archbishop of Canterbury, and the village doctor might be Physician to the Queen or President of the College of Surgeons, but the village schoolmaster got his £100 a year at twenty years of age, and when he was fifty or sixty he might go to the workhouse unless he had made some provision for himself out of that small pittance; there was no career open to him. He (Mr. D'Orsey) had made similar statements before, and had been twitted with the fact that the head-masters of Eton, Harrow, and other public schools were often made bishops; but it was as clergymen their advancement came, not as teachers; the white neckcloth was a passport to society, while the teacher, *qua* teacher, was nowhere. It was a strong assertion to make, but he could substantiate it, that so far from raising your *status* in society by teaching, you lost caste by it. A gentleman would be deeply grateful to anyone who procured for his son an appointment in a Government office, but if you told him that the lad had great talents for teaching, and that you could get him a good post as schoolmaster, the parent would be not less surprised than indignant. Speaking both as a clergyman and a teacher, he must say that he considered the latter the most important member of society. Until the profession of teaching was recognised and honoured all their essays and speeches would be but beating the air. Education was not to be regarded merely as a good thing for the lower orders; they wanted a scheme of education for all grades of society, which should be as applicable to the heir apparent to the throne as to the poorest person in the kingdom. He was an advocate for compulsory education, but not confined, as was commonly the idea, to the lower classes. He could tell them of a Duke whose family had suffered from the want of a compulsory system of education. They wanted a system which should apply to all classes, as was the case in Prussia, although, of course, the law was almost inoperative, because no one required to be compelled to do that which every one saw was for his own advantage. He might be accused of wandering from the point, but he believed that his remarks were all connected with the subject before them. He had had long experience in teaching ladies, and could testify that technical education, so far from interfering with their usual studies, promoted them. A girl would more readily write an essay on astronomy, geology, or botany, if she had first been furnished with ideas, than on irregular verbs or participles. He recognised the essay which Mr. Davidson had quoted as the work of a young lady about 16 years of age, who was pupil in a school where he had the honour of teaching, and he thought they would all agree that this was an instance in which technical education did not interfere with progress in other matters, but rather accelerated it.

Mr. George Campbell suggested that the discussion should be more confined to the question of female education. He sympathised with all Mr. Davidson had said, with the exception, perhaps, of his remarks on the Revised Code. Almost all persons were now convinced that the education both of boys and girls must be improved, but he agreed with the views which had lately been expressed by Mr. Froude, that real, true education was that which would enable a person to earn his daily bread; and he thought that applied not only to men but to women also. Mr. Davidson had advocated a system of education which should make girls better wives, daughters, and members of society, and he was sorry he had not carried the subject more into detail, and explained in what matters more particularly women should be technically educated. He did not share in the sentimental feeling so common in the present day, which, on the one hand, would go to the utmost extreme in advocating the rights of women, and, on the other hand, would relieve them from all labour whatever. He was, however, far from wishing to go back to the old plan, when the men stood still and the women did all the work; and the employment of females in agricultural gangs might be very objectionable, but his experience in Scotland, where a great part of the farming work was done by women, showed him that by such employment they did not necessarily lose self-respect or womanly feelings. At the same time it was evident that such technical employments as spinning, weaving, &c., were more adapted to women than those which required the mere exercise of brute force, and in such matters, therefore, they should be thoroughly instructed. Technical education, however, was also wanted for the higher classes, where the women had not hitherto been in the habit of earning their bread. As he had said, he did not sympathise with much that was said about the rights of women, for he was inclined to think they had already power enough; but he felt that the current of feeling and events was against him, and he feared that in spite of all which could be said these rights would be obtained. On the other hand, he did not think the gain would be all on the side of women, because, after all, rights must be correlative with work, and if the law were changed

so as to make the rights of wives equal to those of their husbands, he did not think the latter would see the propriety of doing all the work. In any case, women should be technically educated, so as to earn their own living. He was not prepared to say how this should be done, but certainly it was a matter worth discussion. Hitherto he had only heard one subject, that of drawing, suggested as desirable for women, and no doubt at South Kensington great facilities were given for its acquirement, but he regretted that in that great national establishment the ornamental arts had, to a great extent, driven out the more useful and practical ones.

Mr. George White did not quite agree with the remarks which had just been uttered, nor did he think Mr. Davidson had brought before them much information on the subject of technical education. As he understood technical education, it meant that practical instruction by which a man was enabled to earn his living, or to excel in some particular art; but Mr. Davidson had, he thought, wisely left that part of the subject, and confined himself to the question of female education in general. Like one of the former speakers, he had been engaged in similar discussions thirty years' ago, sometimes in this room, and yet a generation had passed away and nothing had been done; they were talking still. He saw, however, that they were considerably nearer some great improvement in education than they were at that time. Although the public generally might not be so far advanced as the enlightened schoolmaster was, yet they were better acquainted with the merits of true education, and had fewer prejudices against its adoption. He considered, therefore, that we had made great progress, for the country was steeped in deep ignorance, and great impediments had to be surmounted. They had looked to the wealth rather than the welfare of the population; if they had been more earnest in endeavouring to educate the people in general, rich and poor, and less earnest in the race for wealth, they would not have been in their present position of pauperism and ignorance. With regard to the revised code, he must say, as a practical man, that at the time it was introduced there was a general feeling in the country that schoolmasters should be put upon piece work. There were, doubtless, many evils connected with its operation; for instance, it regarded education simply as a debtor and creditor affair, but he saw no objection to teachers being put upon the same footing as other labourers with regard to their work, and that they should be required to show a certain amount of result which could be verified; he believed that results might be asked for and obtained with respect to the moral as well as the intellectual condition of the population, and therefore, though he thought there were evils connected with the revised code, there were also some excellent features about it. With regard to payment for education he had had some experience, having been one of the first to draw largely from the pockets of the poor in this way. He had taken as much as £40 in an ordinary day-school on a Monday morning, in one of the poorest neighbourhoods in England. Penny schools used to be laughed at, and then the fee was raised to twopence and threepence; and when the parents found the value of the education which was given they were willing to give even another penny, and thus more teaching power could be provided. He was not quite prepared to advocate entirely free schools, although, of course, if it were thoroughly understood that every child had a right to a free education, there would be no pauperising effect, as there generally was in connection with most of our charities. Still he was not prepared to say at the present time, with the present forces in existence, and the vast amount of money contributed by the public and by various benevolent institutions, as well as the voluntary efforts of the clergy, that schools should be entirely free. He was, however, very anxious that some free schools should be established, and he was very glad to see the importance which was attached by Mr. Davidson to "common things," for he did not think for his own part that he should much like a "technical" wife or daughter. He believed common things could be so taught by an intelligent teacher as to educe all that could be educed from a thinking and growing mind. A good teacher ought to make the ordinary processes of reading, writing, arithmetic, singing, &c., matters of educational training. The great difference between a good teacher and a bad one was, that one merely taught dogmatically, while the other made the instruction a real education. The one interested the child and did not fatigue himself, while the other exhausted the powers of the pupil and his own patience. It was a matter of great importance that girls in all classes should be well taught how to read. Nothing could be more useful than that a woman in any sphere of life should be able to read aloud with pleasure to herself and her hearers, and yet how few of either sex—perhaps fewer in the male sex than the female—possessed this valuable accomplishment. There were also many domestic matters which it was most important that girls should be taught. A great deal had been said at different times of the instruction given in workhouse schools; he had had a girl who had been so educated, but he found she had never seen anything but the bare walls, and did not know whether or not a bottle of wine grew on a tree and was cut off at the cork. A good common education he most cordially approved of, but a technical education for any particular art or science must involve selection, which involved favouritism in reference to those selected, and possible injustice to those who were not. He should therefore leave that matter to work itself; technical education should be provided by those who required persons so trained. Those who possessed genius would educate themselves, and choose the line of study in which their genius could most profitably find its development, and they should be assisted by the benevolence of the country, and by the funds charitably left for educational purposes.

The Chairman said he had been much pleased to preside over so interesting a discussion, especially as he had a great regard for Mr. Davidson, who had devoted so much time to this important subject. The education of girls was one of the great questions of the day, and it must be coped with. They had been talking too long, and it was high time something should be done. Allusion had been made to the schools in Bath-street, and he must say they were formerly in much the same position with regard to the education of boys as was now complained of in the case of girls. There was no end of talking and discussion until he said "Let us begin and *do* something," and directly the effort was made the schools proved eminently successful. In the same way he would say, "Begin and establish a good girls' school," and the subjects to be taught would soon follow. He should be very glad indeed if he could be of any assistance in such a matter, and he hoped a girls' school would be commenced at once. It had been his privilege during the last summer to make a tour in America, and he was exceedingly pleased with the state of female education in that country, and was glad to find that female delicacy or modesty did not appear to be wanting in the slightest degree, although the education of boys and girls together was very general. He would not go into the question of whether the right things were taught, or whether he should like to see the same system introduced here. After all there was nothing like Old England; but he should like every child, here as there, to have an opportunity of being educated, and this brought him to the question of payment. He had formerly been a great advocate for payment, but he was a convert to the free system, and thought now that schools should be open in every place for all classes. He believed if they were opened all classes would avail themselves of them, and that such a system would do away with a great deal of that wretched class and sectarian feeling which was one of the greatest curses of England. The small amount of twopence or threepence which was paid was not really worth consideration; and if they had a good free system introduced he believed they would in

time become a well-educated people, which, unfortunately, was not the case at present. He did not think domestic matters, such as making beds or cooking, should be taught at school; the proper place for such instruction was at home. There was no greater nonsense than many of the so-called industrial schools, where girls were taught to cook with machinery and appliances which they never found at home or in any place of service to which they went. He remembered many years ago, being invited, in company with the late Dean of Hereford, to visit an industrial school at Finchley, where there was certainly a capital dinner of leg of mutton and potatoes served, but his companion, Mr. Dawes, as he was then, by a few plain questions, such as how long the meat had been cooking, and so on, soon elicited from the girls that the leg of mutton had been cooked at the baker's, and that all the girls had done was to peel the potatoes. In conclusion he hoped that something practical would follow from what had been said, and he moved a cordial vote of thanks to Mr. Davidson for his admirable paper.

The vote of thanks was carried unanimously.

Fine Arts.

Belgian Triennial Fine Art Exhibition.—The Belgian Government has announced the appointment of the commission for the management of the general triennial exhibition of works of fine art, which is appointed to take place this year at Brussels, though the date is not yet fixed. The commission includes, besides officials, Baron Leys, MM. de Keyser, Thomas, Geefs, Simonis, and many other artists of high reputation.

General Exhibition of Fine Arts at the Hague.—The commission entrusted by the authorities of the Hague with the management of this exhibition, announce that it will open on the 29th April and close on the 6th June, and will be held in the rooms of the Academy of Painting. Works intended for exhibition are to be addressed as follows:—"à la Commission directrice de l'Exposition des Beaux Arts, au Feelcen Akademie, Princessegracht, à la Haye," between the 1st and 15th of April. No work will be received after the latter date. The commission will pay the carriage, provided the works are sent by luggage train, &c., *petite vitesse*, but not otherwise; and the expenses on the return of the works are to be borne by the exhibitors. The conditions are, that all works must be by living artists; that no one shall send more than three works; and that the frames shall be square, or mounted on square backs. The commission will award seven gold medals, three to foreign and four to native artists, but exhibitors may decline to compete if they think fit.

Lamartine.—It seems probable that several memorials will be raised without delay in honour of the late poet and statesman; the subscription now on foot in Paris is for a statue to be placed in the Place de l'Hôtel de Ville, on the pedestal of which is to be recorded the service done to his country by Lamartine in 1848, when he withstood the attempt to adopt the red flag proposed by the ultra-revolutionists. The Municipal Council of Mâcon, the place of Lamartine's birth, held an extraordinary meeting the other day, and voted by acclamation a sum of 5,000 francs for the erection, or in aid of the erection, of a statue there.

Commerce.

Brandy Production. — Consul the Hon. H. P. Vereker, in a report on the trade of the port of Tonnay-Charente, for the year 1867, recently issued, and quoted in the *Produce Markets Review*, supplies some interesting information concerning French vineyards. This trade is almost confined to the export of brandy, the Charente being one of the finest vine-growing districts in France. That it has flourished is evidenced by the continually-augmenting tracts of land put under vine cultivation, and by the fact that there were more than 6,500,000 bottles of brandy shipped from that port to the United Kingdom and the colonies. In fact, the various localities, where the vineyards were formerly considered as of secondary importance, the vine has now become the principal object of industry. The tracts under vines are stated to have comprised, some years since, 111,682 hectares, or about 1-6th of the superficies of the department, the hectare being equal to nearly 2½ acres English; and at present, though there are no means of accurately ascertaining the lands under vines, it is estimated to amount to one-quarter of the whole, or, say, 575,000 acres, in the Charente-Inférieure. It is not on the produce of the Lower, but on that of the Upper Charente, or the Department of the Charente, that the trade of Tonnay-Charente mostly depends, the chief centre being Cognac. Mr. Consul Vereker points out that as regards the Tonnay-Charente trade, the year 1867 commenced under auspices somewhat unfavourable, for, in consequence of the unprecedented exportation of brandy in the preceding year, the stock in hand at the French side had decreased, and the markets in the United Kingdom seemed fully supplied, whilst the stock there tended to increase. To these drawbacks were added late frosts, the vine disease, and unfavourable weather for ripening, which excited fears that a material reduction would be exhibited over the trade of 1866. The falling-off, however, only slightly exceeded 1,500,000 gallons, which is highly favourable, considering that the brandy exports of the port have grown from 2,888,094 gallons in 1862, to 6,303,880 in 1866, and to 11,562,210 in 1867; the reduction last year being to only 9,770,420 gallons, the value of which is estimated at £1,776,440. But while the Charente has produced this enormous quantity of brandy, its cereal crops have proved very deficient, and some months ago, we are told, that there was so great scarcity in the district as to render necessary increased importations of provisions. The French Government and French capitalists deserve credit for their combined efforts to develop the resources of this rich province. Railways are penetrating the heart of the agricultural districts. The completion last year of the line from Saintes to Angoulême places the Charente in direct communication with Rochefort, Bordeaux, and Paris; according to Mr. Consul Vereker, it opens up the most important producing district in connection with the brandy trade, and has already exercised a sensible influence on commerce, as many of the goods previously conveyed for shipment by boats on the river are now carried by rail, and, judging by analogy, it may be assumed that the railway will in time supplant the slower conveyance by boat. The Charentes Company are also undertaking a railway from Saintes to Contras, on the Bordeaux line, which will pass through a productive district; while efforts are being made in other directions so as to connect these multiplying and expanding vineyards more closely with the markets of the world.

Leeches.—Paris is the best market in Europe for leeches. The mouth of the Danube is now the best fishing ground, and no less than £120,000 in value of leeches are annually sent to Paris from Trieste. The best leech is said to be a native of Australia, as he does his work in a shorter time than any other. The Viceroy of Egypt has granted a monopoly of 3,000,000 leeches annually, which are to be found in the bed of the Nile after the periodical inundation of that river, to a French dealer. On arriving in Paris those not required for active duty are sent to Gentilly, where they are lodged in reservoirs provided with greasy mud and filled with greenish water.

Exports of Coal from Belgium to France.—The exports of coal from Belgium to France, in 1866, amounted to 3,226,378 tons, as compared with 3,014,452 tons in 1867, and 3,393,649 tons in 1866. The quantity of coke exported from Belgium to France last year was 193,131 tons, as compared with 232,984 tons in 1867, and 292,793 tons in 1866.

Exports of Guano from Peru.—According to the official report of the harbour master of Callao, the number of vessels which left that port during 1868, ladened with guano from the Cincha islands, amounted to 358. The quantity of guano which was exported during the year was estimated at 300,000 tons.

Colonies.

Whale Trade in Melbourne.—Among other symptoms of enterprise in this colony, a commencement of something very like a whale trade has been made by a Melbourne firm. It was recently represented to the Government that they ought to encourage any attempt to develop the whaling trade in the Southern Ocean, and make Melbourne the rendezvous of whalers pursuing their labours in higher latitudes, in search of oil and whalebone. There are many reasons in favour of such undertakings. Whales are supposed, by competent judges, to have been unusually abundant in the Southern Ocean for some years. Melbourne is most advantageously circumstanced for supplying provisions, and all the materials required in the outfit of whalers; and, on the other hand, the establishment of such an industry in our seas, while furnishing a new and lucrative employment, would give an immense impulse to various commercial interests. The Commissioner of Customs so far approved of the suggestion, holding out hopes of a remission of port charges, and other privileges, to any firm making a practical beginning, that the project is rapidly assuming a definite shape.

Publications Issued.

Cassell's Technical Series of Manuals. (*Cassell.*)—The first volume of this series, called "Linear Drawing," showing the application of practical geometry to trade and manufactures, has now been followed by a volume called "Projection; the Development of Surfaces and Penetration of Solids." This volume which, as well as the first, is by Mr. Ellis A. Davidson, Science and Art Lecturer in the City of London Middle Class Schools, following up the course struck out by its predecessor, enters fully into the scientific methods of projecting solids, the curves formed where one solid penetrates another, and the shape metal must be cut so that on being rolled, bent, or folded it may give the required form; the theory and practice of geometrical projection, &c. The work also contains a chapter called "Plain Hints on Linear Drawing—an Essay on the use of the various Mathematical Instruments;" and in order to its importance as a text-book, 100 questions for examination are given. The lessons, which are given in the simplest manner, are illustrated by 43 whole-page cuts, drawn on wood by the author. The two volumes, which are rapidly being introduced into the schools and colleges throughout the Kingdom, have been placed by the Science and Art Department on the list of books supplied by them to the Government Schools of Science and Art. We understand that Vol. III., "Building Construction," by the same author, is in the press. In order to give a technical tendency to the instruction in primary schools, Messrs. Cassells are also publishing their "Primary Series;" one of these is called "Right Lines in their Right Places, or Geometry without Instruments;" another "Our Houses;" giving an account of the processes, materials, tools, &c., employed in building. Both of these are by the author of the Technical Series.

Notes.

Antidote to Phosphorus.—The value of essence of turpentine as an antidote to the effects of phosphorus has long been recognised in Paris as well as in London, and M. Personne, apothecary at the Hospital of La Pitié, has brought the question before the scientific world by a series of experiments upon dogs; he has found that in all cases in which turpentine has been administered to the animals a few hours after they had taken phosphorus they exhibited symptoms of intoxication, but recovered; whereas when turpentine was not given they invariably died. In other cases in which turpentine was given immediately after the phosphorus the animals were scarcely made ill at all.

The Mont Cenis Tunnel.—The position of the works of the Mont Cenis Tunnel up to February 28th was as follows:—

	Metres.
Length driven at Bardonneche	5,474·60
Length driven at Modane	3,911·90
Total length driven up to Feb. 28th	9,386·50
Length remaining to be driven	2,833·50
Total length of tunnel....	12,220·00

During the first two months of the present year, the total length of tunnel driven has been 219·70, of which 111·05 at Bardonneche, and 108·20 at Modane.

Application of the Oxyhydrogen Light to Street Lighting.—M. Tessié du Motay continues his experiments with oxyhydrogen gas in the courtyard of the Tuileries, with success as regards the effect produced, but we know nothing yet of the comparative cost of this and ordinary gas. Several modes of lighting were tried; on the occasion of the late balls and other entertainments given at the palace; powerful lamps were placed on the triumphal arch at the entrance, and at other points of the enclosure, and a very brilliant effect was produced without unpleasant dazzling. On ordinary occasions the oxyhydrogen light is placed in the usual gas lanterns, and the light is very pleasant as well as effective. At the main entrance to the courtyard are two large lamps, which each contain three lights, and the effect is very brilliant. The zircon cylinders used are certainly effective, and they are said to exhibit scarcely any alteration whatever after considerable use. Those used generally at the Tuileries are very small, apparently about a quarter of an inch high, and even less than that in diameter; they are pierced vertically through the centre, and are merely placed on platinum points.

Correspondence.

Porpoise Oil.—Sir,—Since the publication of my note, in your *Journal* of the 5th ult., I have read the following sentences connected with the subject, and which show its former utility. A notice, dated Glasgow, April 9, 1753, stated:—"Small harpoons are making here for killing porpoises off the Western Isles. These fish, which appear in June and July, yield from one to six barrels of oil each, and are so slow in motion that yawls with four oars can easily come up with them. It is but within these four years that this kind of fishing has been attempted, and if pursued with small craft will undoubtedly prove beneficial, as it requires but small expense, and the practice is a kind of diversion." Money premiums, or the gold medals of the London Society of Arts, were offered by this Society for porpoises and their oil, until June, 1803, inclusive. An additional premium of ten guineas was offered by the Society "to the person who shall strike the greatest number of whales, not fewer than three, with the gun harpoon." According to Maunder ("Scientific Dictionary"), the Rev. Dr. Clayton, about 1735, first tried gas experiments, and published a paper about it in "Philosophical

Transactions," 1739. (See "British Cyclopædia," article on "Gas.") It was neglected for some sixty years, when Mr. W. Murdock, employed in Boulton's Soho foundry, experimented, and, in 1798, erected a gas apparatus there. (See *Edinburgh Review*, for January, 1809; and "Royal Society's Transactions," for February, 1808.) Mr. Winsor, in 1803, exhibited gas light in the old Lyceum Theatre, London; and, in 1807, at Carlton Palace. In the years 1809-10 he proved its utility further by lighting one side of Pall-mall, where he resided for some time, although, after the failure of his projected company, he resided at Paris, where he died. He obtained a patent on the 7th March, 1807, and one in 1811. He had lived at Winchmore Hill, where his cottage, near the King's Head Inn, remains.—I am, &c., Chr. Cooke.

London, March 20, 1869.

MEETINGS FOR THE ENSUING WEEK.

Mon.....R. United Service Inst., 8½. Mr. Chas. F. Henwood, "The Conversion of our Wooden Line of Battle Ships into Armoured Turret Ships."
Royal Inst., 2. General Monthly Meeting.
Entomological, 7.
British Architects, 8.
Medical, 8.
Asiatic, 3.
Victoria Inst., 8.
Tues ...Civil Engineers, 8. Continued discussion on "American Locomotives and Rolling Stock."
Pathological, 8.
Anthropological, 8.
Syro-Egyptian, 7. Annual Meeting.
Royal Inst., 3. Prof. Grant, "On Stellar Astronomy."
Wed ...Society of Arts, 8. Mr. Charles Tomlinson, "On the Theory of Boiling, in connection with some Processes in the Useful Arts."
Pharmaceutical, 8.
R. Society of Literature, 4¼.
Obstetrical, 8.
Thur ...Royal, 8½.
Antiquaries, 8½.
Zoological, 8½.
Royal Society Club, 6.
Artists and Amateurs, 8.
Mathematical, 8.
Royal Inst., 3. Prof. Tyndall, "On Light."
Fri .....Astronomical, 8.
Royal Inst., 8. Dr. Carpenter, "On the Temperature and Animal Life of the Deep Sea."
Sat .....R. Botanic, 3¼.
Royal Inst., 3. Mr. A. Geikie, "On the Origin of Land Surfaces."

Patents.

From Commissioners of Patents' Journal, March 26.

Grants of Provisional Protection.

Anchors—828—W. R. Lake.
Animal substances, &c., preserving—727—G. Spencer.
Annealing ovens and kilns—784—J. Tenwick.
Boilers, apparatus for diffusing the heat and promoting the generation of steam in—786—W. A. Martin.
Bottles, &c., packing—798—W. McAdam and S. Schuman.
Bottling apparatus—790—H. D. Rawlings.
Caissons and pontoons—261—C. Lungley.
Capstans, &c.—774—W. H. Harfield.
Card grinders—788—J. C. Shaw.
Carding engines—796—J. Taylor, R. and J. Ingham, and J. Sharples.
Carriages, &c., connecting and disconnecting apparatus applicable to pole heads for—766—G. Bray.
Cooking apparatus—778—E. W. and M. Slade.
Dressing bags—705—W. Saunders and C. Smith.
Floor cloths, &c.—814—M. Rourke.
Furnaces—824—E. Booth, W. P. Gaulton, and J. Walls.
Gas, apparatus used in manufacturing—782—W. T. Carpenter.
Goloshes, &c.—760—W. Coxhead.
Harness, &c., safety hook for—816—H. Starr.
Hats, &c., machinery for hardening and felting the bodies of—780—C. Vero.
Heated air, producing and applying—832—A. B. Walker.
Inkstands—343—E. D'Artois.
Looms—804—J. L. Norton.
Magnetic regulators—770—L. Labadie.
Meat, &c., preserving—3775—J. Millward.
Metallic joints, constructing and forming—451—E. G. Brewer.
Mules and twiners, self-acting—802—W. Robertson.
Ordnance, mounting and working—739—A. Moncrieff.
Paper, preparing pulp for—772—A. M. Clark.
Picture frames, &c., mouldings for—433—A. C. Engert.
Ploughs, apparatus for working—437—F. J. Vandenvinne.
Printing blocks, plates, &c.—806—E. Roper and G. Shaw.
Propellers—161—W. R. Lake.
Railway trains, communication in—181—J. Edwards.
Railway trains, communication in—721—G. Goldsmith.
Railway trains, signalling on—725—J. Edwards.
Railway tunnels, ventilating—820—J. Ramsbottom.
Railways, transporting minerals, &c., upon—800—F. Render.
Road locomotives—717—B. Hunt.
Roads and tramways, paving for—764—D. S. Price.
Rosin oil, manufacturing—3863—E. P. H. Vaughan.
Screw propellers—812—H. Claughton.
Sewage, treating—826—J. T. Darke.
Ships' bottoms, &c., paint for protecting—762—H. J. B. Kendall.
Ships' sails, yards, and rigging—792—G. P. Evelyn.
Smoke-consuming apparatus—830—J. Partington, jun.
Steam cocks, &c.—768—H. J. Cénant.
Steam engines and boilers—818—J. H. Bennett.
Steam vessels—794—W. R. Lake.
Tissue—776—H. Delattre.
Velocipedes—808—E. W. P. Gibbs.
Velocipedes—834—J. Cox.
Velocipedes, &c.—810—T. Rickett.
Water, apparatus for raising—690—W. A. Gilbee.
Wire, &c., cutting—372—J. C. Shaw.
Wood, apparatus for cutting—822—G. R. Mather.

Invention with Complete Specification Filed.

Felt cloths, machinery for felting—874—G. T. Bousfield.

Patents Sealed.

2976. J. Wadsworth.	2990. H. Jewitt.
2977. W. E. Gedge.	2991. V. Juge.
2979. J. H. Irwin.	2992. J. Mabson.
2980. E. T. Hughes.	2995. W. Richardson.
2981. A. H. Brandon.	3006. H. Highton.
2984. W. Hallam & H. J. Madge.	3013. R. Legg.
2987. E. Horton.	3023. N. Henwood.
2988. G. Daws.	3026. C. E. Brooman.
2989. W. Gadd and J. Moore.	

From Commissioners of Patents' Journal, March

Patents on which the Stamp Duty of £50 has been paid.

878. R. Newton.	894. F. P. Warren.
887. J. Ramage and T. Nelson.	901. W. Deakin and J. B. Johnson.
953. E. C. Prentice.	898. C. T. Liernur.
984. J. McNaught and Wm. McNaught, jun.	905. T. Ryder.
888. S. Barbour.	915. J. C. Martin.

Patents on which the Stamp Duty of £100 has been Paid.

1027. C. P. Coles.	919. H. J. Madge.
903. H. Pooley, jun.	859. W. F. Smith & A. Coventry.
815. E. Morewood and A. Whytock.	913. H. Smith.
825. E. Morewood and A. Whytock.	914. J. H. Johnson.
	929. G. and J. Collier.
	952. J. C. Kay and W. Hartley.

Registered Designs.

5003—March 4—Reversible file—John Gray, Phœnix Works, St. Mary's-road, Sheffield.
5004—March 6—The apomecometer—Richard Clayton Millar, 197, Great Brunswick-street, Dublin.
5005—March 17—Frame for dressing bags, travelling bags, purses, and other articles—Philip Jacob Lack, Whiskin-street, Clerkenwell.
5006—March 17—Bread cutter—Ernest August Dreyer, Finsbury-square.
5007—March 17—A refrigerator, to be called the new duplex refrigerator—The Wenham Lake Ice Company, 140, Strand.
5008—March 17—A scarf ring—Jean Jacques Rohrbach, 29, Polygon, Euston-square.
5009—March 18—Mr. Bird's inhaling pipe—James Bird, 80, Seymour-street, Connaught-square, W.
5010—March 18—Portable camp stool and seat—Warren Sharman, Melton Mowbray.
5011—March 19—A core for moulding chimney flues or drains in concrete houses—Drake, Bros., and Reid, 208, New Kent-road, S.E.
5012—March 20—Cash box—Perman and Stamps, Birmingham.
5013—March 24—Optical multum in parvo—Richard Pilkington, West Ham, Essex.
5014—March 27—Stench trap—Charles Winn, Birmingham.
5015—March 31—Oval case—Adolphus Ash, 30, New-road, Woolwich, S.E., and Henry Mason, 1, Plumstead-road, Woolwich, S.E.

Journal of the Society of Arts.

FRIDAY, APRIL 9, 1869.

Announcements by the Council.

Ordinary Meetings.

Wednesday Evenings at eight o'clock :—

April 14.—"Spain Commercially and Economically Considered." By E. M. Underdown, Esq., Barrister-at-law.

April 21.—"On Trade Marks." By W. Wybrow Robertson, Esq.

April 28.—"On the Duties of the Architect with reference to the Arrangement and Structure of a Building." By Roger Smith, Esq. On this evening Sir Digby Wyatt will preside.

May 5. "On the Formation of Industrial Settlements in our Colonies." By Col. Francis C. Maude, C.B.

FINAL EXAMINATIONS, 1869.

In order to avoid holding these Examinations on the same evenings as those of the Department of Science and Art, it has been decided to hold them, in 1869, on the evenings of

TUESDAY, the 20th APRIL,
WEDNESDAY, the 21st ,,
THURSDAY, the 22nd ,,
FRIDAY, the 23rd ,,

From 7 p.m. to 10 p.m., instead of on the 27th, 28th, 29th, and 30th April, as announced in the Programme of Examinations for 1869.

Cantor Lectures.

The Third Course of Cantor Lectures for the present Session will be "On Applied Mechanics," and will consist of Four Lectures, to be delivered by John Anderson, Esq., C.E., Superintendent of Machinery to the War Department, as follows :—

Lecture I.—Monday, April 12th.

Applied Mechanics in relation to Art and Science.

Lecture II.—Monday, April 19th.

Applied Mechanics in relation to Natural Properties of Materials.

Lecture III.—Monday, April 26th.

Applied Mechanics in relation to Natural Laws in processes.

Lecture IV.—Monday, May 3rd.

Applied Mechanics in relation to Natural Power.

Each lecture will begin at eight o'clock. These Lectures are open to Members, each of whom has the privilege of introducing two friends to each lecture. Tickets for this purpose were forwarded with last week's *Journal*.

Institution.

The following Institution has been received into Union since the last announcement :—

Oldham, Analytic Literary Institution.

Committee on India.

Six Conferences are now in course of being held for the discussion of the following subjects, viz. :—

Tea Cultivation in India.
Hill Settlements and Sanitaria.
Waste Lands in India.
Trade with Central Asia, Thibet, and South-Western China.
Indian Fibres.
Silk Cultivation and Supply.

The following evenings have been fixed for the remaining four conferences :—

Friday, April 16th.
,, April 30th.
,, May 14th.
,, May 28th.

At these Meetings the chair will be taken at 8 o'clock, and the discussion will be opened by a paper.

On Friday, the 16th inst., a paper, "On Hill Settlements and Sanitaria," will be read by Mr. Hyde Clarke, Member of the Council. The chair will be taken by Lord William Hay.

Members of the Society interested in Indian questions are invited to attend.

Piscicultural Committee.

This evening (Friday), the 9th inst., a meeting will be held, when a paper, "On Salmon Laws and Salmon Rivers," by Dr. Wm. Peard, of Bath, will be read and discussed. The chair will be taken at eight o'clock.

Members of the Society interested in Pisciculture are invited to attend.

Subscriptions.

The Lady-day subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

India Conferences.

The second of the conferences appointed to take place on Indian questions was held on Friday evening, April 2nd, Dr. Forbes Watson in the chair. The paper read was—

ON SILK CULTIVATION AND SUPPLY IN INDIA.

By P. L. Simmonds, Esq., Hon. Sec. of the Silk Supply Association.

I have been asked to open up the subject of Silk Cultivation and Supply in India by a few remarks, but when there are so many much more intimately acquainted with the subject than myself, I can scarcely tell why I have been selected to open the discussion of this very important question. It is one at least to which I have long paid attention, for it will be seen by reference to the *Journal of the Society*, that fourteen years ago in this

room I spoke at some length on the subject of Indian silk production,* when Mr. Dickins read a most exhaustive paper on "The Commercial Consideration of the Silk-worm and its Products." Strangely enough that gentleman and myself, who have not been thrown together since, are now closely associated as the active agents in a Silk Supply Association recently formed in London, which has for its object the endeavouring to stimulate and extend the production of that important raw staple, on which not only depends the prosperity of thousands in this country and on the Continent, but also the comfort and well being of operatives and labourers in far distant lands.

In 1808, at a meeting of the Silk Trade, held at Weaver's Hall, it was unanimously resolved "That Bengal silk was become highly necessary in many branches of manufacture, and that from experiments lately made it is found fit for purposes to which it had not before been thought suitable."

Although our extended commerce with China and Japan has brought in largely-increased supplies from those eastern countries, and the production of silk on the continent has been greatly stimulated, the demands for the civilised world are such, that Bengal silk is more and more inquired for, and has materially improved. Much, however, yet remains to be done, both as to quantity and quality. Our total imports of silk last year were nearly seven million pounds, but this is a million and a quarter pounds less than was received in 1858.

The silk of Bengal was originally very inferior in quality and very carelessly wound. The East India Company, in 1757, sent a Mr. Wilder to improve the winding of silk, and in the year 1769, other Europeans, as drawers, winders, reelers, and mechanics. The plantations were all in Bengal, and to the southward of 26° of N. lat., for the North-west Provinces were (as stated by Dr. Royle) to be much too hot and dry for the silk worm.

Experiments were for many years made on the western side of India to introduce the culture of the silk worm, under an Italian, M. Muti, but they were abandoned, for want of success. Some excellent silk is, however, produced in Mysore, and it is probable that the culture might easily be carried on in the valleys of the Himalayas, and to these points I shall draw attention hereafter.

The Jury of the Paris Exhibition of 1855, on Silk, remarked in their Report, that the art of silk cultivation extended over the extreme portions of the Indian Empire. There skilful cultivators, seconded by large capital, have established for some years past improved establishments for reeling the silk from the cocoons. The silk shown among the other varied products of the East India Company, excited the warm attention of the Commission, and showed the great progress that had been made in reeling Bengal silk, which had been previously thought impossible, by reason of the difficulties that lay in the way of introducing the discipline necessary for the introduction of the improvements in those distant regions. Looking at this progress, who can predict the future of silk in the East. China will soon have no barrier to oppose the pacific civilizing conquests of European industry.

Messrs. Eaton and Sons inform me that the one great drawback hitherto attending Bengal silk is being rapidly decreased—namely, the manipulation of the cocoons by the natives. Now, on all sides, plantations worked by Europeans are starting up, and the natives, instead of winding off the cocoons which they produce, sell them to the proprietors of the plantation, and these being worked upon the Italian system, silk is turned out fit to compete in many respects with that of the European production; but the cocoon, being naturally a poor little thing, will never yield silk equal in nerve to the other sorts. Something may, however, be done by introducing new seed from Japan,—which, in all countries, seems to prosper well.

* See *Journal*, Vol. iii., p. 203.

In their last annual statement, Messrs. Durant and Co., speaking of Bengal silk, say "The delivery is fully equal to last year, and this, with a reduction of 20 per cent. in the supply; hence a considerable reduction in the stock, and comparatively full support of the improved prices of all the finer and better classes; the lower classes are at present almost unsaleable."

The average monthly delivery of Bengal silk during the last three years was over 641 bales. The average net weight of a bale of Bengal silk is 150 lbs., but small bales weigh only 105 lbs.

The late Mr. Wentworth, in his Report to the Society of Arts on the Italian Exhibition at Florence in 1861, stated that there was received there from India and China (but principally from the former), and always in cocoons, about 984 tons annually, which at 2s. 4½d. the lb., would be worth about £241,000.

If we trace back the annual supply of Indian silk, commencing with 1820, we find that the imports into the United Kingdom in that year were 1,206,722 lbs., or nearly one-half the total quantity named. The highest import reached was 2,116,596 lbs. in 1829. It subsequently averaged about 1¼ million pounds (with one or two exceptional years) until 1853, when there was a great fall to 586,662 lbs., and the later years, up to 1859, were not very much higher, except 1854, 1855, and 1858, which years averaged about 1 million pounds. But this has to be explained by the entries made through Egypt, which swell the returns of Indian silk to from 3 to 5 million pounds; or from one-third to one-half of the total supply from all quarters.

In 1851 the quantity of silk exported from all India was 592 tons, value £619,318; 31 tons being shipped from Bombay, and all the rest from Bengal. Nearly all this was sent to England, a very little to France and the Arabian and Persian Gulf.

In 1861 the total quantity exported was 873 tons, value rather more than one million sterling. France received about 213,000 lbs. weight of this. Bombay and Bengal were still the only two producing presidencies.

The value of the manufactured silk goods exported from India has largely declined. In 1851, 634,024 pieces, valued at £355,223, were shipped, nearly all to the United Kingdom. In 1861 only 211,542 pieces, of the value of £122,787, were exported; and in 1865 the value of the silk goods exported had dropped to £106,612. The principal seats of silk manufacture in India are the cities of Peshawur, Lahore, Umritsur, Mooltan, and the capital of the neighbouring State of Bhawulpore. The silks of the latter place are considered the best, and the next those of Mooltan.

The value of the silk manufacture in the Punjab was estimated twenty years ago at over £130,000, nearly half of that sum being expended on the raw material. At Umritsur there were 2,200 shops of all descriptions interested in the silk manufactures, the fabrics turned out being valued at £40,000. At Lahore there were nearly 1,000 shops, and the value of the manufactures was £20,000. In the Mooltan and Bhawulpore districts above £30,000 worth of silk goods were turned out, and nearly as much more in the Jullundhur and other districts. Little or no raw silk appears, however, to be produced in the Punjab, a circumstance that seems singular, considering the apparent fitness of the soil, country, and climate for the cultivation of the mulberry. The raw material employed at Lahore is chiefly brought from Bokhara or Afghanistan. The raw silks of Bengal and China are also made use of, the latter being procured from Bombay.

It is not improbable that the lower districts of the Punjab were formerly silk-producing countries, as we know that in the time of Justinian silk was produced in Pirhind. A series of experiments was made a few years ago by the Government of the Punjab, with a view of ascertaining whether silkworms could be successfully reared in the plains; but the experiment was a failure; the heat

and want of sufficient moisture having rendered the worms nearly unproductive.

Notices regarding the extension of silk cultivation in the Punjab have, from time to time, appeared in India, and attracted considerable attention. The cultivation was originally commenced in 1862, at the suggestion of the then secretary of the Agri-Horticultural Society of the Punjab, and most liberally fostered by the local and supreme government. Reasons (on which it is unnecessary to dwell) led to the experiments being given up. Shortly afterwards Mr. H. Cope, of Umritsur, brought the fact to notice that a native had successfully carried on silk cultivation in the Goordaspoor Zillah for years. The fact induced Mr. Cope to renew his attempts in 1860, when he obtained 3½ maunds of cocoons. Lord Canning sent the silk to England, where it attracted much attention. In 1862 the Punjab government again came forward; gave Jaffer Khan 500 rupees, and 10 acres of land; also a grant of 2,000 rupees to Mr. Cope, to aid him in further attempts. He made a vigorous attempt in 1863, but failed for several reasons, none of which had any reference to climate. He persevered in 1864, and succeeded in obtaining 8½ maunds of cocoons, or nearly 700 lbs. At the same time other parties had been similarly successful, Mr. Scarlett's silk company at Peshawur obtained 1,200 lbs. of cocoons; other parties in various parts of the Punjab, including the military stations at Gogama and Shahpere, succeeded in rearing silkworms, and the result was most encouraging. These experiments were subsequently carried on, and efforts were made to extend sericulture to other localities, with fair promise of ultimate success. Mulberry trees were sent out in 1865 from Lyons, at the request of Dr. Forbes Watson.

For more than thirty years Mr. J. Bashford, of Surdah, Bengal, has devoted his attention to the reeling of silk, and so successful have his efforts been in improving the quality, that the Society of Arts accorded him their medal. Although superior to much of the China reeled, yet it falls far behind the finest qualities of French or Italian silk. Animated with the desire of improving the cocoons in a country so abundantly furnished with mulberry trees and every facility for breeding silk worms, Mr. Bashford introduced a quantity of the best eggs from France, Italy, and China, to cross with the poor races of Bengal, which breed all the year round. He did not desire to introduce an annual species, because that seemed destined by nature for cold climates, where the mulberry trees yield only one crop of leaves in the year, whilst in India the best trees shoot vigorously after pruning, and give, in five or six weeks, an abundant yield of fresh leaves. Although he has not yet had very great success in his experiments, he perseveres. The natives are, unfortunately, in the habit of stinting the worms in their food, and allowancing the leaves in such a manner as to injure the cocoons. Quantity of produce with them suffices; they give little attention to quality. The eggs are not sold in India as in Europe, but cocoons are bought for breeding from. Good and bad are purchased alike; no choice is made, and they are not rich enough to lose any; this is their reasoning. The houses in Bengal where the worms are raised have walls of earth or of matting, with thatched roofs. They are usually very small, and, notwithstanding the excessive heat, have neither windows, ventilators, nor anything to give light, except a fine grating, which answers for a door. They pay no attention to light or temperature, and there is one good reason for this, without the protection of trellis work the flies would enter and destroy the worms in two or three days; and, even with this protection, they do occasionally enter by millions, every year, and penetrate into the chamber at the hour when the worms are fed. More than one collection of cocoons, which looked excellent at night, has been found destroyed in the morning by the worms escaping. In the times of extreme cold there may occasionally be seen a fire at the door of the houses, but very rarely; and it is doubtful if even this is useful in buildings so badly ventilated. The variations of temperature are very considerable in Bengal during the year, and even in the 24 hours. It is frequently 20 degrees all at once. There is no effort made to equalize the temperature in these houses filled with worms, without the necessary air and giving out a pernicious odour.

Messrs. Durant and Company, in their annual Silk Circular, give the statistics for a long series of years, from which I deduce the following figures as the progressive imports of Bengal silk in bales into the United Kingdom:—

	Bales.	Prices.									
		Common.					Superior.				
		s.	d.		s.	d.	s.	d.		s.	d.
1830	8,726	10	0	to	12	0	14	0	to	16	0
1840	7,644	13	0	,,	16	0	18	0	,,	21	0
1850	10,090	6	0	,,	10	6	12	0	,,	15	0
1860	9,231	11	0	,,	15	0	16	0	,,	26	6
1863	6,200	13	0	,,	16	0	23	0	,,	31	6

In the words of a recent writer, Mr. P. R. Cola, in his essay, "How to Develop Productive Industry in India," "It may be conceded that the production of raw silk is an important branch of industry open for future skill and exertions in many parts of India, and the duty of the English Government is to go on encouraging it by every possible means, as they are doing in France."

The decennial progress of our total imports of raw silk into the United Kingdom is shown by the following figures:—

	lbs.
1821	2,641,866
1831	4,621,874
1841	4,966,098
1851	6,597,178
1861	8,835,255
1862	10,434,350

Since then the total has dropped three or four million pounds. The imports in 1868 from the East, including China and Japan, were but 5,300,000 lbs.

Indian silk is classed into two bunds—namely, the rainy and the dry weather bunds; the name being derived from the season in which it is obtained. The inferior qualities of silk are generally used by local manufacturers; the better qualities are almost wholly shipped to Europe. This most valuable product is capable of great extension and improvement. If its production were more carefully attended to, it might rival the finest silks of Italy. There is no doubt that, with continued attention, the Punjaub will soon rival Bengal in the production of this important staple. The raw silks from Burmah, and some from Assam, are of a peculiar coarseness, yet the length and strength of the thread are such as to render this silk peculiarly adapted for the manufacturing of fringes. Experiments made in France with this silk will no doubt lead in a short time to the exportation of large quantities to Europe.

The worms, being badly fed, bred in quantities, in ill ventilated houses, with little care bestowed on them, it can scarcely be expected that good cocoons would be obtained. There are, however, a few intelligent and careful breeders, who obtain improved results, and 15 lb. of their cocoons, or about 9,500 in number, will yield one pound of very good reeled silk.

The native breeders are generally very poor, and few raise more than 100 lbs of cocoons each. Many produce far less, and often they exceed their means and starve their worms to arrive at this result. The production rests entirely with the natives, and the purchase of cocoons for winding is made by agents from house to house.

All the worms which produce silk in Bengal yield several crops of cocoons during the year, except one,

an annual species, of unknown origin, and which is dying out fast.

The principal kind, known under the name of Dessie, or Dasee, signifying "Country," worm, is assumed to be an indigenous species. This furnishes nearly all the cocoons of the principal harvest of November, or that of the cold season, in Bengal, and yields the best silk. The cocoons are, however, small. In some districts the produce of the best quality is estimated at about 10,500 cocoons to one pound of silk. The worm succeeds best in the cold season, and the cocoons are better than those of the succeeding gathering, but they continue, more or less, in different localities during all the year. The interval between the hatching of the egg and the formation of the cocoon is about 36 days in the cold season, but the time sensibly decreases as the heat increases.

The next species in order of importance is the Madrassee, and, as this name signifies, "Brought from the sea," it may be concluded it is an imported species. It is very hardy, and is easily raised. The produce is comparatively better than that of the Dessie worm, since it takes only about 10,000 good cocoons for the pound of silk. The fibre is, however, less strong and brilliant, but it produces a very fine thread if wound with care. This worm passes so rapidly through its several stages, that twenty-five days suffice from the hatching of the egg to the full development of the cocoon. It will thus be seen that there are two different species of worm, suited by the wisdom of Providence to the different seasons.

The large worm known as Boroo Poloo is annual, and of unknown origin, for it existed when the East India Company sent out Italian eggs, all of which latter failed. It is principally met with now in the District of Radnagore. The silk it yields is excellent, and double that from the other kinds of India worms. But after frequent failures in the crop, irregular hatchings, and very expensive cost in breeding, besides being an annual worm, the natives have taken an aversion to it, and it is likely soon to be as rare at Radnagore as it is now in other districts.

We have seen that it takes at least 10,000 of the best Indian cocoons to produce a pound of silk, while in France about 2,500 will produce the same quantity. This great disproportion between the yield of Bengal cocoons and those of Europe must necessarily arrest attention, and the idea which naturally presents itself is that if India could produce cocoons equal to those of France and Italy the quantity of worms at present raised might supply the silk required by all Europe.

I may now summarize the principal silk-producing moths of India, and this I can well abridge from an able paper by Mr. Frederick Moon, of the India Museum, published a few years ago in my scientific journal *The Technologist*.

The common mulberry silkworm (*B. mori*), doubtless introduced from the northern provinces of China, produces only one crop annually, but spins the largest cocoon and the best silk, of a pale yellow.

There is another species (*B. sinensis*), the small Chinese monthly worm, introduced into Bengal about thirty or forty years ago, but now fast disappearing, being very delicate.

The Madrassee, or Nistry worm (*B. cræsi*) yields in Bengal and China nine crops of a good gold and yellow silk. Introduced into India about 1780, it is degenerating by reason of carelessness and improper management of the worms. Cocoons monthly between November and June, if attention be paid, but more generally from January to May.

The dasee, or country worm (*B. fortunatus*), yields a gold or yellow silk, and produces several crops annually—stated to cocoon five times in the year, at periods from 40 to 110 days.

The Arracan silkworm (*B. arracensis*) yields annually several crops of silk, superior to that produced in Bengal.

The boroo poloo (*B. textor*) produces a pure white cocoon—spun in March and April. The life of the worm is from 42 to 50 days, and the cocoon lasts from 10 to 15 days.

A wild mountain species (*B. Huttoni*), found abundantly feeding on the indigenous mulberry in the forests of the N. W. Himalaya, produces decidedly good silk, and in considerable quantities, which would be valuable. The worm, however, has hitherto proved so intractable that it cannot be reared in the ordinary way in the house, and thrives only upon the trees in the open air.

The caterpillar of *Actias selene* feeds on many wild plants, and can be easily domesticated. The cocoons in Pondicherry are softened in a solution of wood ashes, taken out, picked, and immediately spun, without being either combed or carded, the silk being exceedingly strong, tenacious, elastic, and brilliant. Four broods can be produced annually.

The Tussah (*Antheræa* [*Paphia*) is one of the most common in use of the native wild silkworms. It is found in abundance over Bengal and the adjacent provinces, and has afforded to the natives from time immemorial an abundant supply of a most durable silk. Millions of the cocoons are annually collected in the forests and taken to the silk filatures near Calcutta, but the principal place of manufacture is at Bhagulpore. Tusser silk is everywhere used as clothing by the natives, and even by Europeans, while considerable quantities of woven Tusser are imported into England.

The silk of the *B. Mylitti* and *B. Pernyi*, which known in India under the name of Tussar silk, has been thrown with some success in England. In the Indian Department of the London Exhibition of 1862, some goods manufactured from this silk were shown, which were very fine in texture, but being woven from the raw material they do not take the dye well, and hence cannot compare with the silk of the *Bombyx Mori*.

Tusser moths are hatched twice in the year, in May and August. The larvæ go into the chrysalis state in September, remaining so till the May following; whilst those that enter the chrysalis state in July, come out in three weeks. Many of the females lay eggs in eight or ten hours after quitting the chrysalis; others, again, do not until the following night, or longer. In ten days the young larvæ make their appearance, and feed on the Asseen and Saul trees. In about three weeks from the time of the exclusion from the egg they attain their full size, and in eight or ten days more prepare for their transformation into the chrysalis. The caterpillar commences its operations by drawing a few leaves slightly together, as if to screen it from observation. It then spins a strong cord, composed of many threads, altogether about the thickness of a crow-quill, at the end of which it weaves the cocoon. This is so transparent for the first six-and-thirty hours, that the larvæ may be distinctly perceived at work in the interior. After that time, the cocoon gradually acquires consistence by the continued industry of the caterpillar, and becomes quite opaque, from the addition of a glutinous liquid with which it moistens the whole. When that dries, the cocoon appears as if covered with white powder, and in the course of a couple of days becomes perfectly hard. The moth generally deposits its eggs within a few yards of the cocoon; these the villagers collect and keep in their houses till the young caterpillars come forth, when they are placed on the Asseen trees in the jungles, the proprietors remaining to protect them from the birds, and to bring home the cocoons when perfect. The people who rear these silkworms are of the Sontal and Bhouree castes, and practise many superstitious ceremonies while tending them in the jungles.

From the experiments of M. Perottet of Pondicherry, it would appear that the statement that this moth cannot be domesticated is fabulous, as he succeeded in inducing it to breed in a state of captivity, and obtained sound and

productive eggs. He managed, during a year of abundant rain, and when there was a continued damp atmosphere, to obtain four generations of these worms during the year. M. Perottet forwarded to France living cocoons of this species, and several generations were reared there, being fed on the leaves of the common oak, which were greedily eaten by them. During the early part of 1859 he sent five different despatches of living cocoons of this worm to France, which arrived safely and were doing well.

The cocoons found upon the *Terminalia* are always considered stoutest and strongest, while those on the Jujube are the weakest. Fifty cocoons obtained from the former tree will weigh one French pound. These cocoons are exceedingly rich in silk; they reel by means of an alkali or any other solvent with great facility, and to the very end. The silk they produce is very elastic and of singular brilliancy, but dark in colour.

There has been some discussion as to the distribution of this species of moth in India; the difficulties having arisen mainly from the existence of allied species in Darjeeling and other remote localities.

Dr. Roxburgh, in the 7th vol. of the Linnean Transactions, has described the preparation of the Tussah silk; and Colonel Sykes, in the 3rd vol. of the "Transactions Royal Asiatic Society," has a paper on the cocoons of the *Saturnia Paphia.*

Tussah silk could be obtained in large quantities in the wild tract of country to the eastward of the Godavery river. The breeding worms in the cocoons are there preserved in the houses. At the proper season, the young caterpillars are taken to the jungle and placed on wild trees, where in time the cocoons are formed. Demand would encourage supply to an unlimited extent. If this coarse kind of silk would sell in Europe, the whole jungle would unfold its treasure, and a very large quantity might be brought into the market annually.

The Tussah cocoons brought from Cuttack vary much in size and colour, and there is also a very perceptible diversity in the texture and glossiness of the raw silk, which, most probably, depends on the species of tree on which the caterpillar may happen to have fed. The same variety is observable in the female moths, which are of three or four different sizes and colours. The mode of winding off the thread does not differ from that pursued in the case of the ordinary silk worm proper. The Tussah silk worm feeds indiscriminately on the teak, the jujube, the mulberry, and other trees. In some places it is an annual only, but in Bengal it has at least three broods in the year.

The Moonga silk worm (*A. Assama*), feeds also upon several wild trees; it is often cultivated by the natives, and can be reared in houses, but is fed and thrives best in the open air and upon the trees. There are five broods in the year. The silk forms one of the principal exports of Assam, and leaves the country generally in the shape of thread.

The Mezankooree, a closely allied worm (*A. Mezankooree*) feeds on a species of *Tetranthera* in Assam. The silk is nearly white, its value being fifty per cent. above that of the Moonga, and it constitutes the dress of the higher classes in Assam. The oak-feeding silk worm of North West India (*A. Roylei*), feeds on the common hill oak (*Quercus incana*). The cocoon is large and very tough, and the silk is pronounced as promising, and worth cultivation. An allied species (*A. Pernyii*), has been introduced into France from China.

The Atlas moth (*Attacus Atlia*) the caterpillar of which feeds on the leaves of *Falconeria insignis, Bradleia ovata*, &c., is stated to produce the Tussah silk of China. It is easily reared in a state of domestication, producing a cocoon well stored with a fine yet strong silk, of a greyish colour.

The *Attacus Canningii* is the wild sub-Himalayan Eria silkworm, feeding on *Coriana nepalensis, Xanthophyllum hostile, and Ricinus communis.*

Attacus ricini is the commonly cultivated Eria or Arindy silkworm, which, in Bengal, yields four or five crops annually, and is reared over a great part of Hindostan, in houses in a domestic state, feeding on the leaves of the castor-oil plant. It gives a cloth of seemingly loose texture, but of incredible durability, the life of one person, it is stated, being seldom sufficient to wear out a garment made of it. The thread is woven like cotton, and the clothes are mostly used for home consumption by the poorer classes at all seasons, and by the highest for winter wear.

These wild silkworms may be thought by many unworthy of notice, as they do not yield that kind of silk most valued in commerce, but they are more important than they at first appear to be. We must remember that the culture of some in the forests, and the collection of all, affords employment to considerable numbers of the natives in the parts of districts least productive of useful occupation. They afford also clothing for many of the inhabitants. In one district alone, that of Azimghur, it was stated that, in 1837, 318,772 pieces of Tussah silk were turned out annually from the looms.

The inquiry as to which is the tree best adapted in India or elsewhere for the production of good silk, although apparently a very simple one, is in reality not easily answered, since much must depend upon the species of worm under cultivation, as well as upon the climate itself; and the difficulty is enhanced by the fact that every one who, possessed of much zeal but little knowledge of the subject, essays to rear silkworms, appears to think it necessary to extol some particular species of mulberry, and to pronounce it for the time the *ne plus ultra* of silkworm diet. One while it is the white-fruited mulberry only that can enable the insect to elaborate good silk; and anon, for some inexplicable whim, the white is discarded, and another tree adopted in its stead. The purple-fruited species is unhesitatingly denounced. And yet the white mulberry is found to be nothing more than an albino variety of the purple-fruited tree.

In the report of the Agri-Horticultural Society of Calcutta, for 1866, notice is taken of the experiments in various parts of Bengal with the varieties of the Japan silkworm, which are stated to yield a much superior silk to the monthly worm of Bengal, and samples raised from this stock at Ghotal were considered by Mr. Turnbull as infinitely superior to the general run of Radnagore silk, and not far short of Italian. In consequence of this favourable result further supplies of eggs were ordered, and the experiments continued.

The cultivation of the silkworm in Oude was believed to be capable of great extension, as the mulberry abounds throughout the province, and the climate appeared to be favourable to the rearing and thriving of the worms. Of silk from Oude shown at the London Exhibition in 1862, Messrs. Durant reported that it was, in some respects better than the silk of Bengal, inasmuch as it had more nerve and less of the fluffiness which, more or less, seems to be an inherent condition of even the best of the European filatures of that country.

In 1861 Dr. Bonavia commenced the cultivation of various kinds of mulberry trees in Lucknow, distributing cuttings to the officers of all the districts in Oude, and energetically induced the natives to rear silkworms. After repeated trials, he stated in 1865 that his experiments were given up, for it was found that *multivoltine* varieties required more care than any native would be inclined to give them, in a climate like that of Oude, where the contrasts of temperature between different seasons are so great. The *Univoltine*, or annual variety, also, did not succeed sufficiently well to give much encouragement. He further states, that if silkworm breeding is ever to succeed in Oude, it must be some hardy annual variety, feeding on the hardy native mulberry.

The cocoons of Oude and Umritsur are said to have degenerated in one season 56 per cent. below the Cashmere standard. Cocoons raised at Lucknow, in Oude,

by Dr. Bonavia required 5,200 to the pound of silk. At Candahar, in 1849, the Afghans reckoned about 4,500 to the pound of silk, while in France, previous to the late epidemic, 2,500 cocoons were, on the testimony of Mr. Bashford, equal to a pound of silk. Here, then, we have positive evidence that the climate of the Punjab and other parts of the plains of India is injurious to the health and general well-being of the insect.

The political resident at Munnipore, writing in 1864, states that there can be no doubt of the suitability of the climate of the locality to the growth of the finest quality of silk.

With the sanction of government, an experiment was instituted by Captain Thomas Hutton, at Mussooree, in the N.W. Himalayas, in 1850, having for its object the eventual cultivation of the wild Himalayan silkworm, known as *Bombyx Huttoni*, and for this purpose he was instructed to form a plantation of the indigenous mulberry trees, three years being granted in which to finish the work. Subsequent trials proved unfavourable to the chance of future success with this species. Captain Hutton, however, represents that experiments tried with the domesticated *Cashmere* and Bengal *Madrassee* worms, had proved, beyond a doubt, not only that these worms throve well in the climate of Mussooree, but that there was also a ready and remunerative market for the silk.

Is it not (asks Captain Hutton) a well-understood and long-established fact, that, whether among animals or plants, an occasional renewal of seed, and reinfusion of the original stamina is found to be absolutely necessary for the preservation of health and of that particular standard of perfection which it is thought desirable to maintain? And yet, with the domesticated *Bombyx mori*, this necessary precaution has been uniformly neglected for 400 or 500 years. What wonder, then, that under the combined effects of bad and scanty food, want of sufficient light and ventilation, too high a temperature, and with the constant and unvarying interbreeding of a debilitated stock, the insect should have become subject to a multitude of maladies, and threaten, at no distant period, to become extinct.

As early as the year 1791, experiments for the introduction and culture of what succeeded so well in Bengal. were made in the Presidency of Madras, and continued for several years, but without any permanent results; as in the year 1854 only 1666 lbs. of silk were exported. This is probably owing to the climate of the Madras Presidency being generally unsuited to the culture; for, in the more elevated climate of Mysore experiments have been continued to the present time, and some very good specimens of silk were sent to the Exhibitions both of 1851 and 1855; also to the Exhibition held at Madras in 1857; when it was stated as probable that the culture might be successfully carried on in the valleys of Neilgherries. The silk produced in Mysore is required for the manufacture of the silk shawls of that province.

In the same way, experiments were made in the Bombay Presidency about the year 1755, repeated again in the Deccan in the year 1830, and persevered in for ten years, under the superintendence of an Italian, M. Mutti, but without eventual success, as was always anticipated by Dr. Gibson, in consequence of the heat and dryness of the climate.

Though these instances may appear to put limits to the extension of silk culture in India, and to a supply of raw material from that country; they only do so in the districts having the climate which has been indicated. In the valley along the foot of the Himalayas, in North Western India, there is a less arid soil, a more temperate climate, and species of mulberry appear indigenous and flourishing. This is still more the case in the lower hills which bound the Punjab and in many parts of the Punjab itself. Here, indeed, a most successful experiment has been commenced, of which the results were shown in the Paris Exhibition of 1855.

Experiments were for some time energetically carried on by the late Mr. Cassamajor and by Major Minchin. Silk from Italian worms was successfully reared at Katy, and silk was produced of good quality on the estate of Mr. F. Lascelles on the Neilgherry hills. Quantities of silk may be looked for yet from these localities, from Assam, Bokhara, and Affghanistan, whilst the dry and equable climate of Scinde is especially favourable to silk culture.

The cultivation of the mulberry in connexion with the manufacture of silk has been carried on for many years in the talooks lying in the vicinity of Bangalore, Mysore, and Seringapatam, where are chiefly congregated the Mussulman communities, to whom this branch of industry is almost wholly confined. Devoid of energy, and unaided by the capital which could enable them to import varieties, both of the mulberry and the silkworm, they have been content to eke out a bare subsistence, and, indeed, from the rapid deterioration which has been going on in both respects the local trade had been for some years in a languishing state. The settlement, however, of a Silk Filature Company, conducted by an Italian gentleman at Kengari, near Bangalore, and the introduction of new breeds of silkworms, as well as of improved kinds of mulberry, promise to inaugurate a new era in the silk manufactures of Mysore. The increased demand thus occasioned has given a stimulus to the production of a better kind of silk, and, in order further to promote this object, arrangements were made, in 1865, with Signor de Vecchi for the importation of silkworm eggs from Japan, for distribution to those who were willing to rear them with care and to give the experiment a fair trial. The only kind of silkworm hitherto reared in the Mysore country is the China variety. These worms yield cocoons which are described as being much inferior to those of China and Japan; the silk is not closely woven, and is internally flossy, though the quality of the thread, when reeled by European processes, is found to be good. The inferior quality of the native reeled silk is evidenced by the value. The best samples, which are worth on the spot 4 or 5 rupees (8s. or 10s.) a seer (equal to three-fifths of a lb.), would not in Europe obtain a higher price than 13 or 14 shillings per lb.

Some singular religious notions stand in the way of the extended production of silk by the natives of the East. Thus Mr. Wright, of Peradenia, near Kandy, Ceylon, after making exertions to extend the culture of the silkworm, and forwarding 500 or 600 cocoons to be distribute among the natives, called the headmen to assist, but they doubted whether the priests of Buddha would sanction the cultivation of the silkworm. The high priests were convened, and came to the meeting in their large yellow silk shirts—their sacerdotal dress; but nothing could induce them to recommend an occupation which involve the destruction of life. "Why," said the agent, "you come here, wrapped in the spoils of the worms that are killed by the strictest Buddhists in China and Siam." But they would not sanction a practice which involved the destruction of the worm, although they themselves gave the greatest encouragement to it by the use of silk.

Silkworms are common in many parts of the province of Burmah. In the district of Sandoway, the eggs are hatched by the ordinary heat of the weather all throughout the year, and a supply thus kept up, but the silk procured not being good at all times, it is not until December that the silk for sale is obtained. In that month the worm is largely bred, and the cocoons are formed in February. No selection is made of the best silk, but it is sold indiscriminately, and used in the district in the manufacture of native dresses. Silkworms are also extensively used in the northern and western parts of Toungoo. Attempts have been made to introduce a better breed of worms, by importing eggs from Moorshedabad in Bengal.

I have now somewhat hastily skimmed over the subject of silk production in India. Imperfectly as this has been done, I trust it will open up a field of inquiry and dis-

cussion which may result in benefit hereafter to that great and important dependency of the British Empire, as well as in supplying the urgent wants of the factories of Europe. The Society of Arts has long devoted its best energies to this subject, and it is to be hoped that this appeal, made for further detailed information, and for useful suggestions as to the best mode of stimulating the production and improving the quality of Indian silk, may not have been made in vain.

DISCUSSION.

Mr. Thomas Dickins, Chairman of the Silk Supply Association, believed the statement Mr. Simmonds had made was on the whole very correct with reference to India; but the unfortunate fact still remained that the quality of the silk produced there was very defective, and would continue to be so, so long as the present mode of reeling the silk was carried on. The great cost in the production of silk was already experienced when the cocoon was produced. The silk worm required so much food and so much attention, and the great object sought was to get the largest quantity of silk from the smallest number of worms. In France, in Italy, and the best silk-producing countries, about 12 lbs. of the green cocoons—that was French cocoons—were sufficient to yield 1 lb. of silk. That 12 lbs. when dried and pressed for packing for exportation, lost about 75 per cent., and when the cocoons were imported in that state from Asia Minor, and such places as now exported cocoons, about 4 lbs. was sufficient to produce 1 lb. of silk. In India and China, wherever the silk was imperfectly reeled, they required twice or three times that quantity; and, therefore, it would be evident that the great cost of producing silk was in that proportion twice or three times enhanced up to the point of reeling the cocoons, so that if in India we could have a better and stronger worm, such as was produced in France and Italy from the Japanese seed, that would be one great point gained. Then, again, the misfortune and great error in the production of silk in all countries except France and Italy, was the practice of reeling the silk there instead of sending the cocoons to Europe, where the machinery and the whole system of reeling was carried out to much greater perfection. The filament of all these countries probably was of about the same quality; whether Bengal, China, Japan, or France, the filament was about the same; and if in reeling the same number of filaments were continued throughout the thread, then the Bengal and Chinese thread would be quite equal to the Italian or French thread; but the superior mode of reeling in Europe enabled the weavers to continue the thread of four or five filaments throughout, and made the silk worth 45s. per lb.; whereas, from the defective reeling in India, the thread varied from four up to twenty-five or thirty filaments, and owing to its uneven character was worth only a third or a fourth of that sum, whilst the cocoons were just the same in both instances. Therefore, he suggested that all parties interested in this question, more particularly with regard to India, should give every possible encouragement to the proper desiccation of the cocoons, press-packing them, and sending them to the best market, such as Marseilles, where they might be reeled. The time might come when we might import the raw material into this country and reel it here. Marseilles presented the great market for this country, and he believed the cocoons if so imported, press-packed, would realise to the merchants who imported them a far greater value than silk reeled in the defective state in which it was now received from India and elsewhere. He purposed at the end of next month reading a paper on silk supply before the Society, in which he should be prepared to enter more fully into the subject by referring to all the countries capable of producing silk, and the comparative qualities which those countries produced at the present time.

Dr. Archibald Campbell (late Superintendent of Darjeeling) attached great importance to the suggestion of Mr. Dickins that encouragement should be given to the sending of the cocoons to be reeled in Europe. It was very desirable that we should ascertain the causes of the falling off in the quantity of the silk from India as well as to direct attention to the means of improving the quality of the article produced. In this respect he thought they should receive active assistance from the Government. He thought it could be done by application to the Governor-General to appoint an officer—say for one year—a man of capacity and information, who had a desire to increase the supply, to make a tour of the principal silk-producing provinces of the Punjaub and Bengal, and to report upon the actual state of the production now as compared with other countries; also as to the causes of failure, and what could be suggested to remove those causes of failure. With regard to the wild kinds of silk mentioned, he believed, if it could be made suitable for our requirements, it could be produced to an unlimited extent, inasmuch as the worms fed upon the castor oil plant, which grew abundantly without cultivation, and only required to be defended from animals. Besides affording food for the silkworms, considerable quantities of oil were obtained by the natives from the seeds of the plant. He repeated, if the article could be made suitable for European requirements, the silk might be produced to an unlimited extent.

Major-General Sir William Denison (late Governor of Madras) thought all these propositions which called upon the government to step in to aid and assist in these sort of matters which really concerned the public at large were futile. He told them frankly, government had not the power to deal with this question, which appeared to him to lie entirely in the hands of those who were officially interested in the matter. For instance, they were told "Here are the cocoons, some large and some small; but if they were broken and pressed and brought home to Marseilles to be reeled, one cocoon is just as good as another." It appeared from what Mr. Dickens said, there was no difference in the quality of the filaments, the filament of one cocoon being just as good as another, and that if the cocoons were imported into Marseilles and wound off there by proper mechanical means, the silk of India would be just as good as that of any other country. The simple process, therefore, was for those interested in the matter to purchase the cocoons from the growers in India and send them to Europe to be reeled for the market. But our habit, he was bound to say, was too much to call upon Jupiter to help us instead of helping ourselves—to call upon government to do that which no government was able to do. Government might appoint such officers as Dr. Campbell had suggested, and might give advice; but in the first place they could not be certain that the officer appointed was a properly qualified one, who understood the work, and had an interest in doing it; because that was the main thing. They might pay a man so many rupees per month to travel about, but they could not guarantee that the work would be worth anything when it was done; but give a man an interest in whatever it might be, whether cotton or silk or any other production, they would then have some chance of getting a fair result. He spoke from personal experience. He had these things thrust upon him when he was in Madras. The Cotton Supply Association went to the government, and the government pressed upon him to do this and that. But when the Cotton Association sent out their people, instead of asking his advice, they wanted to work out their own system in their own way, by his help, or in other words, with the funds which the government had at its disposal—a pleasant way perhaps of doing things, but it was not the way to succeed. They must put their own shoulders to the wheel, and the persons interested in this undertaking must look to themselves and not through the eyes of others, or try to interest others in doing the work they ought to do for themselves. His experience in India extended only over 5 or 6 years,

but he inquired into the character of the natives, and they would find it remarkably difficult to change a habit which had been working in these people century upon century. Lord Tweeddale, his predecessor in Madras, tried to introduce European improvements. He endeavoured to show the people that by using the Scotch plough, and ploughing deep, they would produce double the crops they were then producing; but what did the people say? "Yes, you English are wonderful people, but our grandfathers did as we do, and we do not see why we should not do exactly the same," and they did it. What they wanted was to teach the natives—and that would be a slow process—the principles on which these matters were founded, and to teach them to apply the materials they have upon something like principle. Iron was an article which had to be imported, and there was scarcely such a thing as a blacksmith to be found. There was a want of mechanical ingenuity, a want of mechanical application, and that was what they must teach the natives first. With regard to silk, if they required it to be properly wound, they must get people to do it. As to teaching the natives to do it, it was perfectly hopeless. They required to get the idea into their head first, and then the idea must be developed by practice.

Mr. Hyde Clarke said, after the discouraging speech of Sir W. Denison, who had resided in India, perhaps he might be in a better position to say something upon a question often mooted amongst Indians and statesmen in this country, having had much the same experience as Sir W. Denison, and not having arrived at the same conclusions. Having acted for a considerable period as the Commissioner of the Ottoman government in Turkey, he (Mr. Clarke) had opportunities of seeing the working of some of the questions to which Sir W. Denison had referred. To those who had any knowledge of the East, nothing could be more practical than the observations of Sir W. Denison as to the difficulty of introducing European improvements amongst the natives of the East. It was necessary that anything introduced should be adapted to the purposes of the population. They had seen such failures as Sir W. Denison had described; but he was sure they must all have seen how, when an improvement had been properly introduced, it had been successfully carried out. Indeed, to say—as he understood Sir W. Denison's statement to amount to—that improvements could not be effected in India, was tantamount to saying that no improvements had been effected there, and that we ought to give up all efforts for the improvement of India, in defiance of the experience of the past and of the progress of the present. Sir W. Denison had told them that those interested in the cultivation of silk ought not to apply to government for assistance—not to call upon Jupiter to help them—but that the manufacturers of Manchester and Macclesfield ought to do these things for themselves. Did the statesmen in India who agreed with Sir W. Denison wish to place the English government of India in a less favourable light than the Turkish government of Turkey? That was a question worth asking, and it was an inducement for him to endeavour to answer one who had occupied a high position as a governor and statesman not only in India but in other parts of the world. He would say when the Cotton Supply Association applied to the government of Turkey, they met with instantaneous response and co-operation. They knew, on the other hand, that when they applied to the government of India, it was with difficulty they had obtained assistance from men who, having the interests of England at heart, and those of India likewise, would otherwise have been inclined to have given assistance, which had only been tardily and grudgingly afforded. Why had that been? Not so much he believed from the want of disposition as from an unfortunate theory of political economy; because, whether with regard to India or England, we ought to be particularly careful not to confound political economy with politics. Political economy was not the science of development; and though it was desirable as a principle that government should not interfere, and that trade should look after itself, yet that ceased to be a sound principle of politics when applied to a country like India or a country like Turkey. Any one who was acquainted with the governments of the East, knew how much the condition of a large population might be influenced by one man. Notwithstanding the discouraging account of Sir W. Denison, he (Mr. Clarke) had heard that during the period he held the governorship of Madras, he was able to do a great deal for the improvement and benefit of that population. He said we ought not to be led away by simple axioms of political economy on a subject like this, but we must take a common sense view of the matter; and he thought the statesmen of India, who held the opinion that the government ought not to listen to the applications of the Cotton Association or the Silk Association for assistance, were taking a false ground when they said the government was not the party to apply to. Without going into the theory of the question he would refer to his own experience. He stated that the government of Turkey readily granted the assistance which was asked for. What was the result? The government of Turkey received a large addition to its revenues in consequence of the co-operation it afforded. Assuredly the government of India had obtained benefits from the promotion of cotton cultivation or anything else for the improvement of the country; and if they gave assistance with regard to the cultivation of silk or anything calculated to benefit India or the manufacturers of England in relation to Indian products, we might be assured that the government would participate in the benefits obtained. If that were the case why should we go back to remote principles of political economy, and say that the merchants of Manchester and the manufacturers of Macclesfield should do all this work with regard to cotton and silk; that they should ask for no co-operation, but that the government should receive the benefit of anything that came in their way. Was that a fair way of putting a question of this kind? It placed the government of India in a false position as between the community in England and in India. If we looked at the subject practically with reference to the population of India, he said, without having had experience in India itself, but having some experience of Eastern countries—if the government did its duty in this matter of silk supply, it would not obtain the discouraging results prophesied, but would obtain great benefit for itself and vast advantages for the community of India; and it was only by the co-operation of the government that these results could be obtained. It was impossible for manufacturers interested in this question to carry out, in a distant country like India, what was required in this caae. And there was another circumstance, India was not the sole silk-producing country; and if the government of India would not do what other governments interested were doing, or would do, India would be thrown behind and would not reap those advantages which its natural position and its vast population would enable it otherwise to obtain. He would make no more remarks upon this part of the subject, because there were those present connected with India who would, no doubt, take it up. He thought all would concur in the propriety of Dr. Campbell's suggestion of the appointment of such an officer as he had designated, and under the conditions mentioned by Sir W. Denison, that he should be a man thoroughly qualified for the purpose. He (Mr. Clarke) believed if such an officer were appointed in India, it would be the means of doing as much for the promotion of silk cultivation, as in the case of those appointed for the purpose of assisting cotton cultivation. He knew the government of India had done a great deal for cotton cultivation, and it was by extension in the same way with regard to that and other products that a great deal more was to be done. He would, in conclusion, say a word with regard to the employment of the Mussulman population in this branch of

industry. He saw that in connection with the silk products of Turkey, the Mussulman population, as they knew, always endeavoured to keep up a standard of respectability. Women of the better class were not employed in outdoor work, or in menial pursuits, and it was only by household work that they obtained the means of existence if left without means, in a state of widowhood. Under these circumstances the cultivation of the silkworm was found to be a respectable means of maintaining the family, and in that way the cultivation of silk had been found beneficial amongst the Mussulman population of Turkey. In the filatures introduced into Turkey, chiefly by the French, and which had contributed to the improvement of the silk of that country, the Turkish women were employed, not only in the establishments of Mussulman proprietors, but also in those of French and other European proprietors. It was considered no social degradation to be so employed, though the poorer orders generally engaged in that pursuit. Of course no one expected that a population would change its habits all at once, but if any pursuit could be introduced under favourable and judicious auspices, he thought they might look forward to great results. So far as he could judge from his experience in another country, he thought the prospects of action in this direction in India were so far favourable. Still they might meet in some districts with the obstacles that had been pointed out, which might impede the movement. On the other hand they would find other districts better disposed where the could make more progress. With regard to the question raised by Mr. Dickins as to the reeling of the silk in India or Marseilles, it was an important English trade question with regard to the silk market itself. At one period we had much greater command over the silk market than we have at present. The French had become great rivals, and if, under the encouragement sought for, the production of silk in India was increased, and it was sent to Marseilles, it would be a great discouragement to our own market, and make Lyons a still greater silk market than it is now. Under these circumstances it was a matter of importance for the government and the friends of India to do what they could to promote the proper reeling of silk in India, of which successful examples had been brought before them this evening, and which had also taken place in Turkey. If they obtained better reeling in India then the silk would be brought direct to the London market, and they would be able to improve and promote the market here. He must say, in conclusion, that the presence of the Chairman on that occasion was a protest, as it were—he did not say against the doctrine of Sir William Denison, because he was one of a large party in England—but against that gentleman's vindication of the conduct of the government. From what cause did the chairman hold his present position? Because, on account of his attainments and the great attention he has given to the subject of Indian products, it was felt he could promote the views of the government in enabling India to contribute more largely to our manufacturing requirements. It was by such action that the government best did its duty by encouraging the merchants and manufacturers of England to do their share for the common benefit of mankind.

Colonel Collyer, R.E. remarked that probably the name of Dr. White was known to many present. He was a great botanist and agriculturist; and in reference to Mr. Hyde Clarke's adverse criticism upon the government in contrasting it unfavourably with the Turkish government, with reference to the assistance given by the latter to the cotton interest, he begged to state that from 1842 up to 1844 the government engaged a number of American cotton planters from New Orleans under Dr. White, and everything possible was done to improve the cotton cultivation at the expense of the government; but it was a failure, and the planters were sent back again. He thought Sir W. Denison's remarks had been misunderstood. He did not think he meant to say that if there were any difficulties in the way of growing silk in India, the government could not assist; but he understood Mr. Dickins to say that the Indian silk *per se* was as good as that of any other country, the only fault being in the manipulation of the article. He did not think it was the business of the government to teach the natives to reel the silk in a condition which the European manufacturers approved, but he thought it was rather the duty of those who were interested in it.

Mr. Turnbull said, although he was aware that the natives of India were a very unteachable race, and that the Bengalese were worse than anything Sir W. Denison had seen at Madras, yet they had been taught the cultivation of indigo remarkably well; he therefore could not express how astonished he was to hear it said that they could not be taught to reel silk well, because it was one of the simplest operations a person could be called upon to perform. He knew there were things which the natives of Bengal could not do well unless they were superintended by Europeans who understood the business, and could take means to make the natives understand it. He heard Sir W. Denison say there was no iron in India. That might be true, but he (Mr. Turnbull) never wanted iron in Bengal without being able to get it; and he never knew a native mechanic who, if a thing was placed before him, could not make one of the same kind. His own idea was, that the natives of India under good superintendence were a very teachable people. He had had thousands under his superintendence, and had had business relations with them of various kinds. He did not think they had had justice done to them. They were as docile and tractable as children when properly treated, and would do almost anything that was required of them.

Mr. F. Hendriks, though convinced of the soundness of Sir W. Denison's remarks as to self-help in respect of the Anglo-Saxon race, doubted their application to races like those in India. They looked rather to be taught than to help themselves or take the initiative. In point of fact that was the principle of success of the neighbouring nation of China, because they could teach the inhabitants of India the methods by which such industries could be performed with success. They knew that in China it was part of their religion to know how to cultivate the silkworm, and the theory and practice of it were laid down in the sacred books in which they were examined. He thought the government of India was paternal rather than representative; he thought the time had arrived when this and other societies who had discussions of this kind before them might consider whether boards of agriculture, commerce, and manufacture might not be established in India. He did not say they need be an expense to the country. It had been objected that, if officers were appointed to travel through the silk-producing provinces, they might not be sufficiently informed themselves to be able to teach the natives. Associations might be formed which would particularly take upon themselves the duty of making the natives of India well informed upon the best principles for the promotion of art-manufacture and industry. These boards might consist of natives of position and influence as well as Europeans, and he fancied the results would be found exceedingly satisfactory. He merely threw out the suggestion for the consideration of those who had had experience in India. Even in this country industry was stimulated by rewards and in other ways, and he thought a similar system applied to India would be productive of good results.

The Hon. George Campbell (Judge of the Supreme Court), would rather have listened to a practical discussion with regard to the cultivation of silk, but inasmuch as it had taken another turn he would say a word or two with respect to government assistance in this matter. They could not lay down any absolute rule. There were some cases in which the government might with advantage assist, and others in which government could do no good. When they introduced something entirely new,

government could and ought to assist in manufacture or cultivation; but in the case of an old cultivation like silk, he doubted whether government could do so. Moreover, it appeared to him that the silk industry in India had passed beyond that stage, because they had not only the old native cultivation of silk, but the European manufacture of the article, and, as far as he was acquainted with the matter, he believed the silk of commerce was of European manufacture, and that the silk came almost exclusively from Bengal, where they had a set of men from this country, who had produced it in an admirable manner. He heard from Mr. Dickins with great astonishment that the great fault of the silk from India was in the reeling, because that was an operation exclusively conducted under European superintendence, and it was his belief that, under that superintendence, it had been brought to perfection. But if the fault was in the manufacture, the remedy did not lie with the government nor with a Society such as this. A gentleman had alluded to the cultivation of indigo which, under European superintendence, had been carried out successfully. There were difficulties in the way of that cultivation at first; but he thought silk had not suffered from any of those difficulties, and contentions between capital and labour and between planter and ryot. He knew farms which, in difficulty with respect to indigo, carried out silk cultivation with great success. Therefore, having got to that stage, it remained that, as had been asserted to-night, they were deficient in the manipulation of the article. What was required to be done was to teach the natives how to manufacture their silk more efficiently, and send it to the market in such a state as to acquire greater value. He would add his testimony to that which had already been given. He must say he thought Sir W. Denison had expressed merely his own views, when he said the natives of India were not capable of mechanical art, and he was surprised to hear a gentleman of his experience say there was hardly a native blacksmith to be found. If one class of artisan was more numerous than another it was that of the blacksmith, and in European manufactories the finest portions of the work were done exclusively by native hands. He doubted whether, if they learnt an improved system of agriculture, they would adopt it. There was deep ploughing; but, looking to the nature of the soil, the natives understood their own agriculture better than we; and so-called improvements in agriculture were not lasting, but resulted in dead loss. The natives understood their own business, and were waiting till we showed them such an improved method as would produce improved results. If we showed them that, by methods within their means, they were ready and willing to adopt the improvements.

Sir W. Denison, in explanation, said he did not mean to say there were no cutlers in India. What he said was, if they wanted machinery repaired of which cast-iron was a part, they could find no person capable of doing it unless they sent it to Madras. He admitted the Indian workmen were most admirable cutlers, and in various descriptions of handicraft they excelled.

Mr. Campbell begged to say one word further. He had little technical knowledge of silk, but would contribute his small mite of knowledge with regard to the practical question before them. One gentleman alluded to the Punjaub, and on that point he could say with confidence that government officials had done their utmost in the way of trying experiments in the cultivation of silk there; but he thought the result was rather to show that for the successful cultivation of the silkworm they wanted, first, temperate climate, and secondly, a climate in some degree moist. He had seen experiments in silk cultivation at Lucknow, and was acquainted with Dr. Bonavia, who came from a southern country. If any one was calculated to carry out the experiments successfully, that gentleman was the person to do so; but the result was failure. He (Mr. Campbell) attributed that fact to the dryness of the climate of Lucknow. The Punjaub was still drier, and the results there were discouraging; but there were other districts of India in which the prospects were more hopeful. What he would urge upon the members of this Society was, that they should try to get at the root of the matter, and ascertain the climate and conditions suitable for the silkworm, and in that way to put the matter in a practical shape, so as to induce silk cultivation in those districts of India where the climate is most assimilated to that of France and Italy, where the cultivation of silk was most successfully carried out.

Major-General Clarke could bear personal testimony to what had been stated by Mr. Simmonds relative to the experiments made in silk cultivation in Bengal and Oude. With respect to the latter, it might have been foreseen that they would fail, because the locality was one of the driest in India. In 1852 there was only one self supporting silk cultivating establishment in Bengal proper. He might mention, and claim what credit it was entitled to, that it occurred to him, in 1860, that the moister parts of Oude were suited for the silk-worm; he accordingly procured a supply from Cashmere, and with the assistance of a gentleman connected with a filature in Bengal, he succeeded in producing some capital cocoons, but he could not get the Bengal men to come up there. The eggs were sent up the hills to be hatched in a cool climate, and the worms were brought down in September or October. He was astonished at the success of that experiment. The cocoons were reeled, and a favourable report of the result was made. Some of the silk was sent to the Exhibition of 1862, but he had not heard that it was reported upon; it was, however, the opinion of Mr. Durant, of the firm of Durant and Co., that it was superior to the silk produced in Bengal.

Mr. J. C. Wilson suggested whether a middle course between the views of Mr. Hyde Clarke and those of Sir W. Denison might not be advantageously adopted. The representatives of trade appeared to desire an active sympathy and encouragement on the part of the government, who declined to devote the public funds to that purpose. Could not the trading interest conduct their own operations, with their own funds, by means of their own agents, and could not the government at the same time give its active sympathy and encouragement, and patronise the objects of commerce in every possible way, without the necessity of putting their hands into the public purse?

The Chairman in proposing a vote of thanks to Mr. Simmonds for his paper, said it was too late to go into all the various questions started in the discussion. Without following the remarks as to what should be the course of the government in this matter, he thought he might safely say that if any practical propositions could be laid before the government, they would be found ready to act upon them. With regard to the question of the introduction of better cocoons into India, that was a practical one which would require the attention of practical men on the spot. No doubt a great deal could be done to improve the quality of the cocoons, and he believed attention was directed to that, and the introduction of fresh seed from Japan was producing a certain amount of beneficial effect.

Mr. George Campbell asked what were the limits of climate within which silk could be successfully cultivated?

The Chairman replied that was a very difficult question to answer. Judging from experience, it would seem that a very dry, and at the same time hot, climate was not well suited for silk cultivation. Upon the whole, he thought the climate of Mysore most completely answered the conditions required for this cultivation, and that it could probably be carried on there with better results than in Bengal.

Mr. Campbell inquired whether they must have a cold climate; to which

The Chairman replied—Not necessarily.

The vote of thanks having been passed,

Mr. Simmonds expressed a hope that the remarks he had made would not be taken as an appeal on the part of the manufacturers to government for aid. They were endeavouring to aid themselves, by forming an association of their own body to promote discussion and to obtain information; and the suggestion of Dr. Campbell, based, no doubt, upon his experience in India, on which the discussion had principally turned, was quite a voluntary one. They found that other governments were now paying attention to the subject. The South American Republic and the Australian Government had instructed their agents to give all the aid in their power in diffusing information, and that was all they asked. He happened to be the hon. secretary of the Silk Supply Association. They did not wish either this Society or the officials of the government to be compromised in any way. There were various points on which the India Office and the Colonial Office were capable of furnishing information, such for instance as whether better cocoons could be introduced into India; whether the silk worm disease was spreading; what localities were best adapted for silk cultivation. On these points the government could aid them; but as to asking them to contribute funds, or do anything out of the province of political matters, that had not been thought of.

Dr. Campbell remarked that one officer employed in the way he suggested would do more in one year than could be done by other means in two. He believed there never was a time when the government was more anxious to extend the commerce of India. As in the case of cotton in Turkey, it would tend to facilitate the objects which the Silk Association had in view.

Seventeenth Ordinary Meeting.

Wednesday, April 7th, 1869; W. Bridges Adams, Esq., in the chair.

The following candidates were proposed for election as members of the Society:—

Alex. Ephraim, 5, Brook-street, Grosvenor-square, W.
Altmann, Henry J., 16, Caroline-street, Bedford-square, W.C.
Anderson, Francis, M.D., 47, Arundel-gardens, Kensington-park, W.
Armstead, H. H., Bridge-house, Eccleston-bridge, S.W.
Barlow, W. H., High Combe, Old Charlton.
Bath, Edward, Law Clerk's Office, Waterloo-bridge Station, S.E.
Bedford, Edwin, 5, Royal-crescent, Notting-hill, W.
Bell, George S., 110, Great Russell-street, W.C.
Benson, William, 147, Albany-street, N.W.
Brooke, George, 72, Myddelton-square, E.C.
Brooks, James, 11, Serle-street, W.C.
Berry, Thomas, 1, Halkin-street, Hyde-park-corner, S.W.
D'Orsey, Rev. Alexander, J. D., 13, Prince's-square, W.
Hichens, Captain William, Royal Engineers.
Norton, Thomas Sterry, Lestelle, Sydenham-rise, Forest-hill, S.E.
Thorne, Eliseus, the Thorns, Worcester-park. near Kingston-on-Thames.
Wigan, Frederick, Clare-lawn, East-sheen, S.W.

The following candidates were balloted for, and duly elected members of the Society:—

Backhouse, Edmund, M.P., 84, Eaton-place, S.W.
Barry, Charles, 1, Westminster-chambers, S.W.
Bourne, Lieut.-Colonel, J., M.P., Heathfield, Wavertree, Liverpool.
Briggs, General John, F.R.S., Oriental Club, W. Athenæum Club, S.W., and Bridge-lodge, Burgess-hill, Sussex.
Burke, Edmund Haviland, M.P., 13, Old-square, Lincoln's-inn, W.C.
Grosvenor, Earl, M.P., 28, Prince's-gate, W.
Knaggs, James, Helmsley-house, London-fields, Hackney N.E.
Lea, Thomas, M.P., The Larches, Kidderminster.
Mauritius, the Bishop of, St. Nicholas Rectory, Guildford.
McGarel, Mrs., 2, Belgrave-square, S.W.
Nunes, Francis, Hayes-grove, near Bromley, Kent.
Parry, T. L. D. Jones, M.P., Junior United Service Club, S.W.
Potter, Thomas Bayley, M.P., Langham Hotel, W.
Stone, William Henry, M.P., Dulwich-hill, S.E.
Tredegar, Lord, 39, Portman-square, W.
Wingfield, Sir C. J., K.S.I., M.P., 37, Clarges-street, W.

The Paper read was—

ON THE THEORY OF BOILING IN CONNEXION WITH SOME PROCESSES IN THE USEFUL ARTS.

By Charles Tomlinson, Esq., F.R.S., F.C.S.

In some of the old colliery engines of Scotland, when the steam becomes slack, and there is no time for cleaning out the boiler, the engine-men are accustomed to throw into it about a bushel of the radicles of barley, produced during the malting, and separated in cleaning the malt. The effect of these radicles (or *comings*, as the men call them) becomes immediately apparent on again raising the steam, for not only is there an abundant supply for producing the full working speed of the engine, but an excess, going to waste at the safety-valve. This singular effect will continue during several days.

Let us take another example from Scotch practice. In the distillation of ardent spirits on a large scale, it is customary, when converting the wash into what are called "low wines," to throw a lump of soap into the still every time it is charged. This has the effect not only of causing the steam to rise more quietly, but the vapour is more free from the residual matter of the process.

Our third example is from the sugar boilers. It is customary to throw a lump of butter into the vacuum-pan, for the purpose of preventing that irregular boiling which displays itself in furious bursts separated by apparently almost passive intervals. A gentleman, within the last year or so, has been insisting on the superior advantages of solid paraffin over butter in producing regular boiling.

Fourth example.—Dr. Bostock published, many years ago, an account of some experiments, which excited considerable surprise. Ether (sp. gr. 0·755) in a glass matrass over a spirit-lamp, boiled at 112° Fahr.; but in a test-tube put into hot water it did not boil under 150°, and on one occasion 175°. When some bits of cedar wood were put into the ether, it boiled at 110°: the wood became covered with bubbles until it got soaked and sank. Bits of quill, feather, wire, pounded glass, &c., also lowered the boiling point considerably. Such bodies also renewed ebullition after the liquid had ceased to boil. Plunging a thermometer into the ether produced boiling many degrees below the point at which ebullition took place without the thermometer; the effect soon ceased; but by alternately plunging the thermometer into the ether and removing it into the air, the bubbles were renewed at each immersion. The various bodies used in these experiments are said to act by carrying down air into the ether, and as soon as the air is discharged they cease to act.

Fifth example.—Professor Oersted noticed that if a metallic wire be suspended in a boiling liquid, it instantly becomes covered with bubbles of vapour. To show the application of this fact, 10 lbs. of brass wire, $\frac{1}{8}$ of a line in diameter, were put into a still containing ten pints of brandy; seven pints came over at a heat which, in the absence of the wire, would have sent over only four.

Sixth example.—It is well known in the laboratory that in distilling ether, alcohol, and similar liquids in glass vessels, the vapour is given off with difficulty. At

one moment the liquid does not boil at all; at another it bursts into a mass of vapour and liquid, which fills the vessel, and occasions such a bumping of the retort as to endanger its safety, and indeed sometimes to break it. The vapour forms, in fact, with a sort of dull explosion, which is very marked in distilling sulphuric acid. These bumpings are called *soubresauts* by the French. They are mitigated, if not prevented, by introducing into the retort some solid matter not acted on by the liquid. It is recommended to use sharp, or angular, or rough pieces of metal, glass, &c., the points being, it is supposed, favourable to the generation of steam. Silver, platinum, or copper in the form of foil or wire or filings; or bits of cork or cartridge paper are recommended by Dr. Faraday as "promoters of vaporization." He gives a caution against introducing into the retort any one of these substances whilst the fluid is hot, or "it is probable that the consequent burst of vapour would be so instantaneous and strong as to do more harm than the bumping itself. The safer method is to remove the source of heat for a moment, then, opening the tubulature, to introduce a platina wire, letting it touch only the surface of the fluid at first, and introducing more of it as the ebullition occasioned by it ceases. When that is over, the wire should be withdrawn, and the cork, the platina, or whatever, according to the nature of the fluid within, has been selected, be introduced, the stopper closed, heat applied, and the distillation proceeded with." *

It will be seen from the foregoing examples that the three kingdoms of nature furnish these promoters of vaporization, or *nuclei*, as we may call them, from the Latin word *nucleus*, "a kernel," or, as Dr. Johnson defines it, "anything about which matter is gathered or conglobated."

Now the vapour of liquids, at or near the boiling point, gathers about these nuclei; it is our business to-night to enquire, why? That question being answered, we may be able to define the conditions under which nuclei should be selected.

On extending our knowledge of the action of nuclei, we find that they act in liberating gases from solution, as when a bit of cork falls into soda-water, or a fragment of bread into a glass of champagne. The cork and the bread are instantly covered with gas bubbles, and effervescence sets in from each solid nucleus as from a centre.

In the crystallisation of sugar-candy and many saline solutions, strings are stretched across or along the crystallising vessel. The strings act as nuclei, the crystals forming with facility upon them.

Now, what is the constitution of a saline solution? We suspend a lump, say of sulphate of copper or blue vitriol, in water, and watch the process. There immediately pours down from the solid a dense syrupy looking fluid (very different in appearance from the water), and this saccharine-like fluid accumulates, provided there be sufficient salt, until the whole of the water is of that consistence. The solid has lost its character as a solid, that is, it has lost its cohesion; its molecules no longer obey the attraction of cohesion. The adhesion of the liquid has overcome the cohesion of the solid, and we have got a solution, that is, the solid is converted into a liquid. But this adhesive force exercised by the liquid has its limits; it soon begins visibly to decline, it slackens, it comes to an end, and there is still a portion of the crystalline mass undissolved. In other words, the adhesive force of the liquid for that particular solid, at the temperature at which the experiment is performed, is satisfied; the liquid is *saturated*, and the solution is said to be a *saturated solution*. Lower the temperature, the adhesive force of the solvent is diminished, and salt will be deposited. Raise the temperature, the adhesive force of the solvent becomes increased, and more salt will be dissolved. Now suppose we keep the water boiling, say 100 parts by weight of water, and we gradually throw in 209 parts by weight of common potash alum, the water will dissolve the whole of it, and if the solution be set aside to cool, the greater part of the alum will gradually crystallize out. But let us now prepare the hot solution in such a way and under such conditions as to exclude a nucleus, and in the case of aqueous solutions we can do so by making everything we use chemically clean; that is, we use a perfectly clean vessel, clean water, and clean alum, and as soon as we have dissolved the 209 parts of salt, boil up the solution, cover over the vessel with a watch glass, or plug it with cotton wool, and we get this unexpected result; the solution in cooling does not deposit any of its salt as it did before, when no pains were taken to exclude a nucleus. The solution will now cool down to the temperature of the air, when, holding as it does, a larger quantity of salt than it can take up at that reduced temperature, the solution is said to be *supersaturated*. Now according to Poggiale's table, 100 parts of water at

C.	Fahr.			Parts.
100°	or 212°	will take up of	crystallised potash alum	357·48
90	,, 194	,,	,,	209·31
80	,, 176	,,	,,	134·47
70	,, 158	,,	,,	90·67
60	,, 140	,,	,,	66·65
50	,, 122	,,	,,	44·11
40	,, 104	,,	,,	30·92
30	,, 86	,,	,,	22·01
20	,, 68	,,	,,	15·13
10	,, 50	,,	,,	9·52
0	,, 32	,,	,,	3·90

That is, 100 parts of water at 212° will take up about 357½ parts of salt; at 140° only 66 parts; at 68° only 15 parts; and at 32° not quite four parts. Now, supposing we have complied with the conditions as to the exclusion of a nucleus, our boiling solution, containing 209 parts of alum, may be cooled down to the freezing point of water without any separation of the salt from solution; that is, the water at 32° will hold 53½ times more salt in solution than it could take up at that reduced temperature. I have several of these highly supersaturated solutions on the table. They are perfectly liquid, and can be shaken about without crystallizing. Why do they continue thus to maintain their liquid state? My answer is because there is no nucleus to start the action. I take out the cotton wool from this flask, and the solution instantly becomes solid, with considerable elevation of temperature. I touch this solution with a glass rod, or a bit of wire, and it immediately solidifies.

This, you see, brings us back to the action of nuclei. I can show the action of a nucleus better by means of a supersaturated gaseous solution, such as soda water, seltzer water, or champagne. You are aware that cold water will take up or dissolve its own volume of carbonic acid, and this also is a case of adhesion leading to change of state; the adhesion of the water does not, as in the former case, overcome cohesion; it rather overcomes repulsion; it converts by its adhesive force a highly elastic gas into a liquid. In this bottle of soda water we have one volume of carbonic anhydride dissolved in one volume of water, while a second volume of the gas has been forced into the water by machinery, and is now retained by the pressure of the cork. We may call this a supersaturated solution of carbonic anhydride in water. I pour some of this soda water into a test glass, and we have the usual effervescence and escape of gas, and also a multitude of gas bubbles clinging to the sides of the glass. Now observe. I can renew the effervescence at pleasure by putting in a solid, such as a strip of paper, a glass rod, my finger, a cedar pencil, iron filings, &c. Any nucleus, animal, vegetable, or mineral, put into the soda water will produce a separation of gas. In other words, there is a stronger adhesion between the gas and the nucleus than between the gas and the water.

Now, let us go over precisely the same ground, with

* "Chemical Manipulation," 1830, p. 200.

this single variation in the apparatus, namely, that we *de-nucleize* it, so to speak, which we can generally do when dealing with aqueous solutions, by making it chemically clean. I pour soda-water into a clean test-glass; there is effervescence as before, but there are no bubbles adhering to the glass. I put in a glass rod made similarly clean; there is no escape of gas; clean iron filings produce no effervescence. I insert the other, or unclean, half of the glass rod into the solution, and there is an abundant liberation of gas; I throw in unclean iron filings and we get a noisy boiling effervescence.

What is the reason for this? Why should an ordinary glass rod act as a nucleus in liberating gas, and when made chemically clean refuse to act? We are still dealing with a case of adhesion; the gas adheres to the unclean rod in preference to the water; but in the case of the clean rod, the solution adheres to it as a whole; that is, there is at least as strong an adhesion between water and a chemically clean surface as there is between water and the dissolved gas; the solution adheres to the clean glass rod as a whole, and hence there is no separation of gas.

But why all this? Why should this difference in adhesive force be manifested in one case and not in the other? What do you mean by an unclean surface? These are perfectly fair questions, and I will answer the last first.

By an unclean surface, as used with reference to aqueous solutions, I mean a surface that is contaminated, ever so slightly, with oily, greasy, or fatty matter; and to this sort of matter water adheres with much less force than gas, or salt does. Now this kind of matter is everywhere present. Everything that we touch is contaminated with an organic film more or less greasy; the very act of touching it makes it so; everything that is exposed to the products of respiration, to the air, to the dust of the room, is coated with such a film. A glass washed in water and wiped with a so-called clean cloth has an irregular coating of greasy matter to which water adheres with less force than gas does, and hence, in such a glass, soda-water gives off its gas to the sides, and this gas clings to it in the form of bubbles. Make the glass clean and then the water adheres to the sides with as much force as the gas which it holds in solution, and there is no separation of gas. So also the dust of the room is a powerful nucleus; collect it, wash it in a caustic alkaline solution, and it is no longer a nucleus; it will not separate gas, or salt, or steam from solution.

If I have expressed these preliminary details with sufficient clearness, you will be able to apply them to many of the phenomena of boiling liquids, and to explain the six cases with which I commenced this paper. According to my view, a liquid (water, for example), at or near the boiling point, is a supersaturated solution of its own vapour. It will part with its vapour to a nucleus, but adheres, as a whole, to a chemically clean surface. An unclean nucleus may become clean in the course of an experiment; it may act very well at first, and gradually cease to act. Every chemist knows this, but I will give you an example:—Here is a flask containing distilled water and a little white sand. I boil the water, and the boiling goes on briskly, but with no kicking. Here is a similar flask, containing perfectly clean sand, which is not a nucleus, as the unclean sand is. The boiling is accompanied by a number of violent bumpings, amounting to dull explosions, sufficient to endanger the vessel. In the former case, when the sand acted as a nucleus, each grain performed the function of a vapour-giving surface; but in the case now before us, in which the sand has been denucleized, we multiply the adhesion surfaces: that is, the water, with its charge of vapour, adheres not only to the sides of the clean vessel, but also to every grain of sand, so that the temperature of the boiling water is raised some degrees above the boiling point. Under these circumstances the steam accumulates in the liquid, until the latter becomes so highly charged that it can hold no more; the steam escapes with a burst, and is discharged along the line of least resistance, namely, out through the neck; this upward action is accompanied by a corresponding and equal reaction, a motion downwards, which tends to drive the flask further into the ring of the retort-stand, and it is the rebound from this that constitutes bumping or jumping ebullition. That this explanation which I venture to give is the true one, may be proved by suspending the flask by means of a weak spiral spring, or a piece of elastic, and applying the lamp under it. It will be seen that every kick is accompanied by a downward jerk of the vessel.

A nucleus, then, is a body that has a stronger adhesion for the gas, or the salt, or the steam of a solution than for the liquid which holds any one of the three in solution.

That a boiling liquid is a supersaturated solution of its own vapour may be proved by holding a nucleus in any part of the liquid. It will instantly be covered with steam bubbles.

The radicles of malt thrown into the boiler acted as a nucleus in consequence of the oily and other unclean matter thereby introduced, which enabled the steam to escape more readily from the water.

The soap used by the distillers, the butter used by the sugar refiners, the bits of cedar-wood, &c., employed in Dr. Bostock's experiments, the brass wire used by Oersted, the pointed or rough bits of platinum, &c., used by chemists, are all nuclei more or less durable, which have a stronger adhesion for the vapour of the solution than for the respective liquids, whether water, alcohol, ether, &c., which hold the vapour in solution.

But all these substances, which have hitherto been used empirically because the principle which led to their adoption has escaped notice, are liable to objection. They require to be renewed at each operation; and, also, they often cease to act during one operation. It has been recommended to use sharp-pointed or roughened bodies, under the impression that steam is given off with greater facility from the points or the teeth. This is a mistake. Make these rough or sharp-pointed bodies clean, and they cease to act. Sharp, angular fragments of glass, washed in sulphuric acid and rinsed, no longer act as nuclei. A rat's-tail file, passed through the flame of a spirit-lamp, also becomes denucleized. A body such as a file is apt to collect between its teeth the greasy kind of matter that acts so well as a nucleus; and this has led to an idea in favour of rough bodies. The air is not a nucleus. When Dr. Bostock found his thermometer cease to act, and by taking it out of the liquid and waving it in the air, it liberated vapour when restored to the liquid, the thermometer had caught from the air some unclean particles of dust, which acted for a moment as nuclei, until, by the action of the ether, they become denucleised. So, also, in the cases of sudden crystallization, which you have witnessed to-night; it was not the air that acted as the nucleus, but some particles of dust floating in the air that started the act of crystallization.

I should be glad to show you the action of nuclei on various liquids at or near the boiling point, but as some of them are very inflammable, I could not do so with safety on a scale sufficiently large to be seen by an audience, but I will just notice from my own experiments a few points in their behaviour.

Carbonic disulphide (bisulphide of carbon), from its low boiling point, gives off vapour with facility. If a tube containing this substance be plunged into hot water the liquid quickly attains the boiling point. On touching the surface of the liquid with the end of a brass wire, violent ebullition set in. The boiling ceased as soon as the wire was removed, but when the surface was touched with a strip of paper it set in as violently as before.

Now in these two experiments no air could have been carried down, since the surface only was touched, and the boiling continued only while the solid was kept in

contact with such surface. Iron wire also liberated vapour in abundance. The end of a glass rod was active at two small points, liberating from each a rapid stream of bubbles, the remaining portions being made clean by the action of the hot liquid, since glass is readily cleaned by liquids near the boiling point.

The hot liquid was touched with a rat's-tail file, and it produced furious boiling. The file was held in the flame of a spirit lamp, and while hot placed in the upper part of the tube, so as to cool out of contact with the air. On touching the surface of the disulphide with the end of the file, there was no liberation of vapour, and the file was passed slowly to the bottom of the liquid, but still there was no action. The file was taken out and waved in the air; on returning it to the liquid there was a burst of vapour arising from motes or specks of dust that the file had caught from the air.

Ether was raised to the boiling point, and a pellet of paper thrown into the tube. The liquid boiled up furiously, the paper being much agitated, when suddenly it sank as if struck dead, and all vapour-giving action ceased. It had in fact become chemically clean. The paper was removed, and a brass wire passed down to the bottom of the tube, when the liquid boiled up briskly during a few seconds, but on the wire becoming clean all action ceased, except from a point near the bottom of the wire, which poured off a stream of bubbles. The wire was taken out and filed, in order to get rid of this nucleus, but the active point was not got rid of, for there were now two such points giving off rapid discharges of vapour. These points are probably bits of porous dross entangled in the metal.

Methylated spirit boiling at 171° F. was kept at about that point. A piece of flint was put into the tube, abundance of vapour was given off from its surface. The flint was taken out and broken, and the two fragments were returned to the vessel. The newly-fractured surfaces being chemically clean, were quite inactive, not a single bubble of vapour appearing on them, while the old surfaces continued to give off vapour as before.

I have performed a very large number of experiments on the action of nuclei on various liquids at or near the boiling point, and they all point to the same conclusion, namely, that the action of a nucleus is differential, there being a greater amount of adhesion between the nucleus and the thing dissolved than between the nucleus and the liquid. In the great variety of cases the nucleus is contaminated with some kind of oily, fatty, or greasy matter, and this having a less adhesion for the liquid part of a solution than for the gas or the salt or the vapour of such solution, there is, consequently, a separation of gas, or salt, or vapour. The nucleus may be a solid thrown into the vessel, or the sides of the vessel may act as a nucleus, or fatty matter may be thrown in, in order to make the vessel unclean, as in the case of the distillers and the sugar boilers. But in all cases of solid or liquid nuclei, we may always observe this differential kind of action, on which, as I contend, the action of nuclei depends. It is not my business to-night to combat existing theories, or to disprove the notion that nuclei act by carrying down air, and that when a liquid is deprived of air it cannot boil at all. Such theories have been, and are being discussed, elsewhere; my business here is of a practical, not of a theoretical kind; but I may perhaps be allowed to quote one more case to justify my view of the action of nuclei.

Five ounces of distilled water in a clean flask boiled at $213\frac{17}{20}$° Fahr. Some perfectly clean mercury was poured in, enough to form a ring at the bottom of the flask. The water rose to 214°, with much bumping, steam forming under the mercury, and distending it into hemispheres, each of which burst with a kick. It would have been dangerous to have entirely covered the bottom of the vessel with the metal, for, as it was, the bursts were of an explosive character. While this uneasy boiling was going on, a very little dirty mercury was added to the flask, and, although the quantity was not more than one-sixth of that previously added, the effect was remarkable. Instead of the uneasy kicking, jerking bursts, the boiling became brisk, easy, and soft, rapid volleys of steam-balls being given off by the metal, breaking up the mass of water, while the temperature remained steady at $212\frac{2}{20}$°.

Now, all these "promoters of vaporisation," as they are called, or nuclei, as I prefer to name them, whether bits of metal or glass, bits of paper or wood, soap, butter, paraffin, &c., are liable to the objections already stated, that they cease to act by use, and require to be renewed after each, or even during the same operation.

But there is a kind of matter that is not liable to these defects, which I have not been able to make inactive, either by the action of the strongest acids, or caustic alkalies, or by repeated boiling in water, ether, alcohol, naphtha, &c. I mean porous bodies, such as charcoal, coke, pumice-stone, meerschaum, and a few other bodies. These act by means of the powerful force of capillarity. The same force which, according to Saussure, enables one volume of boxwood charcoal to absorb 90 volumes of ammoniacal gas, 85 of hydrochloric acid gas, 65 of sulphurous acid gas, and so on, enables these porous bodies to absorb vapour from boiling liquids, and, under the continued action of the heat, to give it out in never-ceasing jets, thus relieving the vessel of all tendency to bumping, making the boiling soft, gentle, and regular, and increasing the quantity of the distillate.

Charcoal, or some other porous body, is, then, the proper nucleus in the case of boiling liquids. It is quite remarkable to see how efficiently a lump of coke acts in a vessel of boiling water in giving off vapour, promoting tranquil boiling, and preventing the jumping of the vessel. Not the least important service of these porous nuclei is the fixity they confer on the boiling point. When a liquid is boiling in a clean vessel, and in the absence of nuclei, it may go on dissolving steam until the liquid becomes more and more highly saturated with it, and during this period the phenomena of boiling cease, and the temperature rises some degrees above the boiling point. Here is a very delicate thermometer constructed for me by Mr. Casella for showing this rise, and measuring it accurately in 20ths of a degree. He has also constructed a themometer on a large scale for showing this fact to you to-night, and I shall be happy to do so at the end of the paper. But I may state that this delicate thermometer, graduated into 20ths of a degree, commences its scale at 204° F., and terminates at 215°, but this is not high enough, for although we are taught that when the pressure is at 29·8 inches water boils at 212°, yet under that pressure, in a chemically clean vessel, water may not boil until it reaches 218° and upwards. I have repeatedly had to snatch this thermometer out of the vessel when I saw the mercury rising rapidly to the top of the tube, for, had it reached the top with its ascensive force unchecked, it would infallibly have burst the bulb.

It is interesting to watch this thermometer when it marks temperatures below its extreme limit of 215°. When the bulb is in boiling water the mercury is not still for an instant. It is constantly oscillating like an uneasy pulse which marks the uneasy action of the heart; so the mercury in the stem marks the uneasy action that is going on in the liquid. The formation of steam in the liquid is indicated by a rise, the bursting of a bubble by a fall. The most considerable rise and fall is when the boiling ceases and steam accumulates, and there is a sudden burst accompanied by a kicking of the vessel. This uneasy kind of action, so manifest on a small scale, must be a mighty force in a steam boiler, or a large still or retort. No wonder that attempts have been made to remove or to mitigate this irregular kind of action by means of nuclei; but I venture to say that in the majority of cases the proper nuclei have not been selected. So far as I know they should always be porous bodies of such a nature as not to be acted on by the liquid.

As there is nothing like comparative numerical results for testing processes against each other, I give the

following among many obtained at my request by my friend Mr. Hatcher:—

1. A glass flask with a wide neck was filled about one-third with distilled water; it was boiled over a gas burner, weighed rapidly, and replaced over the burner. After boiling twenty minutes it was weighed again. The flask was once more filled to the original quantity, and some bits of coke were added; it was boiled and weighed as before, the gas flame remaining unaltered all the time.

Results.—Water boiled away in the first trial (water only) 995 grains; in the second trial (with coke) 1,130 grains.

Ratio of products 100 : 113·6.

2. Water was made to distil freely from a still, and the quantity collected in fifteen minutes was weighed. A few pieces of coke were then added to the water in the still, and the distillate collected again during fifteen minutes.

Results.—Distillate from water only 293 grains; from water with coke 310 grains.

Ratio of products as 100 : 105·8.

3. A similar trial was made with common wood charcoal, but the vessel having been made much cleaner by the action of the first boiling, the water boiled irregularly, with bumping. The addition of the charcoal made the boiling tranquil and regular.

Results.—Distillate from water only 262 grains; from water with charcoal, 334 grains.

Ratio of results as 100 : 127·4.

The following results are from my own experiments:—

Methylated spirit was distilled in a glass retort at a fixed boiling point of 171° Fahr. The distillate collected in five minutes was weighed, and found to amount to 244 grains. Three or four fragments of charcoal, partly from boxwood and partly from cocoa-nut shell, weighing altogether 20 grains, were now added to the retort, and when the spirit was again fairly boiling the distillate during five minutes was again collected and weighed. It was now found to amount to 325 grains. The ratio of the results is as 100 : 133·2.

Instead of charcoal, 20 grains of fine ground pumice-stone in four fragments were used in the retort, when the ratio of the results was as 100 : 121·7.

With 20 grains of meerschaum as 100 : 112.

With 20 grains of coke as 100 : 107·46.

These numerical results are, however, very much understated if compared with those obtained in a retort that is structurally free from nuclei, which was by no means the case with the retort actually employed. Indeed, it is seldom that we get a retort or a flask, or even a test tube that is free from porous specks of ferric oxide, or of carbon. These become attached to the glass in the process of manufacture while it is still soft, and they act as small but powerful nuclei in separating vapour from hot liquids, and preventing bumping. Indeed, were it not for the presence of these accidental impurities, many a chemical operation must fail from the fracture of the vessel from excessive bumping, and chemists would have only too close an acquaintance with the phenomena of *soubresauts*.

Charcoal, coke, pumice, and other porous bodies, are especially valuable in distilling those liquids that are of such a nature as to exert a powerful action in cleaning the inner surface of the retort or of the still. Such liquids as alcohol or spirits of wine, ether, naphtha, benzole, sulphuric acid, &c., act in this way, and the sides of the vessel no longer performing the useful function of a nucleus, the adhesion of the liquid to the sides of the vessel is so strong that the vapour accumulates in it, and only escapes in explosive bursts, separated by almost quiet intervals. These porous nuclei render the boiling and the liberation of vapour quite easy. Even in thick syrup of sugar, boiling at 240° Fahr., they are still active, and with their assistance I have in the course of a few minutes driven off so much water from a syrup boiling at 2'3°, that it soon reached 240° and cooled down into a clear semi-solid mass in a flask, into which a plug of cotton wool was inserted when the lamp was removed. Here is a flask containing a syrup that boils at about 220°. It contains a small lump of coke, one or two bits of cocoa-nut shell charcoal, and a bit of pumice. I shall be happy to set this flask boiling.

Charcoal from cocoa-nut shell is a good nucleus. It is very dense, and will occupy the bottom of the vessel that contains liquids somewhat denser than water. It is at the bottom, or near the bottom of the vessel that the nucleus is most efficient, and for dense liquids the porous nucleus may be loaded with some heavy metal that the liquid does not act on. Coke, though a less powerful nucleus than charcoal, is convenient from its being always at hand, and presenting itself in lumps of any size. I have no doubt it will be found of use in steam boilers, and may be used instead of the radicles of barley, the soap, the butter, and the paraffin, &c., already noticed.

I have already said that these porous nuclei act by the force of capillarity, and so powerful is this force alone that it can be applied in a variety of ways. Even a short bundle of fine capillary fibres, united like a faggot by a thread in the middle, is an active nucleus in liberating vapour. Such a bundle, weighing only ten grains, put into a retort from which methylated spirit was being distilled, raised the amount of distillate in the ratio of 100·110.

Where circumstances admit of it, we may apparently increase the nucleus power even of charcoal by first boiling it in a liquid of higher boiling point than that of the liquid to which it is to be transferred. Thus a piece of charcoal that had been used in boiling turpentine seemed to be more active than pure charcoal in liberating vapour from boiling water. The charcoal is not only porous but unclean, and hence its activity. I have not tried it against clean charcoal in quantitative experiments; hence I only say that it seems to be the more active of the two.

I have no doubt that a large number of processes in the useful arts will be assisted by a clearer knowledge of the action of nuclei which I have thus briefly attempted to explain. It is the natural result of scientific labour to reduce to law the empirical practices of industry. As soon as an intelligent manufacturer knows the principle upon which he works, he can improve and cheapen his processes by an increased production, or by economy of fuel, or by simpler apparatus, or less labour, &c. I believe that these ends may be attained by a judicious application of nuclei in the vast number of cases where it is required to raise vapour from liquids by the process of boiling. The proper applications of such nuclei might be made the subject of several patents; but I have so great a horror of patents, especially under the present laws and practice, that I prefer to bestow this application of some of my recent scientific researches as a free gift to the useful arts, rather than hamper it with any conditions.

What I claim to have discovered is the action of nuclei in liberating gas, or salt, or vapour from solution; and the behaviour and proper application of nuclei in various processes in the useful arts. Bodies have long been used for promoting vaporisation, crystallisation, &c.; but how they acted, and why they often suddenly ceased to act, was not known. We have many theories about the "mysterious action of air," "catalytic action," "molecular change," &c., which have borne no fruit; whereas, according to my view, supported as it is by hundreds of experiments, all the varied phenomena of nuclei may be explained by the varying force of adhesion and capillary action.

DISCUSSION.

The Chairman remarked that the subject of the paper was a most important one, and extended in its various ramifications almost throughout the whole range of the

useful arts, from the housewife's tea-kettle up to the locomotive engine. In proportion as boiling could be effected more readily, so would the power of boilers be increased, or their size and weight diminished. He should be much obliged to any gentleman who had any remarks to make on this important subject.

Mr. Bramwell said the matter brought before the meeting was one more suited to a chemist than to a mechanical engineer like himself; but there were some points on which he might venture a remark or two. Mr. Tomlinson had suggested that if the kind of explosion which had been going on in the small retort were magnified to a proportionate extent in a large steam boiler the effect would be tremendous; but he (Mr. Bramwell) did not think there were any instances recorded of such results, which might perhaps be accounted for by the fact that boilers, instead of being too clean, as was the condition of the vessel instanced in the paper, were generally far too dirty. When the use of surface condensers was lately revived for steam engines, there was a fear on the part of some engineers that the water, being entirely deprived of air, might, in boiling, cause these constant explosions; that, however, had not been found to be the case, and the only difference really was that the distilled water, from certain circumstances which need not now be entered into in detail, occasioned more rapid corrosion of the boiler. This had been easily remedied by the introduction of a small portion of undistilled water, which protected the plate by a slight deposit. He (Mr. Bramwell) was not a chemist, but he had endeavoured to follow Mr. Tomlinson in his paper, and he understood him to say that he looked upon the nuclei (especially those porous bodies which he preferred, as being constant in their action) as acting by possessing a greater attraction for the vapour than the water had, and thus extracting from the water the vaporous particles. That he could understand, but he did not quite see how, if they had so great an attraction for the vapour, it was given off again from them so readily. No doubt there was a good chemical answer to this difficulty, which perhaps might be given. An answer, but a mechanical one, suggested itself to him as being possibly the correct one, was this:—That if a vessel of water were heated at the bottom, vapour was there generated which was desirous of ascending all over the vessel, in no one part more than another; that vapour was in a state of unstable equilibrium, but if it could be induced to ascend in any one part, that condition of things would be relieved, and there would be a continuous easy flow. Otherwise the steam would go on accumulating until the pressure was too great to be borne, and then there would be a gush or semi-explosion. Now, if in a vessel of boiling water there was any matter coated with particles of steam, it appeared to him that the parts immediately adjacent to this matter would form an easier channel through the water for other particles of steam; in other words, that a bubble of steam would find its way through the water with less difficulty when on one side of the channel there was a film of steam, than where it had to go through the water entirely. A very coarse practical illustration of that fact was tried in America at the time when he (Mr. Bramwell) was there, by the owner of steamboats running from New York to New Jersey, who thought he could get rid of the friction of the water by interposing a lubricating film of air between the skin of the boat and the water, which he accomplished by making a series of open channels below the bottom, into which air was pumped at the bow, and escaped at the stern. There could be no doubt that in this way he obtained the desired result, although at such an expenditure of power as to render it practically of no value, and therefore he (Mr. Bramwell) mentioned it merely as an illustration of what he had been saying, and not as a useful fact in steam navigation. If this idea were correct, then the porous material which, in the first instance by capillary power, attracted particles of vapour to itself, would act, not by giving it off again,—which seemed to him an anomaly—but by forming a channel, one side of which was a film of vapour. He (Mr. Bramwell) might further remark, that when a current was once established in this or any other way, it was comparatively easy to keep it up, because when once the particles of steam—or carbonic-acid gas, in the case of soda-water—were got to ascend in one place rather than in another, that column, being a mixed column of water and steam, would be lighter than any other part of the liquid, and thus an up-cast and down-cast shaft or current would be established, and this might account for the regularity of the boiling when these porous matters were used. There was one matter on which he should like a little further information. He had understood Mr. Tomlinson to say that in certain cases the amount of produce from a given still was increased by the introduction of porous bodies as much as 33 per cent.; was it intended to be conveyed that this result was obtained without any increased expenditure of heat? because if that were so they would have to reinvestigate the question as to the amount of heat required to convert a given quantity of water into steam. If it merely meant that out of the same sized vessel exposed to a certain heat more steam was obtained, then the difficulty that the result was at variance with accepted laws would not occur, as the result could be explained by simply assuming that more heat was utilized. He would, however, just throw out the suggestion whether or not the supposed extra steam thus produced was absolutely dry steam, because there was a state of things, well known to engineers in trying the evaporative powers of various boilers, under which a large quantity of water disappeared out of them, not all in the form of dry steam, however, but partly in that of water carried along with the vapour, which state of things was technically known as priming. There was another matter, somewhat connected with the subject of the paper of which he should be glad to have an explanation; engineers were in the habit when a low pressure boiler (say with steam from 6 lbs to 25 lbs. to the inch), was primed, of injecting with a syringe a certain amount of grease into the lower part of the boiler, which was found to stop the priming; but on the other hand, in the case of a high pressure boiler, such as that of a locomotive engine, priming was commonly ascribed by the engine driver to his having greasy water; so that what was considered a cure for a low pressure boiler caused or aggravated the evil in a high pressure one. He understood Mr. Tomlinson to say that a chemically clean surface would be wetted by water rather than by a vapour or gas, whereas, if greasy, water would not wet it, while vapour or gas would. This being the condition of things, a possible explanation of the use of the introduction of grease might be, that if in a boiler there were only a few strong local currents, which caused priming, the injection of grease might "dirty" large portions of the boiler surface, and thus form, as before explained, channels up which the steam might pass, and thus set up a general instead of a local delivery of steam, which was commonly the cause of priming. He might mention, in conclusion, that in 1839 Mr. Armstrong published a new edition of his work on the boilers of steam engines, and on the saving of fuel, and between pages 130 and 139 would be found engravings of boilers, with pieces of brick or other matters put into them, and steam-bubbles arising therefrom, which pieces of brick Mr. Armstrong called "steam generators." He (Mr. Bramwell) fancied the right term would be "steam separators," as he could not imagine that putting bricks into a boiler would raise steam. Then, again, many years ago, at the time the Blackwall Railway was first opened, there was an old engine of Bolton and Watt's at work at Rotherhithe, and the foreman, having put some pieces of oak from a shipyard into the boiler for the purpose of keeping it clean, declared that he immediately got more steam. He (Mr.

Bramwell) should certainly like further particulars about the use of barley radicles in Scotland, because, as he understood the statement in the paper, it pointed to a most extraordinary, and, if correct, to a most important result. This result was, that in a steam-engine boiler there could be obtained more steam for the same expenditure of heat when the barley was used than when it was not. It was true this was only repeating that which had been alleged in the case of the small experimental stills, but it was doing it upon a large and practical scale. The statement was, that when a boiler had become so much encrusted as to cease to produce the required amount of steam, the workman, rather than stop the engine for the purpose of cleaning the boiler, would put into it some barley, and then they immediately got more steam than before. He (Mr. Bramwell) presumed that barley could not add to the conducting power of a dirty boiler; and therefore he was at a loss to know how the result was to be explained short of alleging that, when it happened barley was present, by the same expenditure of heat a greater amount of steam was produced—or, which was the same thing, an equal amount of steam was got by a less expenditure of heat.

Mr. Warriner said he could, in some measure, confirm the statements made in the paper by his own experience in the course of making experiments in cooking for the War Department. It was found at Woolwich barracks that by putting oyster-shells into the boilers, food for from 50 to 100 more persons could be prepared. The waters of Kent, Surrey, and Sussex were very much charged with chalk and silica, which caused a great deal of deposit on the boilers, but the introduction of the oyster-shells, or similar substances, prevented that difficulty. Various other matters, such as barley and oak sawdust, had been tried, but nothing equalled lime, oyster-shells, or flint stones. He had also found in the preparation of preserved food in tins, which was boiled in a bath of chloride of calcium, that if a film of oil or fat were poured upon the chloride, an addition of from 12° to 20° of heat was obtained. He had searched every work he could think of in English, French, or German, to endeavour to find the reason of this, but could not succeed, and should like to have an explanation.

Dr. Pearse begged to suggest the question whether the phenomena which had been described were not due to an electrical action, and asked whether Mr. Tomlinson had observed the electric relation existing between the vessel and the fluid contained within it. They knew that in the generation of electricity, largely increased results were obtained from surfaces presenting a number of infinitesimal points; the difference in this respect between the plane surface of an electrode, and one which had received an electric deposit of metal, was very great. From some experiments which he had made in galvanic electricity, he found that the quantity of electricity was trebly increased by simply roughening the surface of the electrode.

Mr. Casella said that as an illustration of the peculiar difficulties caused by the variation in the boiling point of fluids, he might mention that some few years ago, when various methods were being devised for ascertaining the amount of spirit in sweetened solutions, a patent was taken out for a process which seemed thoroughly efficacious, except for the uncertainty that was found to exist as to the boiling point. At that time he was not aware of the uncertainty that existed, it being generally supposed that water boiled at 212°, under certain conditions as to the pressure of the atmosphere, the cleanness of the water, &c. When the theory came to be applied, however, it was found that the turbulent manner in which the boiling was carried on was an almost insuperable difficulty in the application of what would otherwise have been a most admirable process. The introduction of iron filings and various other matters was tried, with tolerable success, but not with so much as could be desired. In determining heights by means of the boiling point of water, this difficulty was found to be almost insurmountable, for although there was no doubt that the height could thus be accurately ascertained, great practical difficulties arose from the uncertain and irregular way in which the water boiled, and, notwithstanding that this method had been in use for many years, comparatively little progress had been made. The difficulty had, however, now been overcome, by means of a simple apparatus, by which the thermometer could be kept, not in the boiling water itself, but in the steam or vapour given off from it, immediately above the surface, and in this way the difficulty was obviated.

Mr. Tomlinson said that to reply adequately to the various remarks and suggestions which had been made would require a whole evening, but he would briefly touch upon what seemed most important. He was not aware of the recommendation in Armstrong's book referred to by Mr. Bramwell, but it was quite probable that such had been made empirically; what he contended for was the discovery of the principle. The next question, which was of considerable importance, was as to how he accounted for the increase of the distillate. In the first place he must say that in all these experiments he had used either water or methylated spirit, whose boiling point was fixed at 171°. Under these circumstances, by the addition of three or four fragments of charcoal, weighing only twenty grains, he had obtained at least one-fourth more distillate. He did not want it to be supposed that he had created any new force, but simply that he had economised heat, by preventing its being wasted in those energetic bursts and jerks, which of course exhausted a certain amount of heat. As it had been well said, a large amount of the power of a locomotive was expended in bumps from irregular junctions of the rails, and so on, and whether force was wasted or usefully employed, it must equally be paid for in some way or other. If they had a vessel which boiled tranquilly occasionally, then ceased, then boiled with violent bursts, then subsided again, and so on, it was evident there must be a great waste of heat. In all these experiments he had used a thermometer, and never found that the introduction of the charcoal or other nucleus affected the temperature of the boiling point in the slightest degree; its action, therefore, was to prevent the bumping, and to enable the steam to come over easily and gently. He was perfectly certain that in each case the steam was dry; the retort had a very long beak, and the receiver at the end was plunged in cold water, constantly renewed, and the same gas jet was employed all through the comparative experiments. When a retort was put over a gas jet there was a great deal of heat wasted, indeed, he did not know of a single case in connection with the arts in which the whole of the heat employed was utilised. There was a considerable waste in heating a retort by means of a Bunsen's burner or a ring of jets, but with the nuclei the heat was economised; that was all he contended for. With respect to the action of porous bodies in promoting ebullition, the theory originated with De Luc more 100 years ago, that water deprived of all air could not boil; that theory had recently been revived, and some remarkable experiments had been made by Mr. Grove and others. In the current number of Poggendorf's *Annalen* it was stated, as a known fact, that it was impossible to deprive water of all its air, the inference being that it was in consequence of the presence of a certain quantity of air dissolved in the water that the steam was enabled to be formed. It had been his business for some time past to overturn that theory, and he should not rest until he had done it. Water, at say 40°, would dissolve $\frac{1}{50}$ of its bulk of nitrogen, and about $\frac{1}{25}$ part of oxygen, but so soon as the water was boiled he contended that all the air was expelled, and that if a chemically clean vessel of boiling water had its surface carefully covered with oil, there would be no absorption of air. Mr. Grove said there

was, but this was not the proper time and place to discuss that question. He entirely denied the truth of the air theory of ebullition. His definition of boiling, which he thought was supported by a very large number of experiments, was, that a boiling liquid was a supersaturated solution of its own vapour. The proof which he had given of this in his illustrations was, that if you lowered a nucleus into a liquid, no matter what its volume, at or near the boiling point, steam was instantly disengaged. That could not be through raising the temperature, because the introduction of a cold rod of glass or metal would rather tend to lower it, but yet the rod would immediately become covered with steam bubbles. His contention was, that the action of porous bodies was precisely that which was pointed out so ably by De Saussure some years ago, in his two classical memoirs on the absorption of gases by charcoal and other porous bodies. In a well-burnt piece of charcoal there was an enormous amount of surface, more almost than would be readily believed, for a piece the size of his thumb-nail had a surface of many square yards. It was this extensive surface which illustrated in the clearest manner the force of adhesion, for when such a substance was thrown into a liquid or a gas it instantly absorbed it largely. Charcoal would absorb 98 times its own volume of certain gases. Accepting his definition of a boiling liquid, one which was supersaturated with its own vapour, when a piece of charcoal was introduced, presenting such an enormous surface for adhesion, De Saussure's law immediately came into operation, and there was an absorption of the vapour. There were thirty or forty liquids, the vapour of which charcoal would powerfully condense at or near the boiling point. If the heat were condensed he believed there was a constant interchange of particles of vapour, some being constantly absorbed and others being constantly given out. On watching the action of a piece of coke or charcoal, or even a bundle of capillary tubes, it would be seen that there was a rapid absorption, and under the continued action of heat a rapid expulsion of the vapour, and the result was that uneasy and fitful boiling was got rid of, and thus heat was economised. He believed that manufacturers engaged in distillation would find it much to their advantage, instead of using soap and various other obnoxious articles to promote ebullition, to know the *rationale* of the thing, and to use coke or charcoal. Referring to the remarks of Mr. Warriner, he had no doubt that oyster-shells would form very good nuclei, but he had not found that flint stones were so, because they soon became clean by the action of the boiling liquid, and then their presence was a positive mischief rather than an advantage. With reference to the increased temperature obtained in the bath of chloride of calcium by coating the surface with a film of oil, he had no doubt the effect was to prevent superficial evaporation. In a bath at 260° the surface would be constantly throwing off vapour, thereby causing a great waste of heat, and by using a film of a fixed oil, which would not boil at all, or of oil which only boiled at a very high temperature, this would be prevented. He did not conceive that the electrical condition had anything to do with the phenomena under discussion, but he was much obliged for the suggestion, and would direct his inquiries in that direction, which hitherto he had not done. Sir Humphrey Davy once made some experiments with a voltaic battery which he was not able to explain. He endeavoured to obtain a current by means of pairs of plates of the same metal, but did not succeed if the plates were clean. If, however, one of the plates were slightly smeared with grease, he found that a current was obtained. That phenomena had never been explained, but to him (Mr. Tomlinson) it was quite clear that in a cell where gas was being generated by one plate, and electricity by the other, the second plate could not conduct unless it could separate the gas from the liquid; for if the gas accumulated it prevented the action of the plate in conducting electricity. It was, therefore, necessary to have the other plate in such a physical position that it could attract the gas. Mr. Casella had made some remarks on turbulent boiling, which had been perhaps sufficiently touched upon in the paper, and also on the variation in the boiling point. He ought to say, in reference to this latter part of the question, that in all his experiments the boiling point was fixed. Many years ago the irregularity of the boiling point was much discussed by the Hon. Mr. Cavendish, De Luc, and others, and it was found to vary according to the nature of the vessel and the depth to which the thermometer was plunged in the liquid. The Royal Society issued a commission on the subject, composed of some of their most distinguished Fellows, whose report would be found in the Transactions for 1777. In this report they stated that the boiling point varied according to the depth to which the thermometer was plunged, and also according to the nature of the vessel, whether it were of glass or metal. They also stated that if water were boiled in a metal vessel, and the bulb of the thermometer and that part containing the mercury were not placed in the water, but so as to be surrounded by the steam given off from the surface, it would be found that the boiling point was perfectly fixed; the steam directly it left the water instantly accommodated itself to the pressure of the atmosphere, and always showed 212°; so that in graduating for the boiling point all that was necessary was to suspend the thermometer in the steam. Mr. Casella had taken advantage of this principle to construct a very convenient little instrument for ascertaining the heights of mountains by means of the boiling point. At the sea-level water boiled, under the pressure of 29·38, at 212°, and for every 535 ft. of ascent, the temperature was lowered one degree, so that at the top of a high mountain, such as Mont Blanc, it would boil at 188°, or not hot enough to cook food. Mr. Tomlinson concluded his remarks by exhibiting and describing one of the instruments alluded to, which was shaped somewhat like a small telescope in an upright position, the lower and broader end holding a boiler and spirit lamp, and the steam ascending to the upper part, into which the thermometer was lowered through an elastic ring or collar.

The Chairman thought it had been clearly shown by Mr. Tomlinson's experiments that, under certain conditions, violent ebullition took place, whilst under certain other conditions it did not. The matter might act in various ways—possibly by disintegrating the mass of water similarly to the tubes of a locomotive boiler. At any rate he thought the results which had been obtained would induce persons to continue the experiments in a more consecutive way than they had been tried hitherto. There was no doubt that effects had been produced by putting strange substances into boilers; some substances appeared to have a much greater effect than others in promoting the flow of steam bubbles, whilst others had no effect at all.—The suggestive paper of Mr. Tomlinson, pointing out the philosophical reasons of many empirical practices, and thereby rendering them more certain processes, is most valuable in a large manufacturing country, where rapid and non-destructive boiling, from the housewife's tea-kettle up to the locomotive engine, is the great element of economy. The source of physical power being heat, the practical application of that power is all important. The best and most efficient application we yet know is through the agency of water. The water is converted into steam, and the heat thus becomes manageable. Every process that can increase the rapidity of steam production decreases the cost and size and risk of boilers. It is not the size of the boiler, but its steam production, that is the measure of its power, and it is quite possible that we shall yet obtain locomotive engines, which, by economising and rendering available their whole heating surface, may be reduced to one-fourth their present size. We shall then get blood horses instead of cart horses to perform our rapid transit. But there is another con-

sideration beyond the steam production, that is, circulation, to extricate the steam. Sediment and deposit in boilers are caused by faulty circulation, just as a similar defect causes diseased deposits in living human or animal bodies. In the boiler and fire-box varying thicknesses of metal, arising from seams of rivets, double and treble overlaps of plates, and irregular exposure of surfaces, cause eddies, instead of a uniform flow, and where the eddies are there are the deposits, gradually shutting out the passage of heat and increasing their bulk, just as sand banks are formed in river and sea channels. A copper teakettle, all formed in one thickness, almost becomes an heirloom in a house by its durability. If that copper tea-kettle were riveted together by projecting rivets and overlapping plates, it would be burnt out by the collection of sediment. There is a thickness of metal through which heat will freely pass, according to its specific quality. If made too thick it will burn down to the proper thickness. A man, famous in his day, one John Hague, a man in his own right of instinctive brain, an engineer, made, amongst other things, dyers' kettles of solid tin, usually about three-eighths of an inch in thickness. One of his customers, finding his kettle wear out too rapidly by stirring inside, determined on having one of double thickness. John Hague remonstrated, but was overruled, and the kettle was made and filled with water, with a fire under it. The metal in contact with the fire began to melt away, and, finally, the thickness was reduced to three-eighths, when it remained stationary. It is probable that some day our locomotive and other boilers will be welded together, without seams or rivets, of the thickness needed for strength and the free transmission of heat, and then they will become as durable as copper kettles. Mr. Tomlinson says he has the greatest horror of patents as a means of seconding philosophical research, and especially under the present laws and practice, and therefore he makes a free gift of his researches to the useful arts. We can easily sympathise with him, No two things can be more at variance than the loving studious nature that follows up researches in the desire for truth and knowledge, and the mere competitive spirit, that cares nothing for truth, but only for such victories as it can achieve by "competent false witnesses" and hired tongue fence. The nature that can do these things has nothing in common with wisdom or philosophy. It is of the wild beast class and order, and worships nothing but the power of the purse, or of that bastard intellectual faculty known as cunning, formerly meaning ability, and now trickery. But Mr. Tomlinson's dislike to these things must not blind us to the evil of suffering, as the first Rowland Hill phrased it, "the devil to have all the good things to himself." There was a time when land could only be obtained and held by the strong hand, but as people became aware that crops could only be obtained by enclosures, and crops were essential to the community, owners obtained, and were confirmed in possession. So also mental labour is essential to the community, and mental labour will only be prosecuted effectually by granting it enclosures—effective enclosures not to be broken into. Were there no copyright in books, books would not be produced, save in few instances by the wealthy. Were there no copyright in art, artists and bookwriters, having little to do, would be inquiring keenly into the rights of other property. The community at large is far more deeply interested in patents than even the inventors, and all the proceeds abstracted from them by uncertain laws are really abstracted from progress. I once talked over this question, as to the feasibility of quick and just judgment as to all the patent cases brought into the law courts, with one of our most competent men, and he gave it as his opinion that there was no mechanical dispute as to practice or principle that could not be decided by two competent brains in half a day, putting evidence of the ordinary class of the circumstantial kind out of the question. The necessity of good patent laws is every day growing, and every day they will be nearer at hand. They are not a monopoly, but the only safeguard against monopoly—the only process whereby brain can be made the equal of capital, as it should be. There is a brain now on the highest judicial seat, which long ago uttered words of conviction as to the possibility of just and simple patent laws, and when that conviction bears fruit, we need not doubt that the originating philosopher will not be forgotten in the scheme of justice to all men working at human progress. What Mr. Tomlinson aims at in his process is to show the law under which steam or vapour may be most rapidly disengaged from masses of water, and his experiments show conclusively that there are conditions under which the steam is retained till it makes a series of violent explosions, and other conditions under which it flows upwards in multitudes of infinitesimal globules through the whole mass. These last conditions are what Mr. Tomlinson calls nuclei—matter which attracts heat, imparts it to the water, and disintegrates the mass. The value of a steam boiler is in proportion to the quantities of fuel it can consume usefully, the heat it can convey into water, and the rapidity of giving out that heat in the form of steam. Therefore, the more diffused are the outlets for the steam into the steam-chamber, the less will be the priming or carrying up of unvaporised water. A steam boiler will be stronger, lighter, less risky, and less costly in proportion to the diminution of its cubic contents; and if a boiler measuring a cubic yard could, by a perfect use of its heating surface and free discharge of steam, consume as much fuel and give out as much steam per hour as a boiler of four yards cube, it would be a great advantage and economy. So far as we know, a given quantity of fuel can only achieve a certain quantity of power by its combustion, but we can by bad arrangements take so long a time in consuming it, that in the case of a locomotive we can only move slowly, and the speed is limited by the rapidity with which we can supply the steam; and the more rapidly this steam can be generated, the less is the necessity for a large mass of water, and magazine of possible explosion. Could we generate power with every stroke of the piston in the exact quantity required, risk of explosion would disappear. In conclusion, he begged to propose a most cordial vote of thanks to Mr. Tomlinson for his valuable paper.

The vote of thanks was passed unanimously and acknowledged, and the proceedings terminated. The experiments referred to in the paper were conducted with perfect success by Mr. Tomlinson and Mr. Hatcher.

DISTRICT SCHOOLS FOR PAUPER CHILDREN.

By George C. T. Bartley, Esq.

The great importance of these schools and the excellent work which they are producing renders it important, especially at this time, when a universal system of education is so much discussed, that their working cost should be better known. Great uncertainty at present exists as to their expenditure, and many districts are unwilling to entertain an idea of forming such schools for their pauper children, fearing that they may be running into endless outlay. None who have seen the schools can doubt of their advantage over the small schools in the unions, and if it can be shown that they are, or may be made, as economical, it will not be long before they exist in every district in the country.

To ascertain with exactness the expenditure is no easy matter, and it is proposed to analyse the annual accounts of the six large district schools at present existing, in the hope that the subject may be well ventilated.

THE CENTRAL LONDON DISTRICT SCHOOL, HANWELL, MIDDLESEX.

The average number of children in the school during 1867–8, the year to which these accounts refer, was 1,051.

I.—Cost of Officers and Servants.

Description of officer.	Salary.	Estimated cost of rations.	Total.	Cost per head for each child at the school.
	£ s. d	£ s. d.	£ s. d.	£
1.—*General Staff.*				
Superintendent	200 0 0	33 17 0		
Chaplain	350 0 0			
Clerk to the Board	250 0 0			
Matron	75 0 0	33 17 0		
Superintendent's clerk	125 0 0			
Assistant do.	60 0 0	33 17 0		
Storekeeper	75 0 0	33 17 0		
Cook and assistant storekeeper	35 0 0	33 17 0		
Yardsman (boys)	32 10 0	33 17 0		
Do. assistant	20 16 0	33 17 0		
Do. (girls)	26 0 0	33 17 0		
Gas man	83 4 0			
Sewage man	52 0 0			
Porter	30 0 0	33 17 0		
Housemaid	15 12 0	33 17 0		
Dining-hall woman	9 19 0	33 17 0		
Corridor woman	15 12 0	33 17 0		
	1,455 13 0	406 4 0	1,861 17 0	1·772
2.—*Nurses.*				
Infirmary nurse (boys)	18 4 0	33 17 0		
Do. (girls)	19 10 0	33 17 0		
Ophthalmic do. (boys)	54 12 0			
One nurse	19 10 0	33 17 0		
Three do	54 12 0	101 11 0		
Five do.	82 0 0	169 5 0		
Eleven do.	171 12 0	372 7 0		
One assistant do.	5 4 0	33 17 0		
	425 4 0	778 11 0	1,203 15 0	1·145
3.—*Medical.*				
One officer	300 0 0			
Assistance	147 2 0			
	447 2 0		447 2 0	·425
4.—*Teachers.*				
Senior master (boys)	155 0 0	33 17 0		
Second do.	85 0 0	33 17 0		
Third do.	55 0 0	33 17 0		
Master (girls)	95 0 0	33 17 0		
Mistress (do.)	49 0 0	33 17 0		
Two do. (infants)	88 0 0	67 14 0		
Three assistant teachers.	120 0 0			
Six pupil teachers and four monitors (boys)	20 7 4	338 10 0		
Five pupil teachers and one monitor (girls)	9 19 4	203 2 0		
	677 6 8	778 11 0	1,455 17 8	1·385
5.—*Industrial Teachers.**				
Bandmaster	85 0 0			
Drill master	70 0 0			
Do. mistress	19 10 0	33 17 0		
Training painter, plumber, and glazier	85 16 0			
Two assistant do.	140 8 0			
Training bricklayer	85 16 0			
Do. blacksmith	93 12 0			
Do. carpenter	85 16 0			
One assistant do.	78 0 0			
Training engineer	65 0 0	33 17 0		
Do. shoemaker	36 8 0	33 17 0		
Five assistants	260 0 0			
Training tailor	62 8 0			
Two assistants	104 0 0			
Training baker	41 12 0	33 17 0		
Assistant	31 4 0	33 17 0		
Training cook	25 0 0	33 17 0		
Do. needlewoman	20 16 0	33 17 0		
Two assistants	41 12 0	67 14 0		
One do.	15 12 0	33 17 0		
One do.	7 16 0	33 17 0		
Training washerwoman	15 12 0	33 17 0		
Laundry woman	19 10 0	33 17 0		
Two assistant do.	31 4 0	67 14 0		
Drying-room woman	15 12 0	33 17 0		
Head washerwoman	15 12 0	33 17 0		
Six washerwomen	80 14 0	203 2 0		
	1,733 10 0	778 11 0	2,512 1 0	2·390
6.—*Farm Servants.*†				
Farm assistant	54 12 0			
Teamsman	52 0 0			
Carter	52 0 0			
Dairymaid	13 0 0	33 11 10		
Two cowmen	104 0 0			
One do.	41 12 0			
Gardener	59 16 0			
Three labourers	156 0 0			
Ploughman	52 0 0			
	585 0 0	33 11 10	618 11 10	·588
7.—*Temporary Mechanics, &c.*				
Various trades	460 14 0		460 14 0	·438
Grand total	5,784 9 8	2,775 8 10	8,559 18 6	8·144

* In considering this item it must be remembered that the work done in teaching the children is remunerative. Thus all branches of trades—as tailoring, shoemaking, plumbing, painting, &c.—required for the inmates and the building, is performed by these monitoral teachers, assisted by the children. The cost of training must, therefore, not be considered so large as it at first sight appears, but a considerable portion should in reality be charged to the clothing of the children and maintenance of the building.

† The farm must be looked upon to a great extent as an industrial school, and these servants may be said to belong almost to the class of industrial teachers.

II.—The Cost of Maintenance.

The exact cost of the amount of food which the children obtain is rather difficult to ascertain from the printed report. The cost of all the provisions is £12,072 7s. 1d., with the addition of an item in the superintendent's account, lumped together with other payments, to the extent of £4,200. Probably this is partly farm produce, and may amount to some £700 or £800. Taking then £12,800 as the total cost, the officers' rations, £2,775, included in item No. 1., must be deducted, leaving some £10,000 to the children's portion, or, as nearly as possible, £9 10s. per head per annum.

III.—The Cost of Clothing.

This item amounts to £1,969 18s. 6d., or at the rate of £1 17s. 5d. per head per annum.

IV.—Miscellaneous Expenses.

This item includes gas, coals for heating purposes, upholstery, glass, and other articles required in keeping up the establishment, and amounts to £4,875 6s. 3d., or £4 12s. 9d. per head per annum.

V.—Farm Expenses.

These charges are for articles required for the keeping up of the farm; they amount to £1,063 13s. 7d., or at the rate of £1 0s. 3d.

VI.—Rent and Re-payment of Cost of Building.

This is one of the largest items in the cost of the school, and will remain so for about 9 years, when both interest and principal will be paid off. The amount last year was £5,965 18s. 4d., or at the rate of £5 13s. 6d. per head per annum. The general summary therefore of the cost of this school per head per annum is—

1. Staff	£8·144
2. Maintenance	9·500
3. Clothing	1·870
4. Miscellaneous	4·637
5. Farm	1·012
6. Rent and redemption of buildings	5·675
Total	30·838

or about £30 16s.

INDIAN ARCHITECTURE.

The following, which is extracted from the *Athenæum*, shows how little attention this subject has received, and corroborates, in a remarkable way, the foresight of the Society in discussing the matter. There is no doubt that the abolition of the East India Company has left the subject of the arts of India without any proper organisation to look after it. The museum in Leadenhall-street was removed and dispersed, and it may be doubtful if it can be revived under the present dual system of Indian government:—

For many years past there lay unnoticed in the stables of Fife-house a mass of old Indian marbles, which had been brought over from Madras, hardly any one knew either when or why. They were broken and uncomely; and if any man had the wit to push inquiries as to what they were and whence they came, he was told they were fragments of an Indian temple of which scarcely anybody in London had ever heard the name. If the inquirer went yet further, he might—or might not—have learnt that these broken stones had been found, a good many years ago, lying on the wharf at Madras, exposed to the wind and rain, and that, after much writing of letters, they had been shipped for England, where they had been tumbled out on the yard of Fife-house. To ask how they came to be lying on the wharf at Madras was like going back to the deluge; yet when curiosity pushed its way backwards, these stones were traced to Mr. Walter Elliot, who, when acting as commissioner at Guntoor, twenty-four years ago, had employed his leisure in grubbing along the green slopes and mounds on the river Kistna, after the fashion then being set by Botta and Layard on the Tigris. Elliot had met with much success in his labours, having unearthed a city and recovered an ancient temple, the details of which were of exceeding richness and importance. Nay, he had actually forwarded his wealth of examples to Madras, in the hope of their reaching London, and making his name immortal. But—alas, for human hopes!—Elliot was no writer. He could not tell his story in a way to arrest the public eye. Amravati was not a biblical city; and, unlike the Tigris, the river Kistna had a foreign sound. The temple which he had found was called a tope; the name and office of which were alike unfamiliar to the English mind. The temple was Buddhistic; and, as Gotama Buddha is not mentioned in the Scriptures, the stones of which his temple had been built in Amravati could not serve to illustrate the form and site of Solomon's temple in Jerusalem. Hence they lay on the wharf at Madras, exposed to wind and rain for a dozen years, until some one happily found that these heaps of stone were in the way; and thought that, as they had cost a bag of money for cartage, they might as well be sent to the India Museum in London. Hence they were shipped from Madras, and brought to London, where, on arrival, they had the fortune to be stored away in the stables of Fife-house, with so much secrecy, that no one soul, beyond the clerks and officers of the Museum, had any knowledge of their existence.

Yet all these years there lay in these waste places of our power, among these broken fragments of stone, as much curious and important history as anything found by our explorers on the Tigris and the Euphrates!

When Mr. Cole was laying out plans for our share in the French Exhibition, he proposed to Mr. Fergusson, as the chief authority on Indian Architecture, that some casts and models of old Indian temples should be prepared under that gentleman's eye. Mr. Fergusson, who fell in with the suggestion, set to work; meaning at first to confine the display mainly to photographic studies of Brahminical and Buddhistic works, backed by four or five casts from the curious and beautiful marbles which had long been shown in the old Indian Museum in Leadenhall-street. These marbles, we need not say, had been greatly admired; and no one will be surprised to hear that good judges thought them so fine as to warrant an artist in going to India to see their fellows. Well, Mr. Fergusson went down to Fife-house, for a quiet study of their comparative merits, with a view to casting those which would best convey a notion of the whole. He had turned them round and round, made plans and drawings, and, in the end, had selected four examples for the caster, when, to his great amazement, the clerk mentioned, "just promiscuously," that there were heaps of such things in the coach-house in the yard. Yes, there they were—shafts, friezes, figures; a world of artistic fragments; some of rare beauty; all of singular interest, lying in a shed, exposed to slush and snow.

Of course, the Indian authorities awoke to a sudden sense of their treasure directly their eyes were drawn to the stable-yard. Dr. Watson and Mr. Griggs, with laudable celerity, came to the rescue. The pieces of stone were now picked up and set in order. The separate slabs were copied. Soon these gentlemen began to find that they had more in hand than a mass of stones. The pieces fitted to each other. It was possible to build them up; and as the pile grew higher, it took a wondrous and comely shape. In fact, the old Buddhistic Tope, under these skilful hands, came back, as it were, to life.

Many of our readers will remember the specimens of Indian marbles which were shown in the French Exhibition, along with the rare and costly collection of photographs of Indian buildings. It is doubtful whether England sent to that gathering of the world's best any other series which so strongly engaged the interest of continental scholars.

But this recovery of an ancient Buddhistic temple is far from being all that we have gained from Mr. Cole's happy thought. The recovery is that of an original record; and we have not only got possession of this record, but of its secret. The tope is a religious edifice, and the stones of which it is built are covered with figures—figures of men, animals, trees, and reptiles. They are especially covered with trees and reptiles; that is to say, with figures which appear to be symbols of trees and reptiles.

The fact is not quite new, but it has not heretofore been shown so clearly and completely as in these remains. Buddha was an idol breaker. He denounced images and symbols; he prohibited his followers from representing God by any visible shape. His religion was one of contemplation and abstraction; and in his saintly eyes a sign or image of the uncreated and ineffable God was a profanity not to be endured. Yet here, in very early temples, we find the house of God profaned by types and images of what Gotama Buddha himself would certainly have denounced as devil-worship. In fact, these slabs in Fife-house cast a flood of light upon the dark history of Asiatic religions, which are not only curious as regards the past, but important in connexion with the future. Men are governed through their religious feelings; and the first step towards a knowledge of these feelings is a perfect study of their religious rites.

In our opinion, Sir Stafford Northcote acted wisely and economically in ordering these monuments to be photographed and published under the care of so good an antiquarian as Mr. Fergusson, whose production and description of the plates leave hardly anything to be desired.

When it was resolved to issue copies of the Amravati marbles, Mr. Fergusson suggested the addition of some specimens of the yet more ancient tope of Sanchi, of which there happened to be a capital series of drawings, made by Colonel Maisy, of the Bengal Army, in the India Museum. The Tope of Sanchi dates from the first century of our era, that of Amravati from the fourth. This additional proposal was accepted by Sir Stafford; and the consequence is, that we have an excellent account, with specimens, of Buddhistic architecture in India nearly coeval with the Temple of Herod and with the earliest Christian edifices in Byzantium. All these things are good in their several ways; but the history of architectural art is of less importance than the history of re-

ligious ideas; and it is for the evidence which they present of the early intermingling of pure Buddhistic ritual with the ancient worship of the land—in its two most antique forms of tree worship and serpent worship—that these pictures of Sanchi and Amravati will be most welcome to serious students of our human history.

We congratulate all the parties concerned in this book—Mr. Fergusson, Sir Stafford Northcote, Dr. Watson, and Mr. Griggs.

TECHNICAL INSTRUCTION.

The Committee of Council on Education, on December 21st, 1867, passed an important minute for the encouragement of scientific instruction. Its leading features are as follows:—

"In order to assist the artisan classes who may show an aptitude for scientific instruction, my Lords resolve to aid local efforts in founding scholarships and exhibitions. The scholarship is intended to maintain a student while remaining at the elementary school, and the exhibition to support him while pursuing his studies at some central institution where the instruction is of a high grade."

"1. The Science and Art Department will make a grant of £5 towards the maintenance of a deserving student (between twelve and sixteen years of age), to the managers of any elementary school, who undertake to support him for one year, and subscribe £5 for that purpose.

"2. The same Department will grant £10 per annum towards maintaining a student (of like age) at an elementary school, who has already passed (1st grade) in two subjects of drawing and one of science.

"3. The same department will grant £25 per annum (for one, two, or three years,) to managers of any educational institution, or local committee who will raise a like sum, for maintaining a student at some college where scientific instruction of an advanced character may be obtained. The exhibition must be awarded in competition in one or more branches of science at the May examination of the Science and Art Department."

In accordance with the intentions of this minute, it is proposed to graft on to the science and art instruction already imparted at the Training College for Schoolmasters, Culham, Oxon, such higher branches as are required for fitting persons to be teachers of technical schools throughout the country. The proximity of the college to the University of Oxford (where the scientific museums, schools of art, and a large body of scientific professors, afford unusual advantages for high education), seems to mark this institution as peculiarly adapted for such an undertaking.

Classes were opened on February 1st, under highly qualified masters, in all branches of practical drawing, mathematics, mechanics, hydraulics, electricity, chemistry, geology, applied sciences, &c., &c., to prepare students for the examination in May next, when several exhibitions of £10 each (to meet those offered by the Committee of Council) will be offered for competition. After May next, a separate department will be opened for carrying on students mainly in those branches of study which will render them efficient teachers of technical instruction.

All further information will be afforded, and all suggestions from Chambers of Commerce, local committees, &c., gladly received by the Rev. James Ridgway, M.A., F.S.A., Principal of the College.

Fine Arts.

International Fine Art Exhibition at Munich.—It having been reported that the Munich Exhibition, already announced in the *Journal*, would take place this year, M. Schwab, Bavarian Consul in Paris, and Commissioner for the coming Exhibition, has written to the *Moniteur des Arts* stating that there is no truth in such rumours, that the doors of the Exhibition will be opened on the 1st of August, and closed on the 1st of October, and that the government, the artists of Bavaria, and the town of Munich, will do all in their power to give eclat to the Exhibition, and a worthy reception to the artists from foreign countries.

Manufactures.

Silk Culture in California.—The *San Francisco Herald* says:—"Those engaged in the culture of silk in California have growing no less than 1,175,000 mulberry trees. They are apportioned as follows:—Los Angeles 50,000, Santa Barbara 100,000, Santa Clara 150,000, Nevada 50,000, Sacramenta 425,000, Yolo 400,000. The total production of cocoons in 1868 amounted to 1,350,000, equivalent to 1,917 pounds, allowing 704 cocoons to the pound, representing a cash value of 3,676 dols. 75 cents. To be added to this was the egg crop of 7,350 ounces, commanding in the market 8 dols. per ounce, amounting to 10,800 dols. There will be a vast increase in the production of cocoons this year, as three cocooneries will hatch 600 ounces of eggs, sufficient to produce 18,000,000 cocoons."

Commerce.

Imports of Coal to France.—The imports of coal and coke to France during 1868 were as follows:—

	Coal. Tons.		Coke. Tons.
From Great Britain	1,885,000	..	3,800
„ Belgium	3,718,000	..	448,200
„ Germany	1,389,000	..	212,700
„ Other countries ..	1,000	..	300
Totals	6,992,000		665,000

Letter Copying.—MM. Niepce de St. Victor and Lavater give the following method of producing several copies of manuscripts, whether fresh or of old date: Let the copying paper be first lightly wetted with a sponge in the ordinary way, and after the copy is made submit it to the vapour of ammonia, which will bring out the writing with great distinctness. Another plan is to wet the paper with a solution of sugar, glucose, sugar of milk, honey, or other mucilaginous, gelatinous, or resinous matter. Paper thus wetted will copy writing in ordinary ink. This is in fact only using the saccharine matter in connection with the paper, instead of introducing it into the ink in the old fashion, but it has the great advantage of leaving the latter limpid, or in other words of doing away with the necessity for special copying ink. The receipt is so simple that any one can test its value for himself.

Colonies.

Victorian Gold.—An official report has been prepared showing the amount and value of the gold obtained and exported during the first nine months of 1868. The yield of gold was 1,274,661 oz. 9 dwt., of which 1,248,704 oz. 18 dwt. were exported. The figures show a decrease on the returns of 1867 on every quarter. The number of miners employed was 63,482. Machinery having an aggregate of 20,683 horse-power was worked on the various fields, and the gross value of mining plant was £2,133,855. There were 837¼ miles of auriferous ground already worked upon, and 2,561 distinct quartz reefs were proved to be gold bearing. The lowest price given for gold was £3 per oz. for some from Gipps Land, and the highest was £4 2s. 3d. for gold taken from the central division of the great Ballarat fields.

Notes.

The Fell Railway on Mont Cenis.—The receipts for the week ending 18th March of the Mont Cenis summit railway, amounted to 22,962f. The total receipts from the beginning of the year to the 18th March were 229,683f.

The Mont Cenis Tunnel.—During the first fortnight of March the length driven at the Mont Cenis tunnel was 67·20 m., of which 40·10 were on the Italian side, at Bardonnèche, and 27·10 on the French side at Modane. The position of these works up to the 15th March was the following:—

Lengh driven at Bardonnèche	6,514·70
" " Modane	3,939
Total length driven.....	9,453·70
Remaining to be driven	2,766·30
Total length of tunnel....	12,220

Correspondence.

Diamonds at the Cape. — Sir, — A letter by Mr. Emanuel on this subject, which appeared in your *Journal* some time since, and which has been copied into the Cape papers, contains some statements to which I feel called upon to reply. That gentleman's "natural desire" to discover fresh sources of diamonds is evidently counteracted by the still more natural desire to keep up the prices of those derived from existing mines. The number of diamonds which have already been found in this neighbourhood is upwards of thirty, of an aggregate value, I believe, of about £4,000. A few of these, some seven or eight, I think, have been found on the colonial side of the Orange river, but the great majority have come from the further side of the Vaal river, where they have been discovered in the territories of independent native chiefs, and have been picked up by naked savages, under circumstances that preclude the possibility of fraud. The assertion that all the colonial diamonds have been found on one farm, belonging to a Dutch farmer, is untrue; and though it may seem plausible enough in England to say that the diamonds were placed by the Orange River farmers on their farms to raise their value, anyone acquainted with these people would know it to be too absurd to even require contradiction. Though I do not pretend to be profoundly versed in geology, I venture to dispute Mr. Gregory's assertion that the "whole of the country visited is of volcanic origin," the prevailing formation throughout the whole of the great plateau north of the Sneeuwbergen to the Orange river being well stratified sandstone, though trap rocks protrude everywhere, in fact, precisely the state of things described by Mr. Nicolay as existing at the Brazilian diamond mines. Sandstone is the stone used in Hope Town for building purposes, as Mr. Gregory himself admitted to me whilst here. The conglomerate mentioned by Professor Tennant at the same meeting, exists abundantly here; and I offered to take Mr. Gregory himself to see it, but he declined to go. It consists of rolled quartz, pebbles of various sorts, chalcedony, agates, quartz crystals, bloodstone, lydian stone, &c., &c., fixed in a matrix of sandstone, and it rests on the regular sandstone formation. The minerals mentioned by Mr. Gregory as usually associated with diamonds might very likely be found if proper search were made for them. He spent a fortnight in making the journey of 120 miles beyond the Orange river, and never visited one spot where a diamond has actually been said to be found; but in the case of a substance, the origin of which is so obscure as that of the diamond, their absence is probably of small importance. With respect to Mr. Gregory's opinion about the gold-fields of South Africa, it may perhaps be sufficient to state that he was never within 600 miles of them. That very rich gold quartz exists there, no one who has seen the specimens brought down can have any doubt; and alluvial gold has recently been discovered; but whether the latter exists in sufficient quantity to pay, the practical digger can alone determine.—Yours, &c., E. Muskett, M.D., District Surgeon of Hope Town.

Hope Town, February 4, 1869.

To Correspondents.

Errata.—In *Journal* for March 26, p. 325, in the remarks of Mr. Horne, for "sedar" read "sirdar;" and for "a pound of *eleven* ounces," read "a pound of *sixteen* ounces."

MEETINGS FOR THE ENSUING WEEK.

Mon.....Society of Arts, 8. Cantor Lectures. Mr. John Anderson, C.E., "On Applied Mechanics."
Social Science Assoc., 8. Jurisprudence Department. Consideration of the "Bill to Amend the Law with respect to the Property of Married Women."
R. Geographical, 8½. 1. Capt. T. G. Montgomerie, "A Pundit's Journey to the Gold-fields of Thibet." 2. Mr. T. Douglas Forsyth, "On the Transit of Tea from North-west India to Eastern Turkistan."
Medical, 8.
Tues ...R. Medical and Chirurgical, 8½.
Civil Engineers, 8. Mr. T. N. Kirkham, "Experiments on the Standards of Comparison employed for Testing the Illuminating Power of Coal Gas."
Photographic, 8.
Ethnological, 8. "On the Ethnology and Archæology of North America." 1. Prof. Huxley, Opening Address. 2. Mr. Wm. Blackmore, "Notes on some of the principal Tribes of the Indians of the United States, with a brief Account of the late Indian War." 3. Dr. A. W. Bell, "On the Aztec Tribes of New Mexico."
Royal Inst., 3. Prof. Grant, "On Stellar Astronomy."
Wed ...Society of Arts, 8. Mr. E. M. Underdown, "On Spain, Commercially and Economically considered."
R. United Service Inst., 8½. Mr. George Campbell, "The North-west Frontier of India."
Geological, 8. 1. Mr. M. Morgans, "On a Peculiarity of the Brendon-hills Spathose Iron Ore." Communicated by Mr. W. W. Smyth. 2. Mr. R. B. Grantham, "On the Broads of Norfolk." 3. Messrs. S. V. Wood, jun., and F. Harmer, "On Intraglacial Erosion near Norwich." 4. Mr. E. J. Beer, "On the Lignite Mines of Podnernuovo." 5. Dr. F. Ruschhaupt, "On the Salt Mines of St. Domingo." Communicated by Sir R. I. Murchison.
Graphic, 8.
Microscopical, 8. 1. Dr. Lionel Beale, "On Protoplasm and Living Matter." 2. Mr. W. T. Suffolk, "On the Proboscis of the Blowfly."
R. Literary Fund, 3.
Archæological Assoc., 8.
Royal Inst., 3. Prof. Tyndall, "On Light."
Thur ...London Inst., 6.
Royal, 8½.
Antiquaries, 8½.
Linnæan, 8.
Chemical, 8.
Numismatic, 7.
Royal Society Club, 6.
Society of Fine Arts, 8. Lecture by Dr. C. Dresser.
Fri .....Philological, 8¼.
Royal Inst., 8. Mr. W. Carruthers, "On the Cryptogamic Forests of the Coal Period."
Sat .....Royal Inst., 3. Mr. A. Geikie, "On the Origin of Land Surfaces."

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Delivered on 20th March, 1869.

Par. Numb.
51. Bill—Sea Fisheries (Ireland).
54. " Land Tax Commissioners' Names.
58. " Brazilian Slave Trade.
59. " Sea Birds Preservation (amended).
Public Petitions—Eighth Report.

Delivered on 22nd March, 1869.

2. (5.) Railways Abandonment—Warrant of the Board of Trade.
82. Mechanics' Institute (Grants to Elementary Classes)—Return.
84. Admiralty—Return of the Distribution of Business.
87. Public Accounts—First Report.

Session 1868.

433. (5.) Endowed Charities (County of Dorset)—General Digest.

Delivered on 23rd March, 1869.

11. Bill—Valuation of Property.
93. Cricksea Bridge—Report.

Session 1868.

500. Navy (Channel Fleet)—Report.

Delivered on 24th March, 1869.

60. Bill—Grand Jury Cess (Ireland).
83. Official Appointments (Ireland)—Return.
89. Naval Officers—Instructions.
Trades Unions and other Associations—Eleventh and Final Report of Commissioners.
Public Petitions—Ninth Report.

Delivered on 25th March, 1869.

45. Bill—Real Estate Intestacy.
53. ,, Metropolitan Poor Act (1867) Amendment.
92. Abyssinia—Explanation.

Delivered on 27th March, 1869.

85. Sligo Borough Election—Minutes of Evidence.
86. Homerton Congregational Schools—Preliminary Report.

Delivered on 31st March, 1869.

74. (I.) Asylums (Metropolis)—Return.
94. Publichouses and Beerhouses—Return.
95. Public Education—Account.
96. Education (National Society)—Letter.
101. Lord Lieutenancy (Cumberland and Westmorland)—Commissions.
106. Mail Contracts—Report.

Session 1868.

151. (XII.) Trade Accounts (Foreign Countries) (Belgium, Holland, France, and Austria), 31st December, 1868.

Delivered on 1st April, 1869.

61. Bill—Imprisonment for Debt.
18. Consolidated Fund—Abstract Account.
23. Metropolitan Board of Works—Report.
46. (I.) Trade and Navigation Accounts (28th February, 1869).
62. Navy—Statement of Savings and Deficiencies.
88. New National Gallery—Correspondence.
102. Maynooth College—Returns.

Delivered on 2nd April, 1869.

90. Beverley Election—Minutes of Evidence.
98. Poor Law (Medical Relief)—Returns.

Patents.

From Commissioners of Patents' Journal, April 2.

Grants of Provisional Protection.

Account books, &c., indexes of—860—J. Booth.
Artificial fuel—753—J. H. Johnson.
Artificial stone blocks—884—J. H. Johnson.
Blinds and shutters, apparatus for raising, &c.—777—P. B. O'Neill and W. H. H. McNeight.
Boots, &c., application of elastic fillets, &c., to—880—J. Macintosh.
Bottle stoppers—872—J. J. Hicks.
Buttons or studs—765—E. Pritchard.
Capsules—747—W. Betts.
Carbonate of potash—819—C. F. Claus.
Carriage shafts, &c., joints of—805—W. and C. S. Catt.
Cotton, &c., machinery for preparing and spinning—799—O. Whittaker and H. and I. Wallwork.
Envelopes—876—J. Nicol.
Fabrics, textile—846—S. R. Wybrants.
Fire-arms and ordnance—757—F. R. Aikman.
Fire-arms, breech-loading—783—W. R. Lake.
Fire-arms, breech-loading—793—J. R. Cooper.
Fire-arms, repeating—779—J. Thomas.
Fire-arms, repeating—838—A. Albini.
Fire-bricks, substitute for—627—J. Cliff.
Fires, extinguishing—858—W. H. Phillips.
Flax, &c., transmitting rotary motion to machinery for preparing and spinning—868—J. Combe and J. Barbour.
Furnaces—693—C. Fairbairn.
Furnaces—848—F. D. Nuttall.
Gas meters—749—J. Bathgate.
Gas, purifying—870—E. Stacey and J. Thomson.
Hats, &c.—817—F. Gillham.
Healds and heald frames—789—C. D. Abel.
Indigo, carmine, &c.—439—H. B. Binko.
Iron and steel—836—J. Thomas, W. Bacon, and H. Groves.
Jute, &c., preparing for spinning—696—P. Buchan and A. Guild.
Liquids, measuring—856—H. E. Newton.
Marine engines, governors for—854—F. E. Duckham.
Metal, apparatus for making holes in—882—C. de Bergue.
Nitro-glycerine, protecting for conveyance, &c.—886—J. Horsley.
Paper and textile fabrics—781—J. and W. Thomlinson.
Paper-making—773—H. C. Bartlett and A. G. Southby.
Phosphate of lime, &c.—761—E. F. R. Lucas.
Pictures, &c., hanging—751—W. E. Newton.
Ploughs—767—J. Cooke.
Powders, compressing into pellets—807—J. James.
Purses, &c., attaching to the pockets or clothing to prevent loss or robbery—878—G. Blanche.
Railway brake and coupling apparatus—771—J. Duffey.
Railway carriage doors, &c.—652—R. Wright.
Railways—351—W. E. Newton.
Railways—842—S. Fox.
Salt water, &c., recovery of salt from—769—C. E. Brooman.
Sanitary purposes, apparatus for—743—W. Wells.
Sewage, preparing for irrigating land—791—J. G. Jennings.
Sewage, straining—809—B. Latham.
Sewing machines—801—W. Campion.
Ships—840—J. Jack.
Signal lanterns—745—W. H. Clapp.
Table cutlery—866—E. G. Reuss.
Telegraph wires, sustaining and insulating—797—W. A. Lyttle.
Telegraphs—733—J. Sax.
Tobacco—763—J. Porteous and H. Gibson.
Tobacco, twisting—862—G. Lauder.
Toothed gearing—852—W. L. Wrey.
Tuyeres—850—H. Whitehouse and W. Probert.
Umbrellas, &c.—803—L. Engel.
Walls, &c., preserving—723—R. M. Caffall and D. Miller.
Water cocks or valves—785—J. Henderson and T. Brown.
Waterproof overshoes—844—W. R. Lake.
Wheels, constructing—864—W. G. Crossley.
Yeast, preserving for manuring purposes—741—J. B. Bernier.

Inventions with Complete Specifications Filed.

Blowing apparatus—940—W. R. Lake.
Electric clocks—919—H. A. Bonneville.
Horse-shoe nails—941—W. R. Lake.
Oil, &c., pressing—915—W. R. Lake.
Paper-folding machinery—904—W. R. Lake.

Patents Sealed.

3009. J. F. G. Kromschroeder.
3011. D. Crichton, W. Donbavand, and D. Crichton.
3015. A. Thorpe.
3022. A. Monsnergue.
3024. R. F. Drury and J. E. and W. G. Walker.
3027. T. C. Parson, jun.
3031. J. Rogers.
3034. E. A. Cowper.
3040. E. T. Bellhouse and W. J. Dorning.
3041. E. Simons.
3043. J. R. Wigham.
3047. R. Ramsay.
3050. J. G. Willans.
3052. J. Jeffreys.
3054. F. P. Warren.
3067. W. Estor and C. T. Pearce.
3068. W. Richards.
3072. J. Chaudron.
3076. T. Sagar and T. Richmond.
3090. M. P. Manfield.
3092. A. MacMillan.
3107. B. Walker and J. F. A. Pflaum.
3120. C. D. Abel.
3131. F. A. Le Mat.
3150. H. Hudson.
3158. A. Robins.
3168. R. M. Marchant.
3169. W. C. Church.
3189. B. Hunt.
3191. C. Whitehouse.
3225. H. Warner.
3237. A. B. Bérard.
3238. R. Dowling.
3260. H. E. Newton.
3313. J. Heaton.
3321. S. Sharrock.
3469. C. K. Bradford.
3486. W. Low and G. Thomas.
3634. J. Heaton.
3643. D. Greig and J. Fernie.
204. J. Wilkins.

From Commissioners of Patents' Journal, April 6.

Patents Sealed.

3060. E. T. Hughes.
3061. W. Rossetter.
3074. J. M. Gray.
3079. J. H. Johnson.
3081. J. Steel.
3084. J. Arnold.
3100. E. Evans.
3106. W. T. Read.
3111. F. Barnett.
3112. T. Merz and G. Thomson.
3114. S. J. Maccarthy.
3115. F. A. Abel & E. O. Brown.
3154. W. E. Gedge.
3166. T. Vicars, sen., T. Vicars, jun., and J. Smith.
3226. C. MacMillan.
3235. T. Carr.
3244. M. Sautter.
3245. M. Sautter.
3352. M. Sautter.
3387. J. H. Johnson.
3440. E. Haas.
3465. H. E. Newton.
3603. J. Sincock.
3635. W. Naylor.
3649. A. V. Newton.
3653. W. Betts.
138. R. Craig.
195. C. J. Chubb.
214. J. Millward.
222. J. M. Merrick, jun.
275. N. C. Szerelmey.
281. S. Smith.

Patents on which the Stamp Duty of £50 has been paid.

921. J. Davis.
922. J. Davis.
926. E. T. Hughes.
959. W. Betts.
986. W. Cole.
992. J. Young.
1048. W. Clark.
955. G. P. Wheeler.
1000. W. Clissold.
1007. J. Foster and J. Hollinrake.
1032. J., J., and J. Crabtree.
962. W. Howitt.
1029. W. Young.
1212. J. C. Pearce.

Patents on which the Stamp Duty of £100 has been Paid.

897. R. C. Ransome.
901. J. M. Clements.
917. E. Hartley, G. Little, and J. Hinchcliffe.
940. G. Bower and J. Qualter.
966. W. E. Newton.
1008. S. Farron.
957. L. Lindley and F. Taylor.
967. W. E. Newton.
988. J. Watremez and A. Kloth.
939. R. Morton.
956. T. Silver.

Journal of the Society of Arts.

FRIDAY, APRIL 16, 1869.

Announcements by the Council.

Ordinary Meetings.

Wednesday Evenings at eight o'clock :—

April 21.—"On Trade Marks." By W. Wybrow Robertson, Esq.

April 28.—"On the Duties of the Architect with reference to the Arrangement and Structure of a Building." By Roger Smith, Esq. On this evening Sir Digby Wyatt will preside.

May 5. "On the Formation of Industrial Settlements in our Colonies." By Col. Francis C. Maude, C.B.

May 12.—"On the Ventilation of Drains." By James Lovegrove, Esq., Assoc. Inst. C.E.

May 19.—"On the Progress of the Colonies." By John Robinson, Esq., of Natal.

May 26.—"On Silk Supply." By Thomas Dickins, Esq., President of the Silk Supply Association.

Cantor Lectures.

A Course of Four Lectures "On Applied Mechanics" is now being delivered by John Anderson, Esq., C.E., Superintendent of Machinery to the War Department, as follows :—

Lecture II.—Monday, April 19th.

Applied Mechanics in relation to Natural Properties of Materials.

Lecture III.—Monday, April 26th.

Applied Mechanics in relation to Natural Laws in processes.

Lecture IV.—Monday, May 3rd.

Applied Mechanics in relation to Natural Power.

Each lecture will begin at eight o'clock. These Lectures are open to Members, each of whom has the privilege of introducing two friends to each lecture. Tickets for this purpose have been forwarded to each Member.

Committee on India.

Six Conferences are now in course of being held for the discussion of the following subjects, viz. :—

Tea Cultivation in India.
Hill Settlements and Sanitaria.
Waste Lands in India.
Trade with Central Asia, Thibet, and South-Western China.
Indian Fibres.
Silk Cultivation and Supply.

The following evenings have been fixed for the remaining four conferences :—

Friday, April 16th.
" April 30th.
" May 14th.
" May 28th.

At these Meetings the chair will be taken at 8 o'clock, and the discussion will be opened by a paper.

This evening, Friday, the 16th inst., a paper, "On Hill Settlements and Sanitaria," will be read by Mr. Hyde Clarke, Member of the Council. The chair will be taken by Lord William Hay.

Members of the Society interested in Indian questions are invited to attend.

Artistic Copyright.

The Bill for Consolidating and Amending the Law of Copyright in Works of Fine Art, which has been prepared under the direction of the Society's Committee, has been presented to, and read a first time in, the House of Lords. The second reading of the Bill is fixed for Tuesday next, the 20th instant, when Lord Westbury, who has kindly taken charge of the Bill, will bring the subject fully before the House.

Postage of Printed Matter and Parcels.

The Council have appointed a Committee to promote the adoption of reduced rates of postage, particularly in reference to printed matter and parcels.

Subscriptions.

The Lady-day subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Food Committee.

The Committee met on Wednesday, 17th March; present—Mr. Seymour Teulon, in the chair; Messrs. J. T. Ware, James A. Youl, and John Jenkins.

Mr. Joseph Mitchell, C.E., of Inverness, and Wimpole-street, attended to give information to the Committee with respect to the supply and transport of fish from the north of Scotland.

Mr. Mitchell said he had, for forty-two years, charge of the roads, bridges, and harbours under government in the seven northern counties. He was also twenty-two years engineer to the Commissioners of the Herring Fisheries, for building fishing harbours, and consequently was well acquainted with the whole coasts of Scotland and the Hebrides. For the last fifteen years he had been engaged in constructing 280 miles of railway north of Perth, viz., the Central or Great Highland Railway, and the line bordering on the Moray Firth, from Keith along the shore to Golspie, in Sutherlandshire, and his attention was of late more especially directed to the fisheries, from wishing to promote the traffic of the railways he had constructed. The traffic by these railways would come into England from Perth by two routes; the east coast route by Edinburgh and Berwick; and the west coast route by Carlisle. In the summer of last year he drew the attention of the directors of the Highland

Railway to the importance of the fish traffic as a source of revenue, and pointed out that the Moray Firth teems at all times with cod, turbot, haddock, flounders, and skate, and the shoals of herrings surpass anything on the coasts of Great Britain. The fishery was private enterprise entirely. Before the railways were made, the only way of realising this harvest of fish was by curing. Cod and ling were pickled and dried, and forwarded to the southern markets. The herrings were cured and sent abroad, chiefly to the Baltic and Spain, and some to London, and of late years a very considerable trade has arisen in the curing (smoking) of haddocks for the London market, &c., but as yet only a very small portion of fish in the Moray Firth is sent south in a fresh state. Now that there are railways, he thought the fish might be sent south fresh, and thus realise a better price, and be of great value to the masses of the population in London and the southern cities. By the returns recorded in the report of the Fisheries Commissioners, there were caught in 1867, along the coast of the Moray Firth from Peterhead, and along the eastern shores of the counties of Ross, Sutherland, and Caithness, including the Orkneys, 348,748 crans, of which 216,000 were caught along parts of the Moray Firth which have access more or less convenient to the Highland Railway. There are, therefore, about 36,000 tons of herrings caught, and it is estimated some 16,000 or 17,000 tons of other fish, making from 50,000 to 60,000 tons of fish annually caught in this locality, and very little of this, as yet, was sent south fresh. A cran or barrel consists of 700 herrings, making the total number of herrings caught in this district about 244,125,600. The catch of fish seems inexhaustible along the coasts of Scotland; the quantity appears progressive, for, according to the Fishing Board reports, the average cure for eleven years to 1820 was 183,980 crans or barrels.

	Barrels.
For 10 years to April, 1830.....	350,049
" " 1840.....	445,057
" " 1850.....	615,722

For the ten years from 5th January, 1850, for Scotland and the Isle of Man (the collection for England having ceased at that date), the total cure was 613,654. For six years to 1st December, 1865, the cure was, for Scotland and the Isle of Man only, 683,526 barrels. In 1865 alone, the cure was 621,763 barrels; in 1866, 658 146; and in 1867, 825,589 barrels. These were the total quantities of herrings cured, as reported by the Commissioners, all over the Scotch coast, but the chief quantity was caught in the Moray Firth; and he gave these figures to illustrate the progressive increase in the catch of fish, showing that if the fishing is properly prosecuted the supply seemed to be inexhaustible. He knew that was disputed by some persons, but these figures were the actual returns from the Fisheries Reports. Now fresh fish in London was in a great measure the food of the rich, and that was plainly seen by the very small number of fresh fish shops met with. In all Mayfair there were not above six or eight, and fish at the West-end was sold at the following prices:—Cod, 9s. 6d. to 14s.; shoulders, 4s. to 12s. 6d.; slices of crimped cod, 1s. 6d. to 3s. 6d.; haddocks, 1s. 6d. to 2s. 6d.; crimped skate, 1s. per lb. The prices in the Moray Firth were:—Cod of the best quality, 6d. to 8d., each weighing 10 to 16 lbs.; haddocks purchased over head 1d. to 2d. each, varying from ¾ lb. to 1 and 2 lbs. weight; herrings, 20s. to 25s. per barrel, which, at the average price in the London fish ships of 2s. per dozen, would be £5 16s. 8d. per barrel. The prices in London were taken from the daily list of a West-end fishmonger, and were quoted to show the difference. He saw no reason why a large supply of the fish caught in the Moray Firth might not now be supplied to London, and the other great English towns. At this moment a train leaves Forres, a central point on the Moray coast, at 1.50 p.m., on the arrival of the train from Golspie, Inverness, and the north, and from Tossiemouth, Buryhead, &c., on the east, which could take all the fish caught, and to be sent that morning. This train reaches London at 9·40. a.m., 19½ hours from Forres; and, of course, it would arrive some hours earlier at the towns north of London. For that matter the train could be increased in speed 1½ to 2 hours. Then, again, fish caught in the morning at the outports, such as Helmsdale and Wick, and along the Caithness coast, could be brought to the rail by six in the morning, and might be despatched then, and arrive at most of the English towns about midday. Now (continued Mr. Mitchell), the question arises, how does it happen that, with prices so low in the Moray Firth, and so high in London, and the time of transport from the sea to London less than 24 hours, and at the present time not more than from Ireland, Cornwall, and even Scarborough, we do not send fresh fish from the Moray Firth. He was answered by the railway manager, that they carried all that came to them, and that it was not his business to turn fish merchant; and no doubt that was true. He was answered by fish curers that they knew their business better than he did; that often they had sent fish to London, and if it did not arrive by early morning it was put aside till next day, and so often sold at a loss. He reminded the railway manager that he had got a new instrument for the transportation of fish, and that it was his duty, if he wished quickly to secure the traffic, to make arrangements accordingly; that the able manager of the Great Northern Railway, some 12 years ago, saw that London was supplied with coals solely by sea from Newcastle and Durham, and that he contrived to take coal from the South Yorkshire coal-fields, and even from Durham, at ⅜th's of a penny per ton per mile; but this was not done without a severe struggle, for the coal-merchants would not go out of their beaten track, whereupon he appointed clerks to take orders all over London. The result was the coal trade on the Great Northern gradually increased, so that, in 1867, that line carried 1,040,000 tons of coal to the metropolis. The other railway companies followed his example, and he (Mr. Mitchell) believed London was now half supplied with coals by railway, at from 18s. to 25s. per ton, some 20 or 30 per cent. lower than before. He saw no reason why similar efforts might not be equally successful in regard to fresh fish. Herrings are cured in the north to the extent of, as he had said, many hundreds of thousands of barrels. Now, the barrel and curing cost 7s. 6d., a sum which would go far to pay the transport. There could be no doubt in his opinion that it would immensely benefit all parties if this fish could be brought fresh to London; but it was clear it could not go to Billingsgate. The wholesale salesmen and fishmongers appear, like the coal merchants, to be against any change. In his opinion, the demand for fish in London was inexhaustible if people were sure of getting the article. Why should not the northern fish merchants have agents in London, who could meet the trains and take the fish at once within the reach of the consumers. It should be the business of the London agent to secure buyers. The whole should be done, and with the aid of the telegraph ought to be done, so as to be as certain of the market and consumption as they were certain of the arrival of the railway trains. Of course, unless this was arranged beforehand, a great supply would be a failure. He thought the sales at Billingsgate, if Billingsgate is continued, should be confined to the fish brought by the river; and as to the fish brought by rail, the supply for twenty-four hours could easily be known six or seven hours before by telegraph; and Smithfield might be available for the concentration of the traffic and sale of fish as well as meat. Nothing could be more absurd than all the fish arriving at Paddington, going down by cart to Billingsgate, five or six miles, and the greater part being recarted four or five miles to the West-end again. This carting he had no doubt was more detrimental to the quality of the fish than all the railway journey; and then, if it did not arrive by five in the morning, forsooth it could not reach

the customer till next day. One of the fishmongers stated that every hour the fish is out of the consumers' hands it deteriorates. Mr. Mitchell remarked that London contained upwards of 3,000,000 of inhabitants, and covers an area of 118 square miles. Fish, of all articles of food, from its perishable nature, requires to be distributed over this area in the promptest manner, yet, at present, the whole supplies of London, besides the surrounding country, have to be concentrated at Billingsgate. He considered that, however convenient Billingsgate may have been before the period of the railways, it is not so now, for he believed at the present time two-thirds to three-fourths of the fish supply of London comes by railway, and, when there is a large supply, the passage to Billingsgate is blocked up for hours. Look at the mode in which fish is distributed at the present time. Trains arrive with fish from Ireland, Milford Haven, Cornwall, and Scotland, and are taken from the railway stations by carts to Billingsgate, in some cases a distance, as I have said, of six miles, and then redistributed in carts all over the metropolis, six, eight, and ten miles. Surely the fish supply of 3,000,000 of people might afford profitable employment, not for one, but for three central markets. If you ask any of the fishmongers about this, they will tell you that more than one market will never answer, and that that market is Billingsgate. Well, the fishmongers are a most respectable class of men, and we are entitled to give weight to their opinions, guided by their personal interests and practical experience; but, in my view, Billingsgate should now be confined to the sale of fish coming up the river, if retained at all. I fear matters will never alter, nor will fish become the food of the people, instead of being, as at present, almost exclusively the food of the rich, unless some public authority, in combination with the railway companies, will do as Mr. Seymour Clarke did in the coal trade, appoint agents all over London, irrespective of Billingsgate, for the immediate sale and distribution of fish as it arrives. Now, as to the time that fish will keep good, he had very good authority on that point. He consulted Mr. Anderson, an eminent and wealthy fishmonger in Edinburgh, who confirmed his (Mr. Mitchell's) views, that fresh fish may be sent from Moray Firth with great advantage. Cod, haddock, and ling, by drawing the stomach, will keep, according to Mr. Anderson, for forty-eight hours, and in winter, for four days. He recommended that they should be sent in boxes two and a-half feet broad, eight inches deep, and three feet long, with rope handles, and a few pieces of ice to fill up corners were a great advantage; and in the north ice could easily be got in any quantity with a little forethought. In fact, Mr. Mitchell thought that it only required arrangement and organisation to add the great fishing of the Moray Firth to the fish supply of the other parts of the coasts of Great Britain. Indeed, fish from the Moray Firth may reach London, by even the present transit, as quickly as fish is now supplied from Ireland, Cornwall, and even from Scarborough. He had gone to Scarborough and to Liverpool, and corresponded with persons who were conversant with the transport of fresh fish from these distant localities, and the above was the result.

The Chairman remarked that one of the difficulties which was not easily to be got over was, if there were only one or two kinds of fish brought to a particular part, the dealers in fish who want a variety would not go to an isolated place for their supply. If the fish could be altogether brought by railway to a central spot such as Smithfield, he could imagine such a thing would work. With regard to the particular fish brought from the Moray Firth, such as cod and ling, it would be better for being kept a little time.

Mr. Mitchell—The Moray Firth and the Scotch coast had fish of every description except soles. Cod was, no doubt, better from being a day in salt.

The Chairman added, the great question was the distribution. They could hardly get people in the trade to alter their mode of getting supplies.

Mr. Mitchell observed that no doubt was the difficulty. His object was to make it clear that fresh fish could be sent in good condition from the Moray Firth to London; but he admitted the difficulty was how to get it distributed amongst the consumers, and yet the inhabitants of London would only be too thankful to take it. It was monstrous that the shores of Great Britain should teem with fish, particularly the Scottish shores, with ready means of transit, yet he believed three-fourths of the inhabitants of London never taste fresh fish. As he said, it was a luxury, the food of the rich.

The Chairman—The railway companies would require to be shown that it was their interest to encourage and facilitate this fish traffic, and they might have carriages constructed for the purpose of keeping the fish as cool as possible during the transit.

Mr. Mitchell said he had done his best in the north to draw the attention of the railway authorities to this subject, and since he had been staying in London he caused to be sent to him, by way of experiment, a cwt. of cod, ling, and haddocks; they arrived in excellent condition. The fish of each kind were large. He was charged in the Moray Firth, for the haddocks, 3d. each, for the cod, 1s. 6d. each. Now the price list sent to his house by the fishmonger on the 23rd of February was, haddocks, 1s. 6d. to 2s. each; Dublin Bay haddocks (and they are not much nearer London than the Moray Firth) were quoted at 2s. to 2s. 6d. each; cod-fish, 6s. 6d. to 15s.; crimped haddocks, from 7s. 6d. to 16s. 6d. each; crimped slice of cod, 1s. 6d. to 3s. 6d.; fresh herrings, 2s. per dozen.

The Chairman asked Mr. Mitchell whether he was prepared with any propositions for getting over the difficulties suggested. Mr. Mitchell had suggested some arrangement with regard to Smithfield market. He (the Chairman) understood the Corporation contemplated some alterations with respect to that market, and the fact that the great bulk of fish taken to Billingsgate was now brought by the railways instead of by water, might have some effect with regard to Billingsgate itself. Therefore any information with regard to fresh sources of supply of fish was important, as assisting the authorities to determine upon the future site of the central fish market, in the event of the removal of the present one.

Mr. Youl remarked it was important that fish should arrive in London very early in the morning; if not the fishmongers would not distribute it. In order to enable the fish to arrive in time for the market, it would involve a great alteration in the trains coming from the north. Under the present arrangements it would seem the fish from the Moray Firth would not reach London till eight or nine o'clock, when the market for the day was over.

Mr. Mitchell thought the interests of the public were more important than the convenience of the fishmongers, and they deserved consideration. Although fish did not arrive in London before eight or nine o'clock a.m., or even ten oclock, he saw no reason why it should not be distributed for dinner that day; besides, there was a large trade in fish from the Firth of Forth, which, for that matter, could arrive at any time in the morning. Mr. Mitchell's attention was first drawn to this subject by noticing that the moment the railway was open from Edinburgh by Berwick, and a new harbour at Dunbar, the great bulk of herrings caught in the Firth of Forth were sent south fresh in barrels and boxes, and more than double price was obtained for them, and the quantity sent was increasing every year.

Mr. Jenkins asked whether there was not a large supply of fish from Hull to the Midland counties.

Mr. Mitchell—From Hull, and also from Scarborough. The Scotch train came up in the evening from Scotland to York, and met the Scarborough train there, and at that place the train was marshalled to the different towns where the market was best for fish. It was delivered at Derby, Leicester, Leeds, Birmingham, and

other towns. In fact, the London market was not reckoned by the fish curers in the north so good a market as the towns in the Midland counties.

Mr. Jenkins asked whether Hull was not a large depôt for the landing of fish from the German Ocean, and whether fish from that place would not reach the Midland counties at early morning?

Mr. Mitchell replied no doubt Hull would be the most central port, but he could not see any actual necessity for the London fish market being held so early as five o'clock in the morning.

The Chairman apprehended it was necessary to enable the dealers to distribute the fish over London.

Mr. Mitchell said, as far as he could gather, Billingsgate was at the present time one of the most inconvenient places in London for a market. It took four or five hours to bring fish from the Nore by the river, and it could come from Hull in that time. As regards the delivery of fish by railway, to which he understood some of the fish dealers objected as irregular, he saw no reason why there should be irregularity with regard to the arrival of fish trains any more than with other trains. If fish waggons were attached to the passenger trains they would come as regularly as any trains in the country. There was a fresh meat train started regularly every day from Forres, and it reached London in 36 hours. The meat trains kept time as regularly as the passenger trains, and it ought to be the same with fish.

Mr. Youl thought the great evil at present was the length of time that the fish were now detained in the streets leading to Billingsgate before they could be unloaded in the market.

Mr Jenkins inquired whether Mr. Mitchell calculated upon a new trade in fish, to the amount of 50 tons a day, having to contend with an already established trade?

Mr. Mitchell had no doubt the difference of price obtained would induce a great trade from the north of Scotland in the herring season. There would be a great difference in the returns to the dealers if the fish could be sent south in a fresh instead of in a cured state; the cost of curing would be saved, and the returns on their capital would be immediate.

Mr. Jenkins asked whether the rule did not always apply that there was a great difference at the fishing station and at the market some long distance off? For instance, herrings sold for £1 a thousand at the station would be sold for £3 per thousand 170 miles off.

Mr. Mitchell replied that was probably so.

Mr. Jenkins—And that the perishable nature of fish was an element in the amount of profit which the dealers required in transporting fish from one place to another?

Mr. Mitchell had no doubt it was so, according to present arrangements; but what he thought most to be considered was the public advantage and convenience, and not that of the fishmonger. He thought, by proper organisation for the prompt delivery of the fish, it could be brought to the consumer in better condition, and the area of consumption being enlarged, even if the price of the fish were less, the profit to the dealer would be more certain and greater from the increased quantity sold. But all this required a different mode of dealing from the present. In the herring season in Inverness, the whole community seemed to eat fish, and the odour of fish-cooking pervaded the town as one walked about, such was the superabundant supply of herrings, which were sold at a very cheap rate. The only other mode of disposing of them was by curing, and, as he had already stated that the barrels and packing cost 7s. 6d. each, when they were sent to the Baltic and other places abroad it was a long time before the curers got a return for their capital.

Mr. Jenkins remarked that large quantities of herrings were received in this country from Howth, on the coast of Ireland, and he begged to ask Mr. Mitchell whether he did not think the fishers of Howth, who had no established trade for their herrings, could send over their produce at a cheaper rate than the Scotch dealers, who had already an established trade on the Continent and elsewere?

Mr. Mitchell replied they could not come quicker than from Scotland. The Scotch dealers would get better prices for the fish if they sent it fresh. The fish which cost, in the Moray Firth, 25s. per cran, sometimes realised as much as 80s. or 90s. in the south. Even from the Hebrides, last spring, as many as 15,000 barrels were sent off, some in quick steamers to Liverpool, slightly strewed over with salt. When landed they were distributed to London and through the Midland districts. What was required, as he had already said, was an organisation of the traffic, and for the distribution of the fish when it arrived; the latter, no doubt, was the more important point. He thought there would be a difficulty in getting the fish into London so early as five in the morning from the Moray Firth. It would take from 12 at noon on the Monday till eight or nine on the Tuesday morning to bring the fish into the London terminus. He saw no reason why the wholesale fish market should not be held at nine o'clock as well as at five o'clock in the morning, as the dealers would then have ample time for the distribution of the fish from all quarters. It only required the alteration of existing habits, and he believed no one would suffer from it.

Mr. Youl remarked that the meat market was held at an equally early hour of the morning, which he apprehended was necessary for the requirements of the trade.

Mr. Mitchell questioned whether there was any absolute necessity for it. He added that the railway was now being extended from the Highland line at Dingwall to the West Sea, opposite the Island of Skye, and would be a direct communication from the whole Hebrides, and thus would lead to further large supplies of fish, available for the southern markets in a fresh state.

The Committee having thanked Mr. Mitchell for the information he had given them, then adjourned.

Thames Embankment Committee.

The fourth meeting of the committee took place on Thursday, the 8th inst., at 11 a.m. Present—Earl Grosvenor, M.P., in the chair; Lord Elcho, M.P.; Sir Charles Trevelyan, K.C.B.; Col. Scott, R.E.; Messrs. Westmacott, R.A., G. E. Street, A.R.A., Baillie Cochrane, Hyde Clarke, Edwin W. Field, Seymour Teulon, and C. F. Hayward.

After some preliminary discussion whether or not it was advisable that the Committee should come to a definite resolution with regard to the proposal to place the Law-courts on the Thames Embankment, the following resolution, proposed by Mr. Edwin Field and seconded by Mr. Seymour Teulon, was agreed to:—

"Resolved—That the Committee report as follows:—

"At their meeting of the 16th March they passed the following resolution:—

"'That it is the opinion of the Committee that public or quasi-public buildings only should be erected on the Thames Embankment; that the designs for such buildings should be publicly exhibited, and approved by an authority responsible to Parliament; and that if any private rights existing before the Embankment was formed or created by it should be found to interfere with the proper execution of such buildings, Parliament should be asked to deal with such rights.'

"The question of building the Courts and Offices of Law has been discussed before this Committee; the report of the discussion appears in the *Journal* of the Society, and the Committee think it better to confine their report

on that part of the subject to calling the attention of the Society to that discussion."

The following resolution was proposed by Mr. Street, seconded by Sir Charles Trevelyan, and passed :—

"That in the opinion of this Committee the authorised position of the railway station on the Embankment in front of Norfolk, Arundel, and Surrey streets, would make the erection of a grand public building on this part of the Embankment very difficult if not impossible."

Lord Elcho said there were two evils connected with railway stations of this kind; one was their position, and the other, not less important, was their character. It had been stated by Sir John Thwaites, before the Parliamentary Committee, that no one had any control whatever over the erection of these stations. It appeared to him that such a station would really be less objectionable if incorporated with any public building which might be put there, than occupying an independent position in front of the Temple-gardens.

Mr. Street did not think it possible that a railway station could be satisfactorily connected with any public building, on account of the inevitable noise and smell.

Mr. Hayward said there were difficulties connected with the railway itself, as well as the station.

It was moved by Mr. Seymour Teulon, seconded by Sir Charles Trevelyan, and passed—

"That in reference to the Bill now before Parliament for extending the powers of the Metropolitan District Railway Company, a petition embodying the foregoing resolution be prepared for presentation to the Legislature on behalf of the Committee."

It was moved by Sir Charles Trevelyan, seconded by Lord Elcho, and passed—

"That it be recommended to the Council to send copies of the report of the discussion on the Law Courts question to the members of both Houses of Parliament, and others interested in the subject."

Mr. Seymour Teulon wished to correct a statement of his at the meeting of March 16th, which had been incorrectly reported. At page 316 of the Society's *Journal*, he was represented as saying that, if Mr. Sheilds' scheme for a new street from Piccadilly to Paternoster-row were carried out, the new Record Office in Fetter-lane would have to come down. What he said was, that the Record Office was built so as to line with such a street, in accordance with the plan proposed many years ago, but that no further steps had been taken.

The Committee adjourned to Tuesday, the 13th inst.

Musical Education Committee.

The Committee met on Thursday, the 8th instant. Present—Mr. H. Cole, C.B., in the chair; Right Hon. Sir John Pakington, Bart.; Sir J. Harington, Bart.; Lord Gerald Fitzgerald; Capt. Donnelly, R.E.; Lieut.-Col. Scott, R.E.; Messrs. J. Puttick and R. K. Bowley.

The Committee discussed the propriety of petitioning Parliament to take the necessary measures for affording Musical Education to all classes of Her Majesty's subjects in the United Kingdom, not less complete and efficient than is afforded by France, Germany, Italy, and other countries of Europe; and they drew up a petition, which they recommended should be adopted by the Council for presentation under the corporate seal of the Society.

Piscicultural Committee.

A meeting of the Committee was held on Friday evening, April 9th. Present—Mr. James A. Youl in the chair; Captain Grant, Messrs. G. F. Wilson, F.R.S., Frank Buckland, Spencer Walpole, F. Chadwick, E. N. Lindon, George Campbell, F. T. Porter, George Ledger, and H. F. Ffennell.

The following paper was read :—

SALMON LAWS AND SALMON RIVERS.

By Dr. W. Peard, of Bath.

A large and influential deputation recently waited upon the Home-Secretary, with the purpose of representing the necessity which existed for amending our Salmon-fishery Laws. The deputation was received by Mr. Knatchbull-Hugessen, Under-Secretary of State, who observed "That the Government had the matter under consideration, and that he had no doubt in good time a bill would be prepared on the subject." Ample materials for the construction of such a bill as would really amend our salmon fisheries are already collected; in fact, the vessel is on the stocks, and within the next few months will doubtless be launched on the stormy waters of St. Stephens. Few measures during the present session will probably exercise a larger influence for good or evil than the bill to which Mr. Knatchbull-Hugessen referred. Its scope is far beyond a mere question of vested rights or conflicting interests. It touches our pockets, health, and comfort; and for the time, at least, will determine whether our inland waters are, or are not to remain comparatively barren, and therefore comparatively useless to the community.

The enactments of 1861 and 1865 practically constitute our entire fishery laws; and for a season or two after the passing of the first mentioned Act great things were expected from it. More extended experience, however, has proved that existing legislation is not only inadequate to develop our fisheries, but is actually powerless to prevent their decline. Salmon are as scarce and dear as ever; few rivers have improved, whilst some—we will only instance the Wye and the Tyne—have woefully degenerated.

The Acts referred to will probably be repealed by the forthcoming bill. Instead, therefore, of discussing clauses which may so soon cease to be law, we will endeavour to consider briefly and clearly the conditions held by all authorities as absolutely essential to the well-being of a salmon fishery. This plan will not only show the general reader the points which should hold prominent place in the new bill, but will in some measure enable him to help forward the science of pisciculture, which, when carried out in its entirety, will indeed prove a boon to the age in which we live.

Before proceeding, however, with the subject, if we describe a "perfect" salmon river, and point out the value of a single well-managed fishery, the importance of water culture, and the need which exists for strong and fostering legislation in its behalf, may become more apparent. Let us endeavour to paint such an aqueous Eutopia. Imagine a stream—whose course we will assume to be fifty miles—without any impediment sufficient to prevent our passengers traversing that high road at will; believe the upper tributaries safe and improved; the deeps secure, the shallows fertile. Suppose its waters unpolluted to any injurious extent from the source to the sea; that wise conservators enact judicious bye-laws, erect nurseries, and hatch artificially, whilst honest water-bailiffs protect the property, proud of a stock so ample, as to occupy without overcrowding all the spawning beds; and, lastly, let us conceive that the number of salmon captured in the season is on a par with the annual produce of the spawners. Without taking into account the results which might fairly be expected from a large application of the artificial system, such a fishery ought

to yield above thirty tons of first-class animal food per annum. Let anyone determine the extent of pasture requisite to send such a weight of beef or mutton into market, and then ponder on the single, as well as the collective value, of our rivers as food-producers. Such ought to be, but is far from being, the condition of the majority of our streams; and having dallied sufficiently with the ideal, let us come to the real.

Observation and experience alike prove that the Salmonidæ require a free passage from the sea to the sources of the streams they frequent. Where no insurmountable obstacles exist, we see them sowing the seed of an incalculably rich harvest in the smallest tributaries; and on the other hand we know from evidence collected on our own as well as the larger waters of America, that in the ratio in which impediments in the beds of rivers increase, salmon decrease. It cannot be doubted, therefore, that a right of way is, par excellence, the condition most essential to the prosperity of our inland fisheries. In this country unfortunately barriers—more or less formidable—are found everywhere, from the rustic mills damming up bright rivulets, to the monster factories whose gigantic wall weirs bar our largest streams. As a consequence salmon have died out from the majority of our rivers, whilst only a few remain which yield large or regular supplies of this valuable commodity.

The necessity of granting a free passage to migratory fish has been recognised in this country by a series of Acts extending from the year 1218 to the year 1861, and to the spirit of these Acts we must return if our waters are to be cultivated. Here we meet the first difficulty, a difficulty which can be overcome either by legislation or the voluntary united action of proprietors of water property. We will consider each case separately.

In the forthcoming bill large powers should be given to the inspectors of salmon fisheries. They should be empowered to examine and determine the legality or illegality of all weirs, which might be classified as non-injurious, injurious, or destructive. If legal and obstructive, the conservators should be required to erect passes subject to the approval of the inspectors, such approval to be grounded on positive evidence that fish actually pass with sufficient ease; if illegal, the proprietors should build passes under the same supervision. Nothing short of this will benefit our rivers; anything less will render legislation only a waste of time and money. If any weir be declared impassable during ordinary floods, such barrier must be reduced to a height determinable by the inspectors, and a pass erected. It is unnecessary that a stream should constantly be maintained through all ladders. In large rivers salmon move steadily and constantly onwards, but in smaller streams they travel only by night or during freshes. In the former class, sufficient water could always be spared; in the latter, if the supply is employed for milling purposes during the day, we may reasonably expect the salmon should have the benefit of it during the hours of darkness. Even should the lessees of mills lose some driving power, and the owners in consequence be obliged to lower their rents, we contend the increasing value of their water property would more than compensate for a temporary diminution of income. The public are well aware that many fish-passes are failures: some from construction, some from too much, some from too little water; but if the new bill gives conservators sufficient power, these mistakes will soon be remedied. It is needless to offer any suggestions on the form or position of fish-passes. During the last eight years there has been a growing tendency in favour of copying nature; we would only observe, therefore, that passes—as far as may be—should resemble natural salmon-leaps both in material and design. All we contend for is, that they answer the end for which they were built. It has been suggested that the Land Consolidation Act might be made applicable to boards, to enable them to raise funds to buy up weirs. Such a suggestion is certainly worth the attention of Parliament, and would be useful in many cases. Steam also, in a variety of instances, might, as shown by Mr. Thomas Ashworth, be advantageously employed instead of water power, to the mutual benefit of mill-owners and river proprietors; but this is a question which belongs rather to individuals than to the public.

Another condition essential to the well-being of our rivers is, that capture shall bear some proportion to reproduction, and this brings us at once to the subject of nets. Wherever salmon are found in any considerable numbers, draughting is carried on so ruthlessly that in effect a wall, slight but nearly impassable, is stretched across the river. The enormous nets now in use are so well made and managed, so constantly employed by day and night, that upper proprietors—the owners of the most important spawning beds—are deprived of their rights. The present system practically gives a monopoly to the nets in the tide-way. This is not only a great injustice but a great error; and if suffered to continue can only end in the gradual decay of our fisheries.

A salmon river without a stock in some measure proportioned to its extent, resembles a farm which has been suffered to run out; and the wholesale destruction of which we have spoken must regularly and inevitably reduce that stock year after year to a lower level. It does this directly as well as indirectly: directly, because destruction is greater than reproduction; indirectly, because injustice makes the aggrieved breeders and rearers of the fry careless as to what becomes of it, and so it comes to pass that the upper proprietors not unfrequently sweep their pools, whilst too many of the mountain tributaries are practically handed over to the poacher. If this state of things is allowed to continue our rivers are doomed; but we cannot believe that so a great a public and private wrong will be practised. The remedy for the evil should not be difficult. Unfortunately recent legislation, with the best intentions, weighed out its remedies with so nice a hand, that the scales were always at an equipoise, and the most heroic practice exhibited in the Acts of 1861 and 1865 was that of robbing Peter to pay Paul. Now, however, we may hope that a strong Government will deal in stronger measures, and in the promised bill reduce the length of draught nets, shorten the time in which they are to be used, and increase the size of the mesh. Nor is this all, for the weekly and annual close seasons should be carefully considered, not only with a view to lengthen the fence time, but also to the adoption of a sliding-scale, based on a calculation of the rate at which salmon travel under certain conditions.

In many rivers the fish have to run above a hundred miles before they are clear of the nets; and it is plain that they will not traverse the whole distance in the thirty-six hours which constitute the weekly close time. Such being the case, the law as it stands merely transfers the salmon from one set of nets to another, whilst the upper waters, which it was proposed to benefit, gain nothing. To obviate this evil, a sliding scale has been proposed, the nature and bearing of which we give in the words of a well-known conservator of the Severn:—"I propose," writes this gentlemen, "that all salmon rivers be classed under two heads, viz., first and second magnitude. That for those of first magnitude, the weekly close time be fixed at sixty hours, commencing at six o'clock on Friday evenings, as respects the first forty miles from the sea, and twelve hours later as respects each succeeding thirty miles, continuing for sixty hours in each case. That for those of second magnitude, the weekly close time be fixed for forty-eight hours, commencing at six o'clock on Friday evening, and twelve hours later for each succeeding twenty miles, continuing in each case for forty-eight hours. The Act should be decisive; it should fix a penalty of £50 in every case of non-observance, or in any way obstructing the free passage of fish during the aforesaid close time; half the fine to go to the informer and half to the preservation fund."

The adoption of such a plan as the above would be of incalculable service to our fisheries; it would conciliate

the upper proprietors; inevitably benefit the netting interest; whilst it would throw a great additional weight of animal food into the market within three years. The application of such a sliding scale will, however, necessitate a clause in the new bill, restricting the use of nets to a given distance above the tideway. This arrangement would convert the higher parts of rivers into valuable rod-fishings, and prove a sure source of income.

Having touched on "free passage and restricted netting"—two of the most essential points in the future of our salmon rivers—we need only glance at the subject of pollutions. On this question Mr. Hugessen observed, "as to pollutions he thought the deputation were wise in waiving it. The Government would not press that matter in a salmon bill; but, no doubt, when the sanitary question came before them, the salmon fishery interests would get what they wanted." We desire nothing better than that the words of the under-secretary may prove prophetic.

And here we might pause, were it not that the latter half of our title justifies us in offering—not for the first time—a suggestion by which we believe the prosperity of our inland fisheries could be increased through private co-operative enterprise rather than by mere legislation.

The interests of every river should be one and indivisible. They who breed ought to participate in the profits of those who catch the salmon, for the fish cannot belong to any particular portion of a stream. Nature marks them as common property, not as objects of monopoly. Bred in the tributaries they are fed in the sea, and should be regarded as a source of revenue to all. If rivers above the tideway are private property, why should they not be considered as water farms, the stock of which belongs to all the rightful owners? Establish this doctrine, and cultivation must follow. It is the want of protection that has hitherto crippled enterprise in this direction, for who would expend capital on nurseries, improvements, or efficient protection, with the certainty that the lower nets would reap all the benefits of his exertions? Once, however, make any river the property of a joint-stock company, with the owners of ripal rights as shareholders, and nine-tenths of the difficulties which have hampered and impeded legislation are at an end. Parliament, however, would still be called on to do something, for monopoly in the tide-way must be crushed, and any upper proprietor unwilling to participate in the undertaking, be obliged to cede his ripal privileges to the company at a fair compensation, with the option of redeeming them at the expiration of three, five, or seven years.

We believe this, or something like this, will yet be done. We earnestly desire to see it accomplished, for then, and not till then, will our inland fisheries yield their strength, and our poor rejoice in the abundance which has been created. Meanwhile, we look with no little anxiety to the bill now being prepared, and trust it may long stand as a monument of the boldness and wisdom of those who framed it.

The Chairman wished to make a few observations on a subject connected with the question, though not bearing directly on Dr. Peard's paper, because Mr. Frank Buckland was present, and he wished him to answer what he was now going to ask. He believed the Thames to be in a state at the present time to yield salmon. He had seen thousands of the most beautiful fish turned into the Thames at Mr. Ponder's, at Hampton Court. Very few, if any, of these fish reach the sea. The error was in turning them out when they were only twelve months old. Nothing could be more beautiful than this young fry, but they only became food for the larger fish. So long as Mr. Ponder turned his fish into the Thames at one year old, he would have no salmon, but if he kept them until they were two years old, they would be by that time quite healthy and fit for what was before them. He hoped, therefore, that Mr. Buckland would state his views on the subject; and, whether or not, Mr. Ponder should keep his fish until they were two years old. It was his candid opinion that, as a salmon river, the Thames might be made to yield 60,000 fish per annum.

Mr. Frank Buckland said he had listened very attentively to the paper which had been read, and he regretted very much that Dr. Peard was not present to answer any objections advanced against anything he had said. First of all, he wished to say a few words on the subject the chairman had brought before the meeting. There was no doubt that within the memory of man there had been salmon in the Thames; he had seen the person who caught the last one; this was only 40 years ago. Now, he asked, how was it there were no salmon there now? He believed the answer to that was the weirs had been their destruction. Mr. Ponder and himself had been working the Thames for seven years, and both had come to that conclusion some years ago. Now it must be seen whether they could get the fish back again. The young ones had been put into the river, but only two had been caught. A man came to him (Mr. Buckland) and told him that he had caught a salmon, and had had the impudence to eat it. That and another instance were the only cases he had heard of. What became of these young fry? The Chairman had said that they were eaten up by the big fishes, and recommended a pond for their reception. But, as there was no pond for them, the fish were put where, after much thought, it was considered best, and where they could easily be found. They were not turned out anywhere, but they were turned out where their mothers used to turn them out. He quite agreed with the chairman that if they could be kept two years instead of one it would be much better, and it would afford him much pleasure to bring the Chairman's suggestion before the Thames Conservation Board. He was sure a pond was not the place to bring up young salmon, and, therefore, Mr. Ponder and himself preferred the running stream. There was another thing to be remembered, these experiments cost money, although success was to be attained not so much by money as by hard work. In 1868, he sent from his own cases in the Horticultural Gardens 7,800 salmon. He did not suppose much would come from turning out this number. Those sent were the celebrated Rhine salmon. With regard to Dr. Peard, like all salmon authorities, he was not quite right in all his points. He (Mr. Buckland) disputed entirely Dr. Peard's remarks that our salmon fisheries are declining. He could not allow the idea to get abroad that the English fisheries are going to the bad. There were in England at the present time no less than twenty-four Boards of Conservators. The chairmen were gentlemen of position, and the gentlemen who form the Boards had the subject thoroughly at heart, and in many cases their labours had been well rewarded. There were more fish in the Severn than hitherto, and with regard to the Wye the dispute was not as to the scarcity of fish so much as to who gets them. If there was any new legislation on the subject, the salmon fisheries of this country would be very valuable. But we must not be in a hurry. The first law that must be made must certainly be with regard to weirs. There could be no doubt that a free passage from the sea up the river was important. The argument we met with was, that the manufacturers' interest is greater than the salmon interest. It was so in some cases, but not in all. He was of opinion that, with a little trouble, our fish can be passed over every weir in the country without injury to the mill-owner. The mills did not require motive power at night or on Sundays, and why should the mill-lessee not put his hatches down when not using the water? He fully sympathised with the upper proprietors. They ought to have every privilege afforded them, but it must not be forgotten that they have September and October, when they can fish with the rod. There was another point which he mentioned with great reservation, though perfectly sure

of its being a fact. A river might be without a weir, or without pollution or any obstruction whatever, and still the salmon would not go up it. Legislate as much as you like; they won't go up until the flood, and then the upper proprietors get their share. He could not explain how this was; something within the salmon—perhaps an instinct. As regards nets, this was a difficult branch of the subject to legislate upon, yet it was very important. No one net was applicable to all rivers. Take, for instance, the hang-nets, they had done well in some rivers, but it did not follow they would do well in all; in the Severn, for example, they were obliged to adopt quite another plan. These things would have to be managed by bye-laws. He agreed with Dr. Peard that we should have sliding-scales, and he had no objection to the £50 penalty for those who fished during prohibited hours, but it was hardly practicable. In fact, Dr. Peard's paper was an outline sketch of the present state of the salmon laws. His colleague and himself had been working hard at their report, and he was glad to say it was now in the hands of the printer; and in that report there would be found grounds for repeating that there is no authority for Dr. Peard's statement that the salmon fisheries are declining, as they are undoubtedly increasing.

Mr. Chadwick (from the Ribble) said, after the observations of Dr. Peard, and what had followed from Mr. Buckland, he had not much to say, except with regard to the increase of salmon. He was only acquainted with one river, the Ribble, and, so far as that river was concerned, the following was the case. In 1859, the salmon taken did not amount to 100. It was certainly a dry year. During the last three years between 5,000 and 7,000 had been taken. There were many places high up the river which had formerly no yield, but which are now realising considerable quantities. On the subject of weirs there was no complaint; and the first point to be considered was this question of weirs, as until there is a clear way for the fish to get to the top of the river, it was impossible to have the river well-stocked. The reason was that the water has not been sufficient to bring them up. He believed this would have been the case if there had never been a net in the river. In the Odder, in 1859, there had been some amount of young salmon put into the streams, hatched on the property of Colonel Townley, and the result was so discouraging that Colonel Townley reluctantly gave up the experiment, and devoted his appliances to trout.

Mr. Walpole said he would not like to be entirely silent on the occasion. He could endorse the denial given by his friend and colleague that the salmon fisheries were decreasing, and the strongest denial of the charge was the statement of Mr. Chadwick. But Dr. Peard had instanced two rivers, the Wye and the Tyne, and had stated that our rivers are deplorable. Dr. Peard could not have been more unfortunate in his selection. The Tyne was the one English river, not excepting the Ribble, which was the most peculiar instance of the great advantages which we had derived from the legislation of 1861. The range of the Tyne was through a thousand miles of country. Its two large tributaries were closed, leaving 500 miles open to the fish. Nine years ago, the fish taken in the Tyne might be counted on the fingers, while last year the Tyne supported 1,200 net fishermen. Now, if a small river, not one-tenth of the size of the Thames, can support 1,200 net fishermen, that a few years ago hardly had a fisherman upon it, it was impossible to maintain that the salmon fisheries are decreasing. It also proved how salmon fishing can be brought back to a river. Nine years ago the weirs were closed. Since the passing of the Act, the salmon of the Tyne had constantly increased. The one thing we should have ever in view was this, the fish should be allowed to pass up the river. He was slightly disappointed at the means Dr. Peard would employ to improve this condition. In considering this question from a practical point of view, there were a great number of difficulties which Dr. Peard did not seem to know of. Dr. Peard seems to have applied the laws he considers a failure to one or two of the largest commercial rivers in this country, and concluded therefrom that the same was true of the whole. As to weirs, it seems that the case really turned on this point—are they legal, or are they illegal? If they are legal, surely we had no right whatever to take away our neighbours' property to please ourselves. Of course we could take it away if we gave him compensation, but not otherwise. We were not so much in want of statutory power as of money. It was asked why is salmon not reared in the Thames, but it should be also asked who will help to make the weirs so that the fish can pass over them. The real difficulty was this, that all the valuable fish in the country is common property, for which any one can go and fish, and until there are some means of terminating these common rights, it was useless to talk of cultivating salmon in rivers. He would very much like to see the efforts of Mr. Buckland carried out on the Thames, but he was afraid they would prove nugatory. The weirs had been the ruin of the salmon fisheries in this country. Up to 100 years ago there were no pound locks in this country. The only way then to pass a barge was to draw it up an inclined plane, and the salmon went too. Formerly the navigation interest was not opposed to the fishery interest, but now these interests were against each other. When we had the sloping weirs, our fish could swim them, but now that we have the perpendicular weirs the fish could not spring over them. There were some very interesting statistics compiled a few years ago, which gave an account of all the salmon caught at Marlow from 1794 to 1820. There was a note to say that if this time had been taken to 1774 the average would have been much higher than the statistics show for the years mentioned. From 1794 the salmon began to decline; even in 1811 the fish was getting very rare, until, in 1820, the last one was caught. Daniel, in his "Book of Sports," says that in 1804 there was no weir across the Thames below Marlow. In 1811 Teddington weir was built. This perfectly demonstrates that the salmon had been decreasing in proportion as the weirs had been built; and that salmon will not flourish until the weirs are removed.

Mr. Lindon would only offer a few remarks upon the observations of Mr. Walpole. He quite agreed with the concluding portion of his speech, and wished to add that he believed sewage had a great deal to do with pre-preventing the passage of salmon up the river Thames.

Mr. Walpole—A smelt was caught at Kew, and if a smelt can pass up the river salmon can.

Mr. Lindon—A smelt is not such a clean water fish as salmon.

Mr. Walpole—The Tyne is much fouler than the Thames, and yet, notwithstanding the large quantity of salmon destroyed in passing Newcastle, the river was plentifully supplied. Sewage would not stop salmon.

Mr. Lindon was not of that opinion. He did not think that any young salmon turned out at Hampton Court would ever get down to the sea. He quite concurred in Mr. Buckland's remarks, that the best place to turn them out was where their mothers used to turn them out; but with the river now so full of pike and perch, they soon fell a prey to their enemies. The only chance for the Thames would be to turn out the young fish higher up.

Mr. F. T. Porter, of Dublin, wished to make a statement on a matter which was connected with some of the Irish rivers. In that beautiful vale which Moore speaks of as—

> "The vale in whose bosom the bright waters meet,"

a family named Howard at one time paid £400 per annum rent. Some copper mines were opened, and the water from them allowed to flow into the river. It looks beautifully clear and limpid; but there is no vitality in it, and no salmon can be caught. With

regard to the effect of sewage, he instanced the Liffey. He remembered that as a very excellent fishing-river. He had seen trout, if not salmon, there; but now there is no fish at all in it, and this is in consequence of some paper-mills that have been recently opened. He begged to give them another fact of his own observation in 1821. In Wexford there is a river into which some persons had allowed foul water, in which flax had been washed, to run. This destroyed all the fish; even the eels were killed. The proprietors were extremely indignant, and offered very large rewards for those who had perpetrated the offence, but no discovery was made. The next year some fish came up from the sea, and soon the river became one mass of salmon fry, because all the enemies of the salmon had been poisoned by the pollution, and the river was now free from them. He had heard it said that it would be a very good plan if these small rivers could be effectually weeded before more valuable fish were let into them.

Mr. Ledger said, with regard to the purity of the Thames, he thought that the greater purity now observable in the neighbourhood of London had been obtained at the cost of pollution lower down the river. He presumed that if the smelt had got up to Kew it had passed safely through the sewage. With regard to the remarks that had been made as to the age at which Mr. Ponder turns out his fish at Hampton Court, he would suggest that it would be a good plan if they were only to be turned out in alternate years. The longer the distance fish had to travel the greater the risks they ran from their enemies. He was convinced that, at one time, the Thames produced salmon. A man had told him that he watched forty fish go over one weir. He did not think that the explanation of Mr. Walpole was sufficient to account for the entire absence of salmon from the Thames. These locks had been growing for a hundred years, but Mr. Walpole admits salmon, in 1804, at Marlow. If this theory were correct, the fish must have been seen below the first lock. Salmon could easily get up beyond Teddington, as at high water the lock was completely submerged, and fish could go over at that time. If we do not see fish at Teddington, and below Hampton, it is not the locks that excludes them. We must seek some other reason, and he was afraid it was to be found in their enemies, more than in any pollution. It was not sewage he referred to, but pollutions of a different nature. The "preparing" process had not been done properly. The first thing was to make the Thames in a healthy state, in order that you might know that fish which reach the sea will return.

The Chairman, in moving a vote of thanks to Dr. Peard, said he thought Dr. Peard had hit one great nail on the head when he urged that we must give the salmon a free course. He could bear testimony to the large increase of spawn in the Tyne. Two years ago he had to send up to the Tyne to get spawn for Australia, and in a few hours he obtained some hundreds of thousands of eggs.

Cantor Lectures.

The first lecture of Mr. Anderson's course "On Applied Mechanics," was delivered on Monday evening, the 12th inst.

Eighteenth Ordinary Meeting.

Wednesday, April 14th, 1869; Sir William Bodkin, Assistant-Judge, Vice-President of the Society, in the chair.

The following candidates were proposed for election as members of the Society:—

Arter, Andrew, 8, Walton-villas, S.W.
Ashton, Joseph, 59, Fleet-street, E.C.
Barnard, George William, 156, York-road, Lambeth, S.E.
Beamish, Captain H. Hamilton, R.N., 45, St. George's-road, Eccleston-square, S.W.
Benwell, J. A., 5, Upper-grove, Kensington, W.
Berthon, P. H., 20, Margaret-street, Cavendish-square, W.
Birch, Charles Bell, 12, Alpha-road, N.W.
Biss, William H., 25, St. Stephen's-road, Westbourne-park, W.
Bisson, F. S. de Carteret, 24, Charles-street, St. James's, S.W.
Boekbinder, J. M., 49, Thornhill-road, Barnsbury, N.
Borrett, Thomas, 15, Bryanston-square, W.
Bowyer, James, 10, Tavistock-square, W.C.
Boyer, Joseph, 4, Codrington-terrace, Notting-hill, W.
Bradley, Charles Lawrence, 4, Belitha-villas-west, Barnsbury, N.
Breach, James G., 14, Prince of Wales-terrace, Kensington, W.
Brett, Edwin J., 311, Camden-road, N.
Brittain, Thomas, 22, Cleveland-road, Downham-road, N.
Brucciani, Dominico, 10, Onslow-gardens, S.W.
Buckingham, J. H., 35, Wood-street, E.C.
Burr, John, 8, Bolton-road, St. John's-wood, N.W.
Cochrane, Alexander Baillie, 26, Wilton-crescent, S.W.
Cockerell, William, 3, Pump-court, Temple, E.C., and Cambridge.
Durrant, George C., 20, New Bond-street, W.
Lacey, Charles J., 1, St. John's-villas, Haverstock-hill, W.
Todd, Arthur, jun., 30, Milk-street, E.C.

The following candidates were balloted for, and duly elected members of the Society:—

Abraham, Philip B., 6, Old-square, Lincoln's-inn, W.C.
Andrews, James, 10, Northampton-park, Islington, N.
Arnott, Neil, M.D., F.R.S., 2, Cumberland-terrace, Regent's-park, N.W.
Clare, Edwin, 104, Guilford-street, Russell-square, W.C.
Cockerell, G. J., Upper Sydenham-hill, Kent.
Death, F., Woodstock-house, Hendon, Middlesex.
Fowler, William, 30, Lombard-street, E.C.
Gwynn, William James, Manor-house, Forest-hill, S.E.
Hambro, Charles J. T., M.P., 14, Cavendish-square, W.
Haynes, W. J., 9, Westbourne-villas, Forest-hill, S.E.
Kemp, Edward Owen, 7, Lincoln's-inn-fields, W.C.
Lascelles, W. H., 121, Bunhill-row, E.C.
Layard, Right. Hon. Austen Henry, M.P., 130, Piccadilly, W.
O'Neill, Lord, 19, Belgrave-square, S.W., and Shanes Castle, Antrim.
Pegram, Orlando A., 13, King-street, Cheapside, E.C.
Rabbits, W. Thomas, Selwood, Mayow-park, Forest-hill, S.E.
Ricketts, Charles R., 13, Albert-road, Regent's-park, N.W.
Seabrook, Charles, Grays, Essex.
Smith, George Mence, The Chesnuts, Bexley Heath.
Waterfield, O. C., Temple-grove, East Sheen, S.W.
Weguelin, Christopher, M.P., Ranelagh-house, Arabella-row, S.W.

The Paper read was—

SPAIN COMMERCIALLY AND ECONOMICALLY CONSIDERED.

By E. M. Underdown, Esq., Barrister-at-Law.

The country of whose physical, commercial, and economic features I shall endeavour this evening to give as lively a sketch as my personal observations thereon will enable me to do, is surrounded, in the minds of most persons, with a peculiar interest, generally speaking, coloured with a kind of romance, naturally arising, partly from the general ignorance of the real state and characteristics of the country, and partly from the accounts, history, and representations of it having been

confined and limited to incidents possessing in themselves most of the elements of the picturesque and the romantic.

Such are the battles of the sturdy Christian with the swarthy and infidel Moor, whose palaces and fortresses of oriental splendour exist to this day, colouring the architecture of Europe, so to speak, at its south-west wing with the hues of the East, as the palm, the pomegranate, and the sugar-cane give its vegetation and its scenery a tinge of Orientalism. The valorous and punctilious Don, fighting now the wretched and benighted Mexican and Peruvian, now the vulgar Dutch or the prosaic Englishman,—the magnificence of the clergy, the burnings and dungeons of the Inquisition—the stately pile of the Escurial—the cathedrals of Burgos, Seville, and Toledo—and, later, the lithe and active bull-fighter doing his deeds of blood before the delighted gaze of tens of thousands of excited and bloodthirsty spectators, men, women, and children. But of her realities, her laws, customs, and the real life of the people, less is known than of any other country in Europe.

I fear that my duty will be to ask you to clear your minds of a good deal of this mediæval and Oriental haze, and calmly examine this land of Spain, and listen to my words without even the imaginary accompaniment of the guitar and the castanets;—remembering that, as it is to the eye of the student of humanity and the political economist, the most dreary of states, so it will be found to be the most prosaic, and, spite of its clear sky, most dismal of lands, peopled with the most matter-of-fact, sober, melancholy, poor, ignorant, and, of necessity, narrow-minded of populations. I speak thus strongly, at the risk of offending my Spanish friends; for it is impossible to conceal from oneself the fact that inordinate conceit of self and of country is one great obstacle to the progress of Spain. The Spaniard will not see himself as others see him; he is morbidly sensitive to ridicule; he is perpetually with his head in a bush. He tells laudatory untruths about himself on principle, hardly hoping they will deceive anybody. In the midst of rebellion, according to his statement, tranquillity always prevails. When Cuba is practically lost, and utterly ungovernable, the rebellion is announced to be at an end. With national debts unpaid, Spain brags of her wealth, and abuses her beggarly creditors. In unparalleled ignorance she talks of her enlightenment and civilization. With paganism almost unaltered for thousands of years, she calls herself the great missionary country —Heaven save the mark! And yet with all this, the Spanish people (properly so-called) are a good, frugal, temperate, obedient, and generally industrious people, home-loving and affectionate members of families; although poor not inhospitable, though, indeed, hospitality is not the custom; fond of law, order, and government; well-mannered and dignified, with strong religious feelings.

The evils I have to mention all come from above, not from below. Not one of the Spanish vices, national or personal, is the vice of the genuine Spaniard; they are all imported; but as they have found in many sentimental qualities of the people the materials for exaggeration, these have flourished with a rankness which has choked their better and more valable qualities.

A powerful religious fanaticism, arising from religion having been for centuries a war-cry in the fight of race against race, has exaggerated their reverential and religious feelings to superstition, rancour, and intolerance, and has preserved the identical idolatries of the ancient Iberians, merely clothing them with new religious associations,—their realism being the more inviting, as having been patriotically contrasted with the simple worship and monotheistic creed of the priestless Moslem. The subsequent success of what are called the "Spanish arms," when aided by German Emperors, and commanded by Italian Generals, still makes a Spaniard believe he can conquer the world—as he believes he conquered the French in the Peninsular War—(for in Spanish histories neither Wellington nor the English armies appear at all); it also induces him to bear the atrocious military rule, which is still unchanged; and, unless this revolution takes quite another turn, appears to be unchangeable; sapping the resources of the country, at the same time that it protects all the evil interests at the expense of the good.

The effects of the plunder of the Indies by the filibustering Cortes and Pizarro, who destroyed civilizations far in advance of their own—then and now, survive till this day, when Cuba and Manilla are made the means of enriching all the adventurers who have either served the governing faction of the time, or have made themselves dangerous to it. I must tell you a story, cited by Mr. Lecky in his new book, of Pizarro and Cortes, and show you how much their missionary efforts were appreciated by the Indians. They were told that if not converted to Christianity they would be reduced to bondage. Immense numbers of them committed suicide to avoid this; but the Spaniards, knowing what the belief in a future state was likely to effect, were too much for the unhappy natives, for they threatened that if the Indians committed suicide, they, the Spaniards, would commit suicide, find their captives in the other world, and treat them all the worse for it. This had the desired effect, the unfortunate Indians lost even the terrible refuge of suicide, and their hopes of rest hereafter.

Like many a bankrupt gallant gentleman, Spain looks upon creditors as very poor creatures indeed; but having cut down all his timber, gambled away his estates, and disgusted his friends, he finds no percentage high enough to tempt the usurers, and had better do what he should have done long ago, turn himself and his children to honest industry, both of hands and brain.

This I long to see, and hope to see, though, of course, so long and so deep a demoralization cannot be eradicated in one or two generations. Of their obedience and reverence advantage was taken to consolidate one of the most despotic monarchies, one in which Divine right has been asserted to a greater extent than almost anywhere else, and where, since Ferdinand's time, a powerful monarchy has worked under a powerful priesthood, though in a country where Constitutional Government was flourishing when we were but learning the first principles of freedom. But we have worked from the roots, they upon the branches. They have been occupied with "crowning the edifice," while we have been working at the foundation. This is the inherent vice of the Latin races. This produces the France and Spain of to-day, side by side with the England and America.

Now what ought Spain and Spaniards to do? and in what can we help them, and to our mutual profit? Perhaps disinterested kindness, both in nations and individuals, is worth very little indeed.

We must leave the poetic, Catholic, warlike, conquering, filibustering, bull-fighting Spaniard behind us, as there is really reason to believe the French are at last doing with the Napoleonic and Louis Quatorze model Frenchman. Don Quixote is a failure, and an anachronism. Let us see what we can do with Sancho Panza. How Cervantes understood his country! How little he would find it changed. The Don is still careering away at a Cuban windmill, having long been occupied in worshipping the virtues and charms of a Dulcinea del Toboso, in the person of Doña Isabel de Borbon. How long will he keep poor Sancho away from his wife and family, getting hard knocks and bad living in pursuit of adventures which only make himself and his master ridiculous?

Mr. Buckle's sketch of Spain is most valuable, and of course has for its basis the physical geography and conditions of the country as influencing the character of the people. Physical conformation will always do this, but less and less so as to their moral characteristics, as communication both by travelling and transmitted

intelligence increase. All national life will become more and more assimilated as these are improved. Not that I believe the differences of race can be eliminated until after periods of similar conditions, of a length now impossible to calculate, shall have passed away. Suffice it, however, to say, that with railways, telegraphs, newspapers, scientific instruction (which had, of course, been practically stifled while the church had power), immigration (which was difficult under the disadvantages Protestant settlers suffered under until now), machinery, and the travelling into other countries by the Spaniards themselves. Spain will be so much more assimilated to the rest of the world, that her better constituents will acquire power to the destruction of the worse; and those portions of her inhabitants whose characters and capabilities are fitted for modern progress and modern work will, combined with immigrants, bring her back, if not to the proud position of southern Spain under the Moors, at once the richest, best cultivated, best administered, and most learned portion of Europe, at least to one that shall not be an opprobrium and a shame to her people.

After writing this I find the passage of Gibbon—Vol. ix, cap. 51. The traveller from Granada to Cordova and Seville most draw the contrast for himself between this and the blessings of the subsequent Christian dominion of the Spanish monarchs, since the civil expulsion of the Moriscoes—the industrious descendants of these Moors.

Spain, physically, is so utterly unlike any other country in Europe that I must ask your particular attention to a few words of description, which may do away with any of your preconceived ideas. A huge table-land sloping rapidly to the sea round the coasts, but broken into two plateaux, the upper comprising the Castiles, Leon, Navarre, and Arragon; the lower Andalusia, and parts of Estramadura, Granada, and Murcia; the table-lands intersected everywhere by barren chains of mountains, ill-watered, without trees, and to the rapid traveller appearing almost devoid of vegetation (the slopes to the sea alone resembling the coasts of southern France and Italy), swept by cutting winds, in winter chilled by the snows of the mountains, and in summer burnt by a pitiless sun, whose beams are seldom intercepted by clouds of moisture, and for which no tree gives a shade. Great part of Spain resembles now a steppe, now a sahara, and differs as much from the gay and sunny Spain of the poet, as the sombre Castilian does from the theatrical Spaniard, who, however, better represents the Andaluz, for, like the Neapolitan, he shares the richer and more oriental character of his province. The dry brown soil looks like the desert; the crops grow rapidly and are soon off the land; of pasture there is very little, and until we have examined the magnificent quality of the alluvial soil, from three to ten feet in depth, we can hardly form an idea of the possible riches of the country if water could again flow over it.

The towns, few and sombre, appear all towers and domes; other huge masses of buildings are the convents, which, if not abandoned, are barracks. One can see nothing of Spain without the association of a monk or a soldier. Twenty years ago the Spaniards rose against the monks, and slew them like the priests of Baal. Now the liberal Prim is slaughtering the Cadiz people for opposing the conscription and protesting against the army, an incubus as bad as the monk, as useless, as wicked, and more expensive.

From what I have said, it is clear that nearly all Spain is a great agricultural plain, consequently, first and foremost, it should be peopled and cultivated; for this irrigation, agricultural machinery, and increase of population are necessary. The government and the foreigners have only to do with the former, of which more anon. The wicked prodigality and stupidity which has cleared the mountains of wood, even brushwood, must be reversed, as it has been in France, where they have found that the bare hills are the great causes of the disastrous floods; a mountain stream tears down the side of a barren hill, *et vires acquirit eundo*, spreading devastation in its path, while on the wooded and grassy slope the same water but trickles slowly round the roots, and through the grass and herbs. In Spain, however, the arid sierras are like African mountains, they retain no moisture; for vegetation, as it requires, so it perpetuates, humidity.

The neighbourhood of Madrid, once a great forest, is now more like the coasts of the Red Sea or the summits of Dartmoor. The rivers are few; and, as may be seen from their straight courses, they soon run rapidly down, and, consequently, wear out deep channels, into which, in their turn, rapidly run the mountain streams, eating out deep but smaller gorges; the effect being to leave the land on either side unwatered. How the skilful Moor avoided this, we shall see. Again, from this rapid fall results the small extent of the river navigation in Spain. Only four rivers of the peninsula are navigable to any distance from their mouths, although the Tagus, with but little work, might be made a carrying stream, even up to Toledo. I suppose this river has been as little travelled on as the Niger—a boat went down it 300 years ago. I had, with some friends, the idea of descending it to Lisbon, but the enterprise is one of some difficulty, and the views of food entertained by the provincial Spaniard are difficult to reconcile with our own. The Ebro may also be canalised. This is an old idea.

The ports of Spain are few, and not generally good.

Vigo, Carthagena, and Barcelona, are good; the two first are magnificent. Santander and Bilbao are both difficult of access, and with formidable bars.

Spain is so regular in shape that her sea-board, in proportion to her area, is extremely small, hence the vast distances for land carriage are unfavourable to her as a corn exporter, should she become the great corn-grower she might be.

This brings me to her communications, which may be said only just to have been developed in any degree, and very imperfectly even now.

The railways of Spain issue in radii from Madrid, and there is little or no communication between the various ports and cities. The Spaniard travels little, and as there are no manufactures there is but little transit. Each place supplies the frugal wants of its immediate inhabitants. Corn, wine, oil, garlic, and a few herbs grow everywhere—so would sugar-cane, beet-root, tobacco (if not forbidden by Government to encourage Cuba)! Formerly rough cloth, was made in Spain, now, or lately, all was smuggled in to cheat the revenue and enrich the revenue and government officers, the people paying dear to encourage native manufactures. All articles of household use, as knives, needles, &c., are miserable from the same cause. One great bitterness of the Spaniard is that the English, out of jealousy, destroyed the manufactory of Buen Retiro, near Madrid (where they made china somewhat like the old Chelsea), fearing lest Spain should ruin her trade in crockery.

The roads are generally (where they exist) pretty good, but the great roads only were so, and they followed nearly the track of the present railways, and travelling was about as rapid as in the days of the first Georges. There are no canals of any consequence, and the coasting trade is small; indeed, internal communication was little needed for the reasons I have given. Her railway system is clogged by fraud in every detail of it. Poor Spain, as usual, has been provided with railways by the beneficence of scoundrels; they are, with the exception of the Bilbao line, wretchedly-made single lines, which have cost enormous sums, yielding little or no returns. And here, a word about foreign speculators and lenders to Spain, who so deeply complain of their losses. In almost every case the speculator or contractor, or what not, has been bargaining with a rogue in the Government, but that is not all—the speculator has consented to join the rogue in cheating the Government of which he is a member or an agent. The

Spaniard is wily—makes the foreigner *particeps criminis*. By-and-bye, if the honester part of the administration, or, what is the same thing, an administration not sharing in the plunder, finds out the swindle, the payment is objected to, or the speculator finds himself in a difficulty. He then rushes to this government to interfere and help him, misrepresenting matters; and he either gets unjust reparation, or the honest commercial and industrial relations of the countries are disturbed, the evil, of course, falling with double weight upon the weaker and worst-governed country.

This is the history of hundreds of transactions with Spain, Turkey, and elsewhere. Our government should never interfere unless the perfect *bona-fides* of the transaction is shown; when shown, should speak with no uncertain voice, both for its own sake, and in that of the people of the foreign nation, whose interests appear to be opposed but are in reality identical.

It has always appeared to me that there are some countries in which the railroads, considered as public highroads, should be made by the state. Spain is certainly one of these countries. Communications between the different parts of Spain and the capital are absolutely necessary. The produce of Spain requires to be carried from the interior to the seaports, or to France, but the mere carriage of the produce of this country, and of the small number of inhabitants requiring to travel, would never be sufficiently remunerative to support the long and difficult lines of railroad, 300, 400, 500, and 600 miles in length, unless they are treated as enterprises deserving the support of the state. Of course, as in all foreign countries, the system of subventions has been carried into effect in Spain. What has become of these subventions, and whether they have benefited the shareholders in the different railways, is another question. One of the numerous frauds attached to the execution of public works in Spain was, first, to set out for the government surveyors the most impracticable lines that could be found, calculating the expenses upon that route, obtain a concession of so much per cent. thereon, and then immediately make the railway line upon a shorter and more practicable route. This alteration of route then had to be sanctioned by the government, but this was carefully arranged between the engineer of the line and the authorities in Madrid, and the difference of the price was divided among whomsoever it might concern. In passing, I may remark that it appears to me, and for the same reasons, that a country like Ireland should be provided with railways through contributions of the state. We know Englishmen have never been favourable to the system of subvention; but when, as we now see, this system of private enterprise applied to public works has been not altogether successful, and many parts of England are, and must be for many years, deprived of railway communication, in consequence of the disfavour with which these enterprises are now regarded, the system of subventions might, I think, under proper restrictions, present some advantages.

Foreigners' property is well protected in Spain, and all the abuses of the administration of the law are no worse for foreigners than the Spaniards. Indeed, the difficulties of dealing with property in Spain—with common care as to formalities—are less than in England. I shall treat with the law of the registration of real property later.

Now, the cultivation of land in Spain, with modern appliances and English methods, answers wonderfully. My friend Mr. John Bell, banker of Madrid, has had for some years several thousand acres of land under cultivation, just irrigated by some canals I shall mention. The experiment has been very successful, and the results upon the people most gratifying and interesting; the crops are remarkable in number and quantity, and, with irrigation, the results are quite fabulous. I am convinced that immigration of Englishmen, with capital and a certain proportion of labourers, would be attended with the best results. Land is, however, comparatively dear in good situations; the number of crops must, however, be taken into consideration. The Spaniards will cultivate well enough when the water is brought under their noses, but, with the fatal defect of their character—want of power of combination and mutual distrust—they alone will never, in my opinion, cultivate Spain as it should be. Once they had the Moors; they have done nothing since they drove them out; they will do nothing till other Moors, in the shape of Catalans, Germans, or Englishmen, or even Frenchmen, for the wines (of which presently) guide them, and, above all, execute the great works of irrigation and plantation which are needed. Of course, the cultivable area of Spain is small compared with her actual area.

Mines.

The mountains which intercept her transport, and yield so little externally, are, perhaps, the richest in the world in minerals. They have been worked from time literally immemorial. Nearly all the mining of Carthagena is but the grubbing up of old Roman mines, the yield of silver and lead, under our processes, making it worth while to re-refine the old ores already treated by the Romans and their predecessors. Copper, lead, silver, mercury, sulphur, iron, coal, and phosphate of lime all abound. Why they have not been worked I must explain. Why they should not be worked I cannot explain. Paternal government is at the bottom, or rather at the top of it; when I say paternal government, I mean centralised rascality and ignorance.

The law applied to mines was one of the most absurd that could possibly be imagined. You were compelled to keep a certain number of men at work upon every distinct portion of the mine for certain days in the year. It was in the power of any person whatever to watch your working, and what was called denounce your mine to the government, claiming the concession or power to work it for himself. Need I say that there was no mine worked, either according to the law or against the law, which had not an officious gentleman who denounced it; and the only mode of carrying on a mine was to get a friend to denounce the mine continually, so that you might have a friendly opponent instead of an enemy. I had an opportunity of speaking upon this matter to some of the influential men in the Spanish legislature, and the law has been considerably modified, and, within the last few months, put into a shape which will render quite possible for foreign speculation to avail itself of the vast mineral treasures in which Spain is so rich. The modes of mining adopted in the government mines were beyond expression ludicrous. One sulphur mine was mined in the same manner as a graveyard—that is to say, if a certain amount of sulphur was sought to be extracted, a pit of the same size as the underlying stratum of sulphur was dug. It never occurred to them to sink shafts and run galleries; the consequence was that some of the richest sulphur deposits, which vie with Sicily if they do not surpass it, are to this day totally unworked. There is a difference with regard to property in Spain, which is a very important one. In England, as you all know, the proprietor of the soil is proprietor of the mines under it. In Spain the proprietor of the soil is no more than a bare proprietor of the surface of the soil; internally it is all the property of the Crown. That leads to what I have already mentioned—any man may denounce, or rather announce the existence of a mine under another man's land, and obtain the power of working it, subject to paying a compensation to the owner of the superficies; and as by a paternal Government like that of Spain it was thought necessary to watch the operations of every man, this kind of spying upon the process of the miner was deemed indispensable, in order to secure his working the property ceded to him. No thought of putting a quit or dead rent on the mine presented itself, and the result of these laws was an enormous number of law-suits, which ruined nearly all the foreigners who took part in mining in Spain, and the almost total abandonment of every kind of

mining enterprise. This, I am glad to say, I hope will no longer continue.

Produce.

It would far exceed the limits allowable for this paper were I to go into the various products of Spain. It may shortly be said that, either at home or in her colonies, Spain possesses the most valuable produce, of both vegetable and mineral kingdoms, known to the world. Cuba gave her the finest tobacco; her South American possessions, cocoa and tropical produce; Manilla, tobacco, coffee, &c.; and the Peninsula itself, all kinds of fruits—excellent apples and pears of Arragon, which supplies nearly all Spain; almonds, nuts (which, by-the-bye, are not grown at Barcelona), grapes everywhere at Malaga, and dried for raisins (*ava pasa*), and whence wine is made more plentiful than water; oranges on all the coasts (four orange-trees, at Valencia, will support a family by their yield); the olive, which grows throughout the length and breadth of the land; cork, saffron, and esparto (the Spanish grass, the extent of which is rapidly increasing, used in this country for various purposes including the manufacture of paper). Madder has been successfully cultivated on some estates, drained and redeemed by an English company, on the Valencian coast, with remarkable results.

The Canary Islands, which I visited in 1867, form a most curious, interesting, and valuable portion of the possessions of Spain. Of the seven islands, the chief is Teneriffe, with the magnificent Peak (el Teide). They are all volcanic, and the scenery is most extraordinary and magnificent. The ancient inhabitants, the Guanches, have now disappeared as a people, though traces of their blood can be seen in the people. They were an extraordinary people, and, though insular, strange to say, boats and ships were entirely unknown, as, indeed, were horses; they will not eat sheep to this day if they can avoid it, considering it unhealthy and improper food. Immense numbers dwell in caves; the town of Atalaya (a Moorish name) is a curious theatre of caves—arranged one above another on the sides of a precipitous valley.

The Canaries produce a tolerable wine, badly manufactured, but which was formerly the famous sack, *vino seco*. The great produce now is cochineal, which has sprung up into extraordinary consequence of late years. Cacti are grown wherever there is a piece of safe ground. On it the mother or *madres* of the insects are placed. The plants are soon covered with young insects. After a time the *madres* are taken off in bags; the young "crop" grows to maturity; some are retained to people other plants, and the greater part are carefully picked off by ladies in masculine attire, and gloves on, to protect the hands from the prickles of the cactus. It is packed in bags for England and Marseilles; it sells for 3s. and upwards per pound. The islands are the best suited for its growth, from their deliciously even climate, although so far south, and off the African coast, and from the absence of violent rains, which would, of course, wash the insects off the plants.

They were and may be still called the Fortunate Islands. Even Spanish administration has not marred them. There are no poor; crime is very rare. One suicide took place while I was in the Grand Canary, of a youth, the first for fifty years. They are a quiet, gentle people; they take no note of time, having, so to speak, no seasons. Out of twenty witnesses, labourers, not two knew their ages; men of twenty-five said they were forty, men of sixty that they were thirty, and so on.

Teneriffe is five days' steam from Cadiz. My return *viâ* Morocco showed me how many points of resemblance there are between the Moorish cities and the ancient cities of Spain.

The yield of the wines of Spain is enormous, and alone might make her the richest country in Europe; but all is badly done. The same mode of making wine, or rather spoiling grape juice, is carried on now as in the time of the Romans. At Cadiz and Xeres it is different, because foreigners have introduced better methods. French companies are spreading, and their wines are really excellent.

What have we then commercially and economically to consider? What commerce can be exercised in Spain, either by Spaniards or foreigners?

In the first place, land may be held in Spain by foreigners. In all the civil wars confiscation has never been practised. Here are proofs that the feudal system was never rooted in Spain—felony or forfeiture for treason is a creature of feudal law (though the Easterns too practised it, but not as a legal incident to fealty). In the feudal countries, too, as the feudal tie was constituted by holding land, the foreigner not a feudatory could not hold it.

The evils of the want of cultivation and management of estates has increased since the railways and great roads were more practicable.

Great people find their way to Madrid; French living disgusted them with their country life. Their estates are left to an intendente, and we have the absentee, the middleman, and the poor tenant repeated, but without Mr. Disraeli's damp climate and melancholy ocean, which are said to add to the trials of a race much like the Spanish, both in their faults and their good qualities.

The condition of the vast estates of the ducal grandees, the personal, political, moral, and physical deterioration of the bearers of these titles, the rascality of their administrators, the impossibility of purchasing land by the real farmers, or of obtaining long leases, have produced the wide-spread inclination for communism, which I know to prevail throughout Murcia and Andalusia, the best and richest parts of Spain, and which the ignorance, excitability, and ferocity of uneducated southern people may yet make formidable.

The alteration of the law of descent, about 30 years ago, will lead to the extensive division of these large possessions in the next generation. One Duke has about 20 towns and 80 titles, and perhaps not really a penny of his own. It may generally be affirmed that there are no rich people in Spain. Commerce is exercised to a very small extent, and is generally despised by these relics of an age of grandees. Nothing is thought of but military service or public posts, and both for the same object—to live upon the country's revenues—*vivir del presupuesto*, live upon the budget.

Of the law of Spain, a most important question for those persons or companies who may be disposed to originate or take part in commercial enterprises in Spain, whether in mines, irrigation, agriculture, or other kinds of public works, I have much to say. During the two years of my stay in Spain I was constantly occupied in conducting various suits respecting interests of great magnitude. With regard to the law itself I have nothing to find fault, indeed, I may say that, in some respects, it is admirably clear, and, as to the law of real property, and the regulations for registration of property, mortgages, and leases, we may well adopt it as a partial model for changes in our own law. The *Ley Hipotecaria* of Spain, or the law on the inscriptions of titles to immovable property, has been well translated and edited by Mr. William Grain, notary public, of London, and is published by Sweet, of Chancery-lane. But after having said that the law, founded as it is on the French Code Napoleon, is good, I must go on to say that, in administration, it beats in badness everything that could possibly be imagined of any system of law. But it is administered with a degree of outward solemnity and formality which is perfectly terrific. On one occasion last year I was sitting beside my advocate, in a suit in which I was conducting. I suddenly found myself called to order by the judge, and requested to remember that I was in a court of justice. Astonished at this rebuke I looked at my lawyer, who pointed to my legs. I discovered that I was sitting with those members crossed, a grave dereliction from the solemnity required in a court

of justice. I suppose, that so narrowly are these forms of justice watched, that there is no time to execute substantial justice. As an instance of commercial law, I may cite suits which I have been conducting in Spain upon bills of exchange; and the law provides that the drawer of the bill, before he can be sued in an executory suit, must acknowledge his signature—it has neglected to provide that he shall be compelled to acknowledge it—or that evidence may be given sufficient to establish the fact of such signature. My defendant made oath that he really did not know whether it was his signature or not. After consulting all the best authorities, I had to give up the executory suit, and adopt what are called ordinary suits upon proofs. These have been going on for two years, and, as far as I can see, may last twenty. This effect is the result of the mode of carrying on the business before the courts. Everything is written down, legalised, countersigned, and whatever nonsense a man may choose to introduce into the papers of his suit is received by the judge, transmitted to the other side, who may, if he likes, object to your nonsense, and insert as much more as he thinks convenient. This is again remitted to the judge, who, having read it over, remits it to you. You then object to the nonsense on the other side, and insert some more. After a few more oscillations of this kind the judge endeavours to come to a decision upon the papers presented, but these various processes having taken up at least twelvemonths, he probably has entirely forgotten the subject matter; the papers are too voluminous to be read through, and he gives a decision, as I have seen in two cases, entirely distinct from the object of the suit. You then appeal, or your adversary appeals, to the superior tribunal, and the same process is repeated, plus the mass of papers which already existed. It will be easily seen from this that even supposing the judicial functionaries to be honest and industrious, it would be almost impossible ever to arrive at a right decision; but all these legal functionaries are appointed by the Government, and are removeable at the pleasure of the functionary, who is facetiously called the minister of grace and justice. They are political officers, receiving salaries from £120 to £300 a-year, and it may be easily imagined that the wealthy plaintiff or powerful defendant will procure that such mistakes or irregularities may accidentally occur, that any decision against him will be practically of non-effect, and the matter may be spun out until it gets to the Supreme Court of Judicature. There, I am bound to say, as far as I have been able to observe, excepting the delays, an honest judgment is arrived at. In former times the Senate, also a nominated body since 1835, was the tribunal set apart for the trial of its members. I had to conduct the accusation of one of its members before that tribunal. It is unnecessary to say that not only was no decision arrived at in favour of the plaintiff, but that I could never obtain any decision at all, nor any notification of what had been or would be done, up to the time of the dissolution of that august body, during the revolution of last year. While I am upon the subject of the law of real property, and on the authority of the book before me by Mr. Grain, the notary, I may allude to a subject which is of very great importance. One branch of it has lately been treated of with regard to the custody of wills—I mean the custody of wills after their making, during the lifetime of the testator. It is strange that in this country numbers of contracts are considered to be public contracts in this sense, that they are solemn contracts if made under seal and delivered. I notice in Mr. Jessel's speech upon the Bankruptcy Bill, that he comments upon the absurdity of one class of creditors, with a seal upon a piece of paper, being enabled to lay hold of the whole of the property of a deceased person, to the exclusion of all creditors, or persons interested, who have pieces of paper without the same amount of wax affixed to them; but in making any alteration, if alteration is to be made, as to the respective values of specialty and other contracts, the old idea which lay at the foot of their validity must be remembered. They were considered to be public and solemn transfers of property and interests in property. This would be very well were they really so. It seems strange that the business of a notary has entirely fallen off in England, except to the one—a very important one, no doubt—of supporting and witnessing transactions as to bills of exchange. But in Spain every notary is a public officer of the law, and transactions taking place before him are public transactions, and the original and real contract made by a notarial instrument is preserved by him in his office, the parties thereto being furnished with what are called original copies. The same is the case with regard to wills. The superior effectiveness of such instruments as these has some element of reasonableness in it, but whether two persons privately making a document which has a seal upon it, and merely from that fact, without regard being had to the ancient reasons for its superior validity, is an anomaly which should no longer be allowed to exist. Public documents should be really public, and there should be some means of either registering, depositing, or in some way referring to them, as mortgages are registrable in York and in Middlesex, and as bills of sale and the change of property in shipping are also registrable.

With regard to the way in which the public monopolies were administered by the Spanish Ministers of the Crown, I can give you one example, a story told me by a gentleman who has had an interview upon the subject with a minister, whose name in connection with Her Majesty Isabella the 2nd has attracted great attention. He was Minister of Colonies. As such, he had the direction of the importation of the government monopoly of tobacco. In order to secure the reception of any kind of tobacco, it was necessary to bribe the custom-house officials, or rather the minister. He was promised for himself so much per hogshead of tobacco. The merchant sold his contract to another. He was sent for by the minister himself, and in his own bureau the latter said to him, "Remember, you have sold your contract, but your agreement with me remains; for all the tobacco that is imported under the contract made in your name with the government, you will have to pay me so much per hogshead." Of course, the merchant laughed at him; but I give this anecdote as a proof of the open, unblushing venality which characterised the late ministry of Isabella the 2nd. Gonzales Bravo, to my certain knowledge, was at one time promised five or six sums, varying from two to six thousand pounds, to assist in carrying out certain measures; and so all public matters were carried on in Spain. Let us trust that the change now sought to be made in that country may make some alteration at least in these practices. That a country which has been corrupt for 300 or 400 years will suddenly change because a lot of ragamuffins have shouted *Viva la Libertad*, and because General Serrano and General Prim have taken the places of General Narvaez and Senor Gonzales Bravo, I do not expect.

One word as to the foreign relations of Spain in her commercial capacity. With the absurd uncertainty and folly which has for so many years characterised the administration of the Spanish ports, it was hopeless to think that Spanish commerce could flourish. Quarantine is put on and taken off the ports especially Cadiz, Malaga, and the southern ports of Spain, in a way which is as foolish as it is mischievous. It is pretty clear that the regulations with regard to quarantine are principally levelled against ourselves, on account of our holding Gibraltar. Any article in the *Gibraltar Chronicle*, or any matter in which the interests of Spain and England clash, is immediately visited by the putting of quarantine upon some or all the ports of Spain, on English vessels coming from England, where, as it would appear, the most malignant disorders are constantly raging. The numberless complaints that we have made to the Spanish government upon this ground have met with the

usual attention such complaints obtain when not forcibly urged and not backed by some degree of firmness.

It would be of the highest importance, if not only international law could be framed into some kind of code which would meet with the approval of all civilized nations, but that the various provisions of commercial law, and which in point of fact should only differ upon the merest matters of detail, could be assimilated and reduced to some form which should be acted upon by common consent by the various tribunals when dealing with commercial matters. England is peculiarly unfortunate with regard to the acknowledgment of her rights, for as we give so very little validity to the proceedings of foreign tribunals, so in return they profess themselves unable to understand our system, and we have very great difficulty in enforcing our rights.

Finance.

I extract the following from the "*Times*:"—

It would not be easy to describe fully and precisely, in all its details, the actual financial condition of Spain. The report which Mr. Robert Lytton has compiled, in his short official residence at Madrid, as Secretary of the British Legation, treats the subject as completely as was in his power, under the circumstances. The public income of Spain is derivable from six several sources. The revenue derivable from direct taxation was estimated by the Cabinet of the late Queen at about £7,037,800, for the present financial year ending on the 30th of June, 1869. The indirect taxes were expected to yield for the the same period about £4,788,470. The stamp duties were calculated at £8,284,090. A total of £4,257,376 was expected from the profits and sale of State property. The colonial revenue was estimated at £1,339,010, and the special resources of the Treasury at £140,000. The total estimated income for the present year, therefore, amounted to about £25,846,747. The expenditure for the same period was fixed at £26,564,787, leaving an estimated deficit of about £718,040.

Mr. Lytton gives a statement of the public debt of Spain, and, including this twenty million loan, he makes it 245 millions sterling. A more scientific adjustment of imposts, and a more liberal commercial policy, is a work for the Constituent Cortes, rather than for a Provisional Government. An extensive reform of the tariff may be expected to be vehemently opposed by the cotton manufacturers in Catalonia. Artificial protection now enables the Catalonian manufacturer to keep wages at a rate which would be ruinous if that protection were withdrawn.

Mr. Lytton gives the following statement of the expenditure proposed by the last budget for the fiscal year 1868-9. The general obligations comprise:—Civil List, £458,500; Cortes, £23,970; public debt, £6,735,583; compensations, £154,282; pensions, £1,635,305—making a total of £9,007,640. The departmental expenditure is as follows:—Office of President of the Council, £68,842; Foreign-office, £138,245; Grace and Justice, £2,110,940; War, £3,966,712; Marine, £858,544; Interior, £918,907; Public Works, £1,893,991; Finance, £4,451,609; Colonies, £151,669; and, adding the expenses on sale of national property, £3,134,186, the total becomes, £17,557,147; the grand total being £26,564,787.

Mr. Lytton maintains that the two permanent plagues of Spain are the army and the employés. The Spanish army is an admirable one, both as regards economy and efficiency; but it is either too large or too small—too small for single-handed defence, unnecessarily large for the maintenance of order at home. It is a permanent source of internal disorder. It reduction to political *impuissance* is the first condition of national regeneration and social order. Scarcely less disastrous is the multitude of persons in government employ, or pensioned off to make room for the hungry parasites of a new party in power. "This swarm of Spanish flies makes a perpetual blister applied to the public income." Half the number of employés better paid, and of a much higher calibre, would do the work better, and the result, in a higher tone of political morality, would be absolutely priceless; but how can these tasks be executed by a government borne into power on the shoulders of suborned prætorians, and with its existence representing the successful combination of three great political parties, each with its hosts of claimants for subsistence at the expense of the taxpayer? But Mr. Lytton holds that Spain unquestionably has made, and is making, progress. "The real sources of her national wealth being essentially unartificial, Spain is in the enjoyment of a physical vitality, capable of surviving social disorders and violent political experiments, which would be destructive to the more delicate foundations of any state whose prosperity, like our own, is the product of human ingenuity and patience than of fertile soils and favouring suns. In less than 20 years the value of the external commerce of this country (under a commercial system so illiberal and complex as to be almost an anachronism in Europe) has increased from 8,000,000 to more than 30,000,000. Under equal disadvantages the revenue, always elastic, has steadily increased; and, what is far more important, the Spanish race has, in the character of it, more energy and capacity for labour than either the Portuguese or the Italian. The harm done by the revolution is obvious. It may be easily reckoned in pounds, shillings, and pence. But the utmost amount of this national "bill for damages" is, perhaps, a cheap price for the good which the revolution is pledged to effect, if it can. Already the events of the 29th September are bringing to a crucial test a whole host of flimsy political common-places. They have rudely shaken the sluggish dominion of many mischievous traditions; they have stimulated those generous emotions which may be easily misguided, but in the absence of which nothing great is ever achieved; and, although they have assuredly not as yet enriched the national exchequer, they have, at least, replaced the nation itself in possession of two beneficial resources—responsibility and hope."

I have frequently alluded, in the early part of this paper, to the system of irrigation of the Moors. Irrigation is the great want of modern Spain; without it its vast tracts of land must be practicaly unproductive, and subject to the vicissitudes of a climate which, during seven or eight months of last year, gave no rain at all, and in consequence the whole of the wheat-crops, throughout two-thirds if not three-fourths of Spain, were utterly lost, even to the seed required for the next year's harvest. There was no food for the cattle, and the unfortunate cultivators were obliged to sell their mules, valued from £25 to £30 a piece, for a dollar or two dollars at the market of the neighbouring town. If the rapidly sloping torrents from the high centre of Spain were, as they well can be, intercepted by weirs and canals, carried off from the higher level across the fields, which lie skirting the precipitous banks of the river, the whole of the water of these streams can well be spared for the zone of irrigation flanking the descending current, and after fertilising the fields the residue can be allowed to flow into the river at the lower level. An enterprise of this kind is in course of completion upon two rivers in Spain by an English company. The one upon the river Henares, about five-and-twenty miles from Madrid; the other upon the river Esla, in the province of Zamora, nearer the French frontier. The author of the little book, which I hold in my hand, called "Spain in 1866," published in the series of "Odds and Ends," by Edmonston and Douglas, of Edinbro', is the engineer of these canals, Mr. George Higgin, of Madrid, whose able paper read last year at the Institution of Civil Engineers, obtained the Telford Medal. In passing, I may mention that this little sketch of Spain is worthy of an attentive perusal, being the work of an accurate and attentive observer, well acquainted with the country. If many points of resemblance are found between it and the present paper I shall be pleased, and consider that my observations are the more worthy of

attention from coinciding with those of Mr. Higgin. For an abstract of the paper read before the Institution of Civil Engineers I am indebted to Mr. Forrest, the secretary.

In conclusion, and summarizing the practical suggestions to be drawn from the hurried sketch of the merits and demerits of the Peninsula, from whose laws and customs, however bad, even we may learn something; I deduce—First, That the Spaniards should abandon Cuba. Second, Disband their army as at present constituted; reconstitute it as a volunteer force by enlistment, limiting it to 25,000 men, the greater part of whom should be gens-d'armes or civil guards, acting as police, but under the law, and not under the administration, in short, not government spies, nor government jailors.

The priests are, I trust, practically weakened; let the parochial clergy marry. Let all energies be devoted to the furtherance of agriculture, by means of irrigation works, and the planting of forests. Make tramways where practicable; roads where not. The mines should be let with good titles, at fixed or progressive certain royalties for long terms, reserving dead rents to ensure working; abolishing interference, except for the protection of the miners. Do away with the conduct of trials through written documents, substituting oral testimony wherever possible. Introduce the study of the natural sciences, and make reading and writing—more easily acquired in Spain than anywhere else, from the ease of the language—compulsory. Change the whole inferior judicial staff, substituting a lesser number, to be paid judges, politically irremovable, but subject to jealous observation as to their judicial duties. Decentralization as to every matter of purely local interest, unless the Government directly aids therein. Further following out of the reforms commenced, as to the noninterference with all commercial associations, by government delegates. Carefully considered guarantees of interest upon foreign capital advanced for public works.

Permanence of public officers. A non-political executive administration will render the governmental form of less consequence, and ensure its stability.

These changes are neither violent, difficult, nor visionary. To return to my first simile, Spain is an insolvent cavalier, who is a large landed proprietor, without capital and without a banker, but with abundant securities.

I feel convinced that, with their genuine adoption, such is the wealth of Spain, such her natural internal capabilities, foreign aid and foreign science and improvement will naturally flow thither, and enable her to attain such a position among the nations of Europe as she has never before held, even in the most showy and glittering days of her military and despotic grandeur, a position, moreover, resting upon the broad basis of the happiness and prosperity of the people, instead of the deceptive and unstable glories of gloomy or profligate monarchs, haughty and intolerant priests, and ruffianly military adventurers.

DISCUSSION.

Mr. P. L. Simmonds said that although some of the topics incidentally touched upon by Mr. Underdown in his paper might, if discussed fully, trench upon debateable ground in the Society's rooms, yet they were all of the utmost importance, considered either in a political, financial, or commercial sense, to this country, and of especial interest to many who were more or less identified with Spain. Mr. Underdown had been just, even if he was severe, and the truth of many of the blots which he had pointed out in the Spanish character and the Spanish rule must be admitted. Still it should not be forgotten that the colonizing influence of Spain in olden times had extended over a large portion of South and Central America, and the descendants of Spaniards had established important states, which were thriving, and might yet become prosperous republics. The East and West Indian colonies still owned by Spain were important as regarded their produce of sugar, tobacco, and fibres. And in these and other articles produced by the Peninsula this country was interested, whether it was the wine, the waste esparto grass for paper-making, or the cochineal of the Canaries, which Mr. Underdown had alluded to. Unfortunately the latter commodity had a formidable rival in the cochineal of Mexico, and the largely employed coal-tar dyes. Whatever difference of opinion might exist as to some of the points alluded to by Mr. Underdown, there would certainly be none as to the thanks which he was entitled to for the industry and talent he had displayed in condensing and bringing forward in a popular form so large an amount of interesting information respecting a country in which Great Britain was deeply interested. It was earnestly to be hoped that a bright future might yet dawn upon that disturbed country, and that many of the improvements of irrigation, improved river navigation, honest administration, improved agricultural implements, and English capital and labour, well protected and secured, might be introduced and carried out as suggested by Mr. Underdown. Under more liberal tariffs her external commerce might increase, and the agricultural and mining interests receive more attention. Mr. Underdown had not only viewed Spain under the practical common-sense aspect of an Englishman, but a protracted residence and business affairs had enabled him to lay open with legal acumen the defects of her courts and legislation. To business men, and indeed to all members of the Society of Arts, the information he had given them was valuable, and might be carefully studied with advantage. In this sense, therefore, while he hoped there were some gentlemen present who would take part in the discussion, Mr. Underdown was entitled to their cordial thanks.

The Chairman said it was almost impossible to overrate the importance of the subjects to which his friend Mr. Underdown had referred in the paper which he had read, because undoubtedly the condition and prospects of Spain formed one of the most interesting topics of the day. Whatever difference of opinion might arise in a Society like that on the very many suggestions Mr. Underdown had ventured to bring before them, he was certain that all would agree in awarding a vote of thanks to him for the able address which he had given them, containing the results of his residence in Spain, where he was for more than two years professionally engaged. They must all agree that he had made the best use of his time in endeavouring to collect such materials as would enable him to enlighten the people of this country on those points which, as Mr. Simmonds had remarked, they had but very little knowledge of. He almost regretted that Mr. Underdown, who had shown himself so well acquainted with the wants, grievances, and capabilities of Spain, had not been at the head of the revolution, so that he might have directed its progress to the best possible results. The Chairman concluded by moving a vote of thanks to Mr. Underdown for his excellent paper.

The motion having been passed unanimously,

Mr. Underdown said he was very grateful to his audience, not only for the compliment they had just paid him, but for the attention with which his paper had been received. He had certainly thought that he had thrown down a sufficient number of bones of contention to almost ensure a quarrel over some of them, but as this had not been the case, there was little for him to reply to. There certainly had been one suggestion as to a chemical preparation being substituted for the animal dye which was procured from the cochineal insect, but this was not a very exciting topic, and he feared it would be impossible to raise a discussion upon it. He could only say that when such a substitute was found the result must be infallible ruin to the Canary Islands; and, therefore, as he had some acquaintance with the inhabitants of those islands, notwithstanding his anxiety for the prosperity of

all English manufactures, he hoped they would be left in possession of their means of livelihood.

Mr. Arturo de Marcoartu writes as follows:—"Few countries unite in themselves such favourable national conditions as Spain for the production of wealth, while few others, holding a lower position in civilised Europe, have found themselves more obstructed in latter times by the system ill-denominated *protective* of national work, and by the intolerant policy of the Spanish governments. The extent of the Spanish territory is 507,036 square kilometres. Its projecting position, and the fact of its being surrounded by the Atlantic and by the Mediterranean, the two seas most frequented by modern commerce, must make it the natural depôt for the trade between Europe, South America, and Africa, whenever Spain may declare herself in favour of commercial liberty. As the Peninsula is traversed by various Cordilleras from E. to W., its soil embodies a surprising diversity of climates, and in a few hours of railway travelling you may pass from a cold climate to a hot one. The cordilleras which give rise to these diversities in temperature and in production give birth also to great sources of water, available to industry, whilst underneath the hills, which are clothed by the vine or the olive, lie hidden deposits of coal, iron, lead, silver, zinc, copper, quicksilver, and other minerals. The people who inhabit this privileged region of the earth, a people energetic, enterprising, who in centuries gone by, through their courage and through their skill in navigation, obtained the primary glory of past civilisation, carrying their language and their activity into the furthermost confines of the globe, has fallen into decadence during the last few centuries, under the domineering effect of the clerical influence which made vassals of their monarchs. In these latter times, notwithstanding the warfare which the fallen dynasty waged against the spirit of philosophy, and against all manifestations of liberty, both political, religious and commercial, Spain has been strenuously working towards regaining her former position. It was the constituent Cortes of 1854 which decreed the plurality of banks, and the abolition of a fixed value upon money, measures which at that time had not yet been adopted by more populous and tranquil nations of Europe, and which created the net-work of railways which now cover the land. Since that time the attention of foreign speculators has begun to be attracted by the immense and various productions which Spain can offer when governed by liberal institutions. The abundance and fine quality of her wheat, her wines, her oil, and her fruit, bid fair to make her the grand centre of production for these articles for the United Kingdom. Spain is one of the European nations whose wealth in sheep is the most considerable, and her wool-markets are well known in England, being capable of much enlargement and improvement. With good reason, and from the remotest times, has the Iberian Peninsula been reputed very rich in minerals. Out of the forty-nine provinces of Spain two only, that of Valladolid and of the Canary Islands, have given no signs of minerals. Allowing the fact that all revolutions, as was also the case with the great popular movements of Rome and Greece in the times of antiquity, showed amongst the numerous classes rather a political than economic bearing, it affords me great gratification to state that the Spanish revolution, although yet struggling against two dynasties, and against the influence of the clergy, is preparing its economic development. I have reason to hope that, in accordance with my solicitations, all the prohibitions contained in the Custom-house tariff will disappear, and that the maximum of duties will be from 25 to 30 per cent. The restrictive and embarrassing laws which have ruled in the custom-houses, at the consulates, and in Spanish ports, account for the fact that the commerce of Spain is not commensurate with the extent of its territory, with the favouring natural conditions which it possesses for the production of wealth, and with the number of its inhabitants. Hence it happens that the freights between English and Spanish ports come to be, in most instances, higher than between England and the United States. France and England are the countries which support the greatest trade with Spain; and if we compare the trade carried on between England, Spain, Portugal, and Gibraltar, we must then make allowance for the contraband dealings which the two latter foster in Spain; and again, if we institute a similar comparison as regards the republics of La Plata, we must also materially take into our estimate the great attractions which, even in such distant countries, are presented to commerce by liberal tariffs. In point of fact, the export trade of England was in 1868 to Spain, £2,403,545; to Portugal, £1,723,270; to Gibraltar, £705,627; that is to say, that Portugal and Gibraltar show between them a consumption as considerable as that of Spain, whose extent and population is four times that of the two combined. Yet, notwithstanding such economic obstacles as the external trade of Spain has to contend against, it is an undeniable fact that it is acquiring a notable development. In the space of fifteen years it has increased more than 200 per cent. It is unquestionable that the wines of Spain would supersede all other foreign wines, to the advantage of the less wealthy classes of the English people, were the duty rated at 1s. per gallon as on the French wines; and if, as should be the case according to sound economic principles, a free admission of wines should be permitted, the most necessitous class in the United Kingdom would find in the Spanish wines their cheapest and most wholesome drink. When we come to consider, as regards mutual relations, the respective political, economic, and commercial interests of England and of Spain, the conclusion is arrived at that great advantages would be derived from drawing together the two peoples, as nations, and as exponents of industry. If governments, and if industrial incapacity do not do violence to the natural laws of exchange, Spain could furnish wheat, wool, meat, textile fabrics, oil, wine, fruit, lead, silver, and quicksilver to the English, receiving from the latter in return coal, manufactured metals, chemical products, and textures. This desirable result would, in my opinion, be forwarded by the formation of an Anglo-Spanish association, a species of free customs parliament, tending to draw together the interests of both countries. In order that financial intercourse should become developed between the English and Spaniards, it also becomes necessary to clear up definitely and *bonâ fide*, without any delay, all those claims which, whether rightly or wrongly, are constantly interfering upon the Stock Exchange between English capital and Spanish enterprise, to the great detriment of both. Moreover, in order that the commercial relations between England and Spain may attain to the importance to which they ought to arrive in the face of 47,000,000 of producers and consumers, it further becomes essential that the rates of postage should be lowered; that England should give in her adherence to the Monetary Convention of Europe; that a certain portion of the produce of Spain should be declared to be free of duty, and the duties upon other portions should be reduced to a minimum scale. And on the other hand it is likewise necessary that Spain should avert from her commerce the embarrassments occasioned at the present time by the lengthy and complicated formalities attendant upon consular clearances and quarantine regulations; that the prohibitions attaching at present to certain articles be removed; that those articles which constitute raw materials, if applicable to the industry of Spain, be declared free of duty, and that the duties upon other goods be reduced by a revision of the monstrous tariff now in force in Spain."

METEOROLOGICAL OBSERVATORY AT PARIS.

The plateau of Montsouris, on the southern extremity of Paris, beyond the University quarter, is now being

converted from a barren waste into a beautiful pleasure garden, and on it has been reconstructed the palace of the Bey of Tunis, which formed one of the most attractive objects in the Champs de Mars during the exhibition of 1867. The building is now nearly completed, and the exterior looks much as it did in 1867, but, the basement especially, has been constructed in a much more solid manner than it was previously. The building is not to be dedicated in future to curiosity, but, on the contrary, to the purposes of a most important new scientific establishment, namely, an observatory for meteorological and other physical phenomena, for which the altitude of the spot and the consequent clearness of its atmosphere peculiarly fit it.

The Minister of Public Instruction, in December last, appointed a commission to draw up a complete plan for the new establishment, including the observations that should be made there, the number of persons that would be required for its proper working, a list of the instruments which would be wanted, with an approximate estimate of the expenses. The commission has performed a portion of its labour, and, amongst other things, has made a special report on the application of aërostation to the study of atmospheric phenomena; this report, not yet published, contains an account of the various scientific aëronautical experiments carried out in France, and particularly those of Mr. Glaisher in England.

A meteorological department was formed at the Paris Observatory in 1855, in consequence of the immense amount of communications received relative to the great storm which occurred in the Black Sea in November of the previous year, and correspondence exchanged with England and other countries, as well as with the whole sea-board of France. It had, however, become evident that a separate establishment would be more serviceable to the progress of physical observation, and the city of Paris undertook to furnish the site for the building. The ground devoted to the purpose on the plateau of Montsouris is about two and a-half miles in extent.

The first observations are to include a careful study of all the elements which together make up the climate of Paris and the basin in which it is situated, and of all the interesting physical terrestrial phenomena which are there produced; a general examination and calculation of ancient observations, a work, says M. Camille Flammarion, which England, Prussia, and Austria have also undertaken on their own account; a similar examination and record of all the observations made in France or abroad, and communicated to the new observatory; a regular publication of the results produced by these labours, whether valuable for the higher purposes of science, or for the practical results to be derived from them. Meteorological science is at present in an unformed condition, and the establishment of such an observatory cannot fail to aid in the collection of facts, as well as in the gradual evolution of the laws which lie within the phenomena in question.

DISTRICT SCHOOLS FOR PAUPER CHILDREN.

By George C. T. Bartley, Esq.

II.—THE SOUTH METROPOLITAN DISTRICT SCHOOL, SUTTON, SURREY.

In continuing the investigation of the cost of these district schools, from the last number of the *Journal*, the Sutton school may next be considered. This institution rivals that at Hanwell, having, in 1867, no less than 1,177 children within its walls.

The following returns are taken from the annual report for the year ending Lady-day, 1867, which was the most recent obtainable on application. The details of expenditure are not given so fully as those in the annual report of the school at Hanwell, and it is to be regretted that the returns from all these district schools are not made uniformly, and in the fullest manner possible:—

I.—Cost of Officers and Servants.

Description of officer.	Salary.	Estimated cost of rations.	Total.	Cost per head for each child at the school.
	£ s. d.	£ s. d.	£ s. d.	£
1.—*General Staff.*				
Superintendent	100 0 0	†		
Chaplain	150 0 0			
Clerk	150 0 0			
Matron	60 0 0	†		
Superintendent's clerk	104 0 0			
Porter and wife	35 0 0	†		
Pantry maid	12 0 0	†		
Cook	20 0 0	†		
Officers' cook	14 0 0	†		
Housemaid	12 0 0	†		
Hall maid	12 0 0	†		
Store-room maid	12 0 0	†		
Labour superintendent	104 0 0			
Kitchen maid	10 0 0	†		
Infirmary cook	15 0 0	†		
Stoker	46 16 0			
	856 16 0	312 0 0	1,168 16 0	·993
2.—*Nurses.*				
Girls' and infants' nurse	16 0 0	†		
Assistant do.	12 0 0	†		
Boys' do.	14 0 0	†		
Two for girls	24 0 0	†		
Four for boys	48 0 0	†		
Head infant nurse	15 0 0	†		
Four infant nurses	52 0 0	†		
Three assistant nurses in infirmary	32 0 0	†		
	213 0 0	442 0 0	655 0 0	·556
3.—*Medical.*				
One medical officer	130 0 0			
	130 0 0		130 0 0	·110
4.—*Teachers.*				
Head boys	110 0 0	†		
Second do.	60 0 0	†		
Six assistants	16 5 0	†		
Mistress (infants)	40 0 0	†		
Second do. (do.)	36 0 0	†		
Master (girls' school)	85 0 0	†		
Mistress (do.)	40 0 0	†		
Six assistants	16 5 0	†		
	403 10 0	468 0 0	871 10 0	·740
5.—*Industrial and other Instructors.*				
Bandmaster	50 0 0			
Drill master	40 0 0	†		
Do. mistress	18 0 0	†		
Three needle mistresses	60 0 0	†		
Laundress	18 0 0	†		
Laundry maid	12 0 0	†		
Five laundry women	195 0 0			
Bedmaker	15 0 0	†		
Baker	46 16 0			
Assistant	41 12 0			
Carpenter	85 16 0			
Painter	78 0 0			
Assistant	70 4 0			
Tailor	65 0 0			
Three assistants	156 0 0			
Shoemaker	65 0 0			
Two assistants	104 0 0			
Engineer	70 4 0			
Bricklayer	85 16 0			
Assistant	54 12 0			
	1,331 0 0	208 0 0	1,539 0 0	1·307
6.—*Farm Servants, &c.*				
Bailiff	65 0 0			
Two labourers	88 8 0			
One cowman	45 10 0			
One ploughman	52 0 0			
One labourer	54 12 0			
	305 10 0		305 10 0	·259
Grand total	3,239 16 0	1,430 0 0	4,669 16 0	3·967

† Those marked thus (†) receive rations which have been estimated at 10s. a week each person.

II.—The Cost of Maintenance.

The various details under this head are placed under the one general heading in the annual statement of accounts as "provisions and necessaries." Adding to this half the cost of the coals which must be required in preparing the food, which item is divided in the Hanwell school accounts, makes a total of £7,243 16s. 3d. From this must be taken the estimated cost of the officers' rations, already stated, leaving £5,815 16s. 3d. This is at the rate of £4·941 per head per annum.

III.—The Cost of Clothing.

This item in these schools appears rather higher than at the Hanwell school, but it includes "bedding," which is probably included in the latter institution in a large item called "linen drapery, upholstery, &c." The amount, then, for clothing and bedding is £2,287 9s. 4d., or at the rate of £1·943 per head per annum.

IV.—Miscellaneous Expenses.

Under this heading are included the various expenses of the institution, including a large item of £603 8s. 9d. for outfits of children on leaving the school for service or apprenticeship, and expenses of conveying them to their places of destination. The whole amount is £3,005, being at the rate of £2·553 per head.

V.—Farm Expenses.

The cost of this amounts to £754 9s., being at the rate of £0·640 per head per annum.

VI.—Rent and Re-payment of Cost of Building.

The amount borrowed for the erection of the school was £49,100, of this £27,230 has been repaid, leaving a sum of £21,870 still outstanding. On this, as interest and repayment of a portion of capital, a sum of £3,532 0s. 5d. was expended. In addition, an exceptional outlay of £1,553 13s. 8d. was this year made for payment on account of contract for erection of infirmary, and being added to the above gives £5,085 14s. 1d. This unusual charge swelling this item from £3 to £4·32 per head per annum must, therefore, be remembered in comparing the average cost with other institutions.

The general summary of these schools gives an average cost considerably below that of the Hanwell establishment, and in the staff a remarkable difference exists, as may be seen by the following :—

	Sutton.		Hanwell.
1. Staff	£3·967	..	£8·144
2. Maintenance	4·941	..	9·500
3. Clothing	1·943	..	1·870
4. Miscellaneous	2·553	..	4·637
5. Farm	·640	..	1·012
6. Rent and redemption of buildings	4·320	..	5·675
Total	18·364	..	30·838

or, leaving out the exceptional cost of the infirmary buildings at Sutton, this gives an annual cost of £17 against over £30 at Hanwell.

Fine Arts.

Election of Fine Art Exhibition Juries in Paris.—The election of the juries for the admission of works of art to the *salon* this year, and for the award of the medals, has recently taken place, under the conditions laid down four or five years since, namely, that each artist who had sent in a work for exhibition, and had had one received at a previous *salon*, although he had not obtained a medal, had the right to vote for two-thirds of the members of the jury of his own section of art. About eight hundred artists voted, and the following are the names of the jurors elected:—In the section of painting and drawing — MM. Gérôme, Baudry, Pils, Bonnat, Bida, Gleyre, Fromentin, Comte, Breton, Daubigny, Robert H. Fleury, and Cabanel; in sculpture and die-sinking — MM. Barye, Guillaume, Perraud, Soitoux, Dumont, Dubois, Cabet, and Carpeaux; in architecture—MM. Duc, Labrousse, Duban, Vaudoyer, Viollet Le Duc, and Ballu; in engraving and lithography— MM. Lalanne, Mouilleron, Jacquemart, Boetzel, Gaucherel, Henriquel-Dupont. The list is nearly the same as last year's; in painting the name of one successful young painter, M. Bonnat, is added in addition to M. Comte, who acted as a juror last year in consequence of the retirement of an artist above him on the list; in sculpture the only new name is M. Paul Dubois, who received the grand medal of honour for his beautiful statue of the young Florentine playing the lute; while in architecture two of the names not in last year's list are those of members of the Institute, while the third is an artist who won the Grand Prix de Rome twenty-nine years ago. It is evident that the artists generally differ but little with the authorities, for of the twenty-six members comprising the three juries just referred to, more than half are members of the Institute and professors. The engravers and lithographers alone have elected one of their body who has not received any academic or other distinctions, but who is a well-known illustrator. The number of works sent in for exhibition this year is larger than ever, amounting in all to 6,375, of which 5,570 belong to the section of painting and drawing.

The Louvre.—Visitors to Paris this year will find a collection of about three hundred pictures of the Dutch and Flemish schools, which have not been seen for three or four years, in consequence of the rebuilding of that portion of the great gallery which adjoins the palace of the Tuileries. The collection is placed in what was, the other day, the Salle des Etats, but which was used for the last time by the Emperor, at the meeting of the legislative corps at the opening of the present session. The gaudy decorations of the room have, happily, been hidden by screens placed in front of the columns which support the galleries on each side, on which the pictures are hung. The new Salle des Etats, which is attached to the Tuileries, is now being decorated, twelve allegorical figures having just arrived to be placed on the Corinthian pilasters of the hall. Two additional rooms have been opened in the Louvre on the lower floor, near the new entrance to the galleries; they contain a collection of monumental and other sculpture of the later Roman period, reproductions of the magnificent tombs of the dukes of Burgundy in the Dijon Museum, and of some Flemish antiquities.

Tungstate of Barytes as a White Pigment.—The tungstate of barytes is said to have been in use in France, as a substitute for white lead, or white zinc, for some months with success. It has been employed for oil and water-colour painting and chromo-lithography.

Copyright Convention between France and Belgium.—A declaration has recently been issued with the view of simplifying the formalities necessary for the security of copyright in works of literature and art in France and Belgium reciprocally. In future, in order that the natives of either country may obtain justice in the courts of the other State, nothing in future will be required but the production of a certificate emanating from the proper authority, showing that the work in question is original, and enjoying, in the country of the artist, legal protection against piracy or illicit reproduction. In the case of works published in France, this certificate will be delivered from the bureau of literature in the Ministry of the Interior, and legalised at the Belgian legation in Paris. In the case of works published in Belgium, the necessary certificate is to be delivered also by the Minister of the Interior, and legalised by the French legation at Brussels. This simple method of verification is to have the same duration as the International Copyright Convention of 1861, to which it is annexed.

Commerce.

Commerce of Rio Janeiro.—In 1864, 985 ships, of an aggregate burden of 342,753 tons, entered this important harbour; in 1865 the total rose to 1,063 ships, of 387,151 aggregate tonnage; in 1866, to 1,223, of 430,883; and, in 1867, 1,250, of 477,350 tons. As regards the points from which these ships came, Platean ports occupy the first rank. Then, in the order of their importance, come Liverpool, Cardiff, Newcastle, New York, London, the Cape de Verd Islands, Lisbon, Havre, Baltimore, Hamburg, Oporto, Marseilles, Bordeaux, Trieste, Glasgow, Cette, and Southampton. The United States furnished the largest number of agricultural implements imported to Rio in 1867, but French agricultural machinery begins, nevertheless, to be employed in the Brazils. As regards industrial machinery in use in the Brazils, England supplies nearly the whole of it, with the exception of that which is employed in the sugar manufacture, and which is especially supplied by the French mechanical firms.

Commerce of Switzerland.—In 1868 the imports to Switzerland were 114,222 head of small cattle, such as sheep, goats, pigs, &c., 161,366 head of horned cattle, and 3,965 horses and mules. The value of the imports of articles such as mill-stones, tools, implements, carts, and railway waggons, which paid duty in proportion to their value, amounted to 938,696 francs. The number of loads of goods brought into Switzerland was 644,679, of which 89,875 were loads of timber for building, fire-wood, &c., and 386,154 loads of charcoal, coal, coke, &c. Besides this there were imported 9,335,991 quintals of merchandise of various kinds, amongst which 3,680,959 quintals of cereals, 232,309 of flour, 37,995 of butter and lard, 44,101 beer in barrels, 175,057 coffee, 50,552 chicory, 11,658 paper and cardboard, 20,030 clock and watch-work, 252,799 sugar, 37,038 tobacco, 333,407 oil, 943,437 wine in barrels, and 8,703 wine in bottles. During the same period the exports amounted to 60,386 head of small cattle, 66,626 head of horned cattle, and 1,669 horses and mules. Timber of the value of 7,467,262 francs, and charcoal of 335,254 francs; 78,013 loads of various merchandise, of which 14,008 loads of fresh fruit, potatoes, and other vegetables; 20,666 loads of bricks, tiles, and stone for building purposes, and 1,438,929 quintals of various goods, amongst which 15,741 quintals of butter, 226,588 of cotton goods, 5,569 of absinthe and kirschwasser, 283,737 of cheese, 66,098 machines or parts of machines, 18,522 of silk, 57,310 raw hides, 3,733 clocks and watch-work, and 21,671 paper and cardboard. In transit *via* Switzerland there were 115,051 head of cattle, 27,088 loads of timber, and 1,915,316 quintals of general merchandise.

Free Carriage of Italian Samples to the East.—The owners of the Italian mail steam packets, Messrs. Rubaltino and Co., of Genoa, who last July established a line of steamers between that port and Alexandria, have just given notice to the various Chambers of Commerce throughout Italy, that, with a view of extending the commerce of that country in the East, they are prepared to take samples gratis, of Italian manufacture or produce on their steamers to Alexandria, to the extent of 20 tons each voyage. The cases or packages of samples must not exceed 50 kils. in weight, or 2 cubic feet in capacity each.

Colonies.

The Drought in Victoria.—The drought has been so severe that deep waterholes and reservoirs that never failed before have been dry this year, and farmers and settlers who usually have no difficulty in this way, have been obliged to cart water for themselves and their stock for many miles. Feed having utterly failed in many places too, owners of small lots of cattle and sheep have been obliged to drive them to market and sell them for what they would fetch, or drive them away to the better watered districts and pay for their keep. Those who could not afford to take the latter course had to drive them to the ranges where rough feed is to be had, but with the prospect of not being able to recover half of them when feed becomes plentiful again at their homes. On a larger scale sheep have been given away, half the number to be returned in three or four months, and many flocks in the interior are said to have died of actual starvation. Several hundreds of thousands have been started on their travels to crawl about the country in search of food and water, which had totally failed on the stations of their owners, and only a small percentage of these can survive. The great scarcity of water in the interior is proved by the fact that the herds of wild horses have become an easy prey to the settler, when in ordinary years nothing can be done with them.

Notes.

French Railways.—On the 31st December, 1868, the total length of the French railways was 16,191 kilos., of which 15,856 kilos. were worked during the year. The total receipts amounted to 664,968,043 francs, as compared with 659,017,446 francs in 1867, but this last corresponds with a length of 15,044 kilos. The receipts per kilo. in 1867, were 43,806 francs as compared with 41,938 francs in 1868. The greatest decrease in the receipts was in the old network, being 65,605 francs per kilo. in 1867, against 63,324 francs in 1868; a slight increase was made on the new network, being 21,209 francs per kilo. in 1868, against 21,099 francs of the previous year. The receipts on the secondary lines decreased from 17,249 francs per kilo. in 1867, to 16,576 francs in 1868. The third quarter of the year was the most important as regards amounts taken; the next in importance being the fourth, second, and first quarter. The tax paid to government on "transports à grande vitesse," was 33,043,774 francs in 1867, against 31,131,710 francs in 1868.

The Havre Maritime Exhibition.—We are requested to state that the Diplomas of Honour, Gold and other medals, and Certificates of Honourable Mention, awarded to British exhibitors by the international jury at the Havre Maritime Exhibition, can now be obtained on application to Messrs. J. M. Johnson and Sons, of Castle-street, Holborn, the Commissioners for the United Kingdom.

Correspondence.

The Theory of Boiling.—Sir,—The question put to Mr. Tomlinson on Wednesday evening, the 7th inst., as to how the various nuclei or porous subtances, which he so ably described and presented to our view, acted in causing an increased quantity of distillate (or, in other words, improved the evaporative power of the boiler or still in which they were inserted), was not to my mind answered satisfactorily by his subsequent explanation; but, as the hour was late, I forbore addressing the meeting upon the subject. With your permission, however, I would desire, in the form of this letter, to say a few words upon the subject. Mr. Tomlinson described their action, as I understood him, to be as follows:—Taking, as an example, a piece of charcoal, as one of the most powerful of the nuclei, he represented that, owing to its extreme porosity, it presented an enormous extent of surface to the boiling liquid, "a piece of it no larger than one's thumb nail presenting a surface of no less than several square yards;" and when this surface came in contact with a liquid supersaturated with its own vapour, as he very aptly described a boiling liquid to be, it

alternately absorbed and discharged the liquid and the vapour; each of its innumerable pores, in fact, drawing in and expelling the supersaturated liquid in such a manner as to liberate large quantities of vapour. Such was the scope of his explanation, but, as I have before remarked, it is, to my mind, incomplete, a link in the chain being wanting. That link I now propose to supply. The question is, in what consists the evaporative power of nuclei (porous substances) inserted in a boiling liquid? And I would add the following question as a corollary to it, What is the cause of the "bumping" of boiling water in a vessel when nuclei are not present? A right solution of these questions must be of the utmost importance to every one concerned in the useful arts. In reply thereto I beg to state at once, clearly and distinctly, that I am convinced the action of nuclei is due principally and almost wholly to a current or circulation of the boiling liquid wich is caused by their presence. To explain this, let us consider for a moment what the process of boiling really is. Heat—as we term it—is conducted through a plate, that is, it is poured into it on one side, in much the same way as water is poured into a bed of sand, and speedily reappears at the other, next to the liquid about to be boiled. But the moment it comes in contact with the liquid, it (the liquid) is converted into vapour; and so far the process is popularly understood. But there is another stage of it which is very important, and necessary to the completion of the process, but which has not hitherto received that attention (possibly on account of its not been seen, except through a glass vessel) which it deserves. It is the disengagement of the vapour from the heated plate and from the surrounding water which presses upon it. When the water in a boiler is at rest—that is, when there is no current or circulation of the water in it, the bubbles of vapour are very small, and rise with difficulty from the places where they are formed. But when there is a current, however gentle, the bubbles of vapour aggregate and increase in size, and rise in quick succession to the water's surface. And what is the effect of their so rising? Fresh supplies of water are more quickly allowed to come in contact with the heated plate, to be converted in their turn into further supplies of vapour; so that the greater the circulation of the water in a boiler, the greater is the evaporation. Nuclei, or porous substances, undoubtedly attract and expel a boiling liquid in the manner described by Mr. Tomlinson, but they do not of themselves directly increase the evaporative power of a still or boiler; it is not owing to any occult power in them as half explained by Mr. Tomlinson, neither is it owing to the subtle influence of electricity, as suggested by one speaker, that such a result is obtained by their use; but it is simply owing, I assert fearlessly, to their indirect influence in causing motion, and therefore a current in the water, which allows, or rather stimulates, the bubbles of vapour to aggregate and arise quickly from the heated plate. This matter of a current in boiling water is pregnant with results of the utmost importance in regard to the future construction of steam boilers and of boiling apparatus generally. Having during the last three years made numerous and costly experiments upon the subject, I feel entitled to speak with some authority upon it, and could here very greatly enlarge, but I fear that I have already encroached upon your space. Suffice it to say that a circulation of the liquid in a boiler is the chief thing to increase its evaporative power, whether that circulation be caused by nuclei or by any other means. The matter of the "bumping" of boiling water in a vessel when nuclei are not present is, as I have found, entirely referable to the want of a current, or circulation. Once establish a current and the "bumping" ceases. The reason is, when there is no current the vapour arises at long intervals (comparatively speaking), and in large masses, and therefore with a violent action and re-action; but with a current it is continually being taken away in small bubbles. Mr. Tomlinson claimed, at the close of his paper, the merit of the discovery of the fact that it is owing to the presence of nuclei that a great discharge of vapour from a super-saturated liquid is made; I claim the solution of the problem as to how these nuclei really act, and to having given the key-note to all real improvement in steam-boilers and boiling apparatus generally, an improvement which can easily double their power (I am within the mark) and save in fuel thousands of pounds annually to the great manufacturing interests of this country.—I am, &c., John C. Wilson, Memb. Inst. Mech. Eng.

26, Martin's-lane, Cannon-street, E.C., 8th April, 1869.

MEETINGS FOR THE ENSUING WEEK.

Mon.....Society of Arts, 8. Cantor Lecture. Mr. John Anderson, C.E., "On Applied Mechanics."
Society of Engineers, 7½. Mr. F. W. Hartley, "On the Methods employed in the Determination of the Commercial Value and Purity of Coal Gas."
Social Science Assoc., 8. Law Amendment Society. Mr. T. E. Holland, "On the Necessity and Practicability of Improving the Form in which the Statute Law is promulgated."
Medical, 8.
British Architects, 8.
Asiatic, 3.
Victoria Inst., 8.

Tues ...Royal Inst., 3. Prof. Grant, "On Stellar Astronomy."
Statistical, 8. Dr. Guy, "On Insanity and Crime, and on the Plea of Insanity in Criminal Cases."
Pathological, 8.
Anthropological, 8.
Civil Engineers, 8. 1. Adjourned discussion upon Mr. Kirkham's paper, "Standards of Comparison for Testing the Illuminating Power of Coal Gas;" and (time permitting) 2. Mr. Wm. Shelford, "On the Outfall of the River Humber."

Wed ...Society of Arts, 8. Mr. Wybrow Robertson, "On Trade Marks."
Meteorological, 7.
R. Society of Literature, 4½. Annual Meeting.

Thur ...London Inst., 6.
Royal, 8½.
Zoological, 4 and 8½.
Royal Society Club, 6.
Royal Inst., 3. Prof. Tyndall, "On Light."
Society of Fine Arts, 8. Exhibition of Engravings. A paper by Mr. Saddler.

Fri .....Antiquaries, 2. Annual Meeting.
Royal Inst., 8. Mr. E. B. Tylor, "On the Survival of Savage Thought in Modern Civilisation."
Quekett Club, 8.

Sat .....Royal Inst., 3. Mr. A. Geikie, "On the Origin of Land Surfaces."

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb.

Delivered on 3rd April, 1869.

62. Bill—Regulation of Railways Act (1868) Amendment.
111. East India (Council)—Return.

Delivered on 5th April, 1869.

64. (III.) Committee of Selection—Fourth Report.
107. Election Petitions—Return.
108. Election Petitions—Return.
109. Civil Services Estimate "On Account."

Delivered on 6th April, 1869.

52. Bill—Turnpike Roads.
62. ,, Railway Companies' Meetings (corrected copy).
99. Printed Books—Accounts.
105. "Atlantic" Pilot Cutter—Correspondence.
110. Mail Contracts (United States)—Letter.
116. Post-office (West India Mails)—Returns.
119. Mail Steamers (Cunard and Inman Lines)—Return.
117. Maynooth College—Return.

Delivered on 7th April, 1869.

100. Light Dues—Report from the Trinity House to the Board of Trade.

Public Petitions—Tenth Report.

Delivered on 8th April, 1869.

64. (IV.) Committee of Selection—Fifth Report.
128. Soldier Labour (Aldershot, &c.)—Reports.
129. Barrack Services (Portsmouth, &c.)—Return.

Manufactures, Commerce, &c.—Embassy and Legation Reports (No. 2, 1869).

Delivered on 9th April, 1869.

79. Public Bills (Ireland and Scotland)—Return.
80. Civil Services and Revenue Departments—Appropriation Accounts (1867-8).

103. Clerks (Somerset House)—Order in Council.
132. Immigrants and Liberated Africans—Return.
Ordnance Survey and Topographical Depôt—Report.
Science and Art Department (Ireland)—Report of the Commissioners, Vol. I.

Delivered on 10th April, 1869.

67. Bill—Sunday and Ragged Schools.
60. Army (1867-8)—Statement of the Savings and Deficiencies.
81. (1.) Railway and Canal Bills—Second Report.
109. Civil Services—Estimate ("On Account") (corrected copy).
131. Greenwich Hospital—Estimate.
133. Army (China and Japan)—Correspondence.
Public Petitions—Eleventh Report.

Patents.

From Commissioners of Patents' Journal, April 9.

Grants of Provisional Protection.

Aërated beverages, &c., apparatus for containing, treating, &c.—847—J. Hamilton and R. Paterson.
Ammunition, supplying to troops under action—821—T. Martin.
Animal and vegetable substances, preserving—978—R. Jones.
Baking powders—924—G. Dymond.
Bobbins—918—T. Sowden and J. Newton.
Boilers—954—A. Barclay.
Boilers, injecting water into—861—J. Loader.
Boots and shoes—966—T. Greenwood and J. Keats.
Boxes for holding matches, &c.—923—W. E. Gedge.
Brick and tile pressing machines—975—B., H., and J. N. Craven.
Buckets, &c.—930—D. Jones.
Cages or hoists, safety apparatus applicable to—913—J. T. Calow.
Carding engines—953—B. Dobson and J. Eastham.
Carriages, &c.—962—A. Chambers.
Carts, &c.—974—T. Corbett.
Cement kilns, &c.—945—W. P. Hope.
Chairs—873—J. E. Emerson.
Chimneys—909—T. Champion.
Cigars—972—W. Langer.
Coal, &c., excavating—906—F. Hurd.
Copper and bismuth, separating from ores containing metals—969—G. Wells.
Earth closets and urinals—967—A. F. Baird.
Electro-magnetic machines—917—W. R. Lake.
Envelopes—973—B. J. B. Mills.
Fire-arms—897—A. Clayton and J. Riley.
Fire-arms, breech-loading—839—C. G. Bonehill.
Fire-arms, breech-loading—929—H. Haschke.
Fire-arms, breech-loading—984—H. Carter and G. H. Edwards.
Fire-arms, breech-loading, cramp keys for—992—W. Gibson.
Fire-arms, &c.—825—J. H. Johnson.
Fire-arms, &c., breech-loading—938—G. Bloem and E. Scheidt.
Fire bars—877—R. Gregson.
Fire escapes—911—T. Baker.
Flooring cramps—879—C. Longfield.
Flooring cramps—901—J. Woodhead.
Fly wheels—833—J. Ritchie.
Furnaces for the manufacture of glass—959—T. G. Webb.
Garden and fire engines—890—R. W. Page.
Gas burners—831—W. T. Sugg.
Greenhouses, &c.—928—N. Voice.
Hats—990—T. Higgins.
Hay-tedding machines—859—W. R. Lake.
Horse shoes—922—H. Downie and I. B. Harris.
Hydrocarbon oils, distilling—956—T. E. Williams.
Iron and steel—905—J. J. Bodmer.
Iron and steel—908—J. H. Johnson.
Land-tilling machinery—912—W. C. Dreyer.
Lawn-mowing machines—964—F. W. Follows and J. Bate.
Lime kilns, &c.—960—H. Y. D. Scott.
Liquids, cooling—920—A. C. Kirk.
Locomotive engines—931—F. Parker.
Locomotive engines and railway carriages—837—F. W. Fox.
Locomotive engines, utilising the waste steam of—965—T. A. Dillon.
Locomotive engines, &c.—889—J. B. Fell.
Looms—823—J. C. Ramsden.
Looms—926—G. Hodgson, H. Bottomley, and E. Cockroft.
Match splints, &c.—887—F. de Bowens.
Metal, engraving and chasing articles of—981—T. Lippiatt.
Metals, coating—942—E. Morewood.
Motive-power—787—E. Sands.
Motive-power engines—857—H. E. Newton.
Mules for spinning—899—C. B. Parkinson, A. and J. Metcalf, and W. H. Heald.
Musical boxes—932—J. Jaquillard.
Music, apparatus used in producing surfaces for printing—3840—W. H. Lennox and J. W. and W. J. Pearman.
Muzzles for dogs, &c.—925—L. Hannart.
Numerical counting machines—937—F. B. Taylor.
Ordnance, side arm for clearing the chambers and rifling of—910—J. T. Greenfield.
Ordnance, working—896—W. E. Newton.
Paints, &c., rubbing and mixing—875—A. Clark.
Paper-making machines, wire cloth for—988—J. B. Rowcliffe.
Paper pulp—811—J. J. G. Damitte, J. M. Agnellet, and H. D. Dubois.
Pencil cases—948—J. Bath.
Photographic printing, producing negatives for—853—J. V. Robinson.
Picks and railways for cutting coal, &c.—943—S. Firth.
Pipe and tube joints—914—C. Marsden.
Presses for applying combined eylets and paper fasteners, &c.—892—C. McDermott.
Railway breaks—986—J. Beckett and A. W. Field.
Railway carriages, &c., heating by means of electricity—888—M. F. Maury.
Railway point and signal levers—900—F. Baker.
Railways—952—M. McLeod.
Railways—958—F. Render.
Railways—976—J. Livesey.
Screw propellers—867—H. Vansittart.
Semolina, &c., machinery for manufacturing—927—J. J. Bagshawe.
Sewing machine tables—957—W. F. Proctor.
Sewing machines—898—T. Shakespear and G. Illston.
Sewing machines—936—W. Riddell and T. Bletcher.
Sewing machines—946—G. T. Bousfield.
Sewing machines, &c., obtaining motive-power for—843—A. V. Newton.
Ships, constructing and treating, to correct and prevent compass deviations—934—J. W. Girdlestone.
Shuttles—865—W. Crossley and J. W. Swithenbank.
Soda and potash—939—W. R. Lake.
Steam-engine indicators—977—J. A. Hopkinson & J. Hopkinson, jun.
Steam engines—829—S., A., and S. Haycraft.
Steam engines, marine—994—W. Allan.
Steering apparatus—835—E. A. Inglefield.
Stereoscopes—944—A. Clark.
Sulphuric acid—881—L. A. Israel.
Telegraph poles, &c., tubular—635—F. N. Gisborne and H. Allman.
Threads, balling or winding—953—C. E. Brooman.
Vegetable substances, &c., extracting oleaginous matter from—933—B. J. B. Mills.
Velocipedes—950—W. W. Harris.
Velocipedes—951—A. Muir.
Waggons for carrying coal, &c.—907—J. R. Baillie.
Weighing scales—841—E. T. Hughes.
Wind instruments, mouthpiece of—855—J. Kay.
Window sashes—916—W. Meakin.
Window sashes and blinds—895—J. Nevill.
Wire fences—968—R. Johnson.

Inventions with Complete Specifications Filed.

Boot and shoe heels and tips, revolving—989—C. D. Norton.
Boilers, &c., materials for preventing the escape of heat from the surfaces of—1011—J. Howden.
Coal and grain boat elevators—1004—S. K. Hoxsie.
Fire arms, breech-loading—1017—F. Boyd.

Patents Sealed.

3118. F. W. Hart.
3119. N. Smith.
3124. S. Leoni.
3125. A. Field and A. W. Tuer.
3126. W. Brailsford & J. Gadsby.
3128. T. F. Cashin.
3130. H. C. Clifton.
3133. W. T. Sugg.
3134. R. Dawson.
3136. J. Worster.
3140. J. Shanks.
3147. E. Leach.
3153. C. G. Gumpel.
3155. H. A. Bonneville.
3188. J. Cockshoot, jun., and H. Weatherill.
3159. E. Peyton.
3196. W. Fitch.
3199. J. Elce.
3203. G. Chapman.
3280. A. M. Clark.
3304. J. G. Tongue.
3309. W. H. Liddell.
3326. A. M. Clark.
3491. W. R. Lake.
3422. R. Halliday.
3536. W. R. Lake.
3650. A. Ransome.
3811. C. E. Brooman.
3981. F. A. K. W. Von Oppen.
370. W. R. Lake.
386. W. R. Lake.

From Commissioners of Patents' Journal, April 13.

Patents Sealed.

3145. J. G. Jones.
3152. J. Denly.
3160. T. Gray.
3162. R. M. Wood.
3164. W. R. Lake.
3170. R. Head.
3173. C. Churchill.
3175. A. Denayrouze.
3177. E. T. Hughes.
3178. C. Mayer.
3179. D. Wilson.
3184. F. P. Warren.
3185. R. A. Green.
3200. J. A. Farrar and B. R. Huntley.
3210. J. F. Brinjes.
3243. J. Gregson and W. Monk.
3248. I. Baggs.
3251. B. Hunt.
3286. J. B. O'Hea and W. Bullen.
3363. A. L. Bricknell.
3377. M. A. F. Mennons.
3379. W. Broughton.
3472. J. H. Johnson.
3574. H. E. Newton.
175. W. R. Lake.
235. H. W. and R. Lafferty.
402. B. F. Sturtevant.
403. J. H. Johnson.
456. A. Morton.
531. M. Gray.
556. R. P. Williams.
639. J. Howe, jun.

Patents on which the Stamp Duty of £50 has been paid.

1019. R. Leake, W. Shields, and J. Beckett.
641. J. Tansley.
1031. G. A. Ermen.
1041. J. J. Bodmer.

Patents on which the Stamp Duty of £100 has been Paid.

974. J. Colling.
1028. G. D. Mertens.
1032. J. Petrie, jun.
1124. G. T. Bousfield.
1218. A. C. Kirk.

Journal of the Society of Arts.

FRIDAY, APRIL 23, 1869.

Announcements by the Council.

Ordinary Meetings.

Wednesday Evenings at eight o'clock :—

April 28.—"On the Duties of the Architect with reference to the Arrangement and Structure of a Building." By Roger Smith, Esq. On this evening Sir Digby Wyatt will preside.

May 5. "On the Formation of Industrial Settlements in our Colonies." By Col. Francis C. Maude, C.B.

May 12.—"On the Ventilation of Drains." By James Lovegrove, Esq., Assoc. Inst. C.E.

May 19.—"On the Progress of the Colonies." By John Robinson, Esq., of Natal.

May 26.—"On Silk Supply." By Thomas Dickins, Esq., President of the Silk Supply Association.

Cantor Lectures.

A Course of Four Lectures "On Applied Mechanics" is now being delivered by John Anderson, Esq., C.E., Superintendent of Machinery to the War Department, as follows :—

Lecture III.—Monday, April 26th.

Applied Mechanics in relation to Natural Laws in processes.

Lecture IV.—Monday, May 3rd.

Applied Mechanics in relation to Natural Power.

Each lecture will begin at eight o'clock. These Lectures are open to Members, each of whom has the privilege of introducing two friends to each lecture. Tickets for this purpose have been forwarded to each Member.

Committee on India.

Conferences are now in course of being held for the discussion of various subjects connected with India.

The following arrangements have been made for the remaining three conferences :—

Friday Evening, April 30.—"Indian Fibres." By Leonard Wray, Esq. The Chair will be taken by the Hon. George Campbell.

Friday Evening, May 14.—"Waste Lands." By the Hon. George Campbell.

Friday Evening, May 28.—"Trade with Central Asia, Thibet, and South-Western China."

At these Meetings the chair will be taken at 8 o'clock, and the discussion will be opened by a paper.

This evening, Friday, the 23rd instant, the adjourned discussion on Mr. Hyde Clarke's paper "On Hill Settlements and Sanitaria," will be opened by Colonel Hayley. The Chair will be taken by Lord William Hay.

Members of the Society interested in Indian questions are invited to attend.

Piscicultural Committee.

On Friday Evening, May 7th, a paper "On Oyster Culture and Legislation" by Arthur F. Pennell, Esq., will be read and discussed. The Chair will be taken at eight o'clock.

Members of the Society interested in this subject are invited to attend.

Final Examinations, 1869.—Notice to Candidates.

The Court of the Worshipful Company of Coachmakers have resolved to place one silver and one bronze medal of the Company at the disposal of the Council of the Society of Arts, to be presented to the candidates (actually engaged in the trade of coach-building) who shall pass the best examination in "Free-hand Drawing" and "Practical Mechanics."

These medals will not be awarded unless, in the opinion of the Council, the candidates possess sufficient merit.

Albert Medal.

The Council will proceed to consider the award of the Albert Medal early in May next. This medal was instituted to reward "distinguished merit in promoting Arts, Manufactures, or Commerce," and has been awarded as follows :—

In 1864, to Sir Rowland Hill, K.C.B., "for his great services to Arts, Manufactures, and Commerce in the creation of the penny postage, and for his other reforms in the postal system of this country, the benefits of which have, however, not been confined to this country, but have extended over the civilised world."

In 1865, to his Imperial Majesty the Emperor of the French, "for distinguished merit in promoting, in many ways, by his personal exertions, the international progress of Arts, Manufactures, and Commerce, the proofs of which are afforded by his judicious patronage of Art, his enlightened commercial policy, and especially by the abolition of passports in favour of British subjects."

In 1866, to Professor Faraday, D.C.L., F.R.S., for "discoveries in electricity, magnetism, and chemistry, which, in their relation to the industries of the world, have so largely promoted Arts, Manufactures, and Commerce."

In 1867, to Mr. W. Fothergill Cooke and Professor Charles Wheatstone, F.R.S., in recognition of their joint labours in establishing the first electric telegraph.

In 1868, to Mr. Joseph Whitworth, F.R.S., LL.D., "for the invention and manufacture of instruments of measurement and uniform standards, by which the production of machinery has been brought to a degree of perfection hitherto unapproached, to the great advancement of Arts, Manufactures, and Commerce."

The Council invite Members of the Society to

forward to the Secretary, before the 2nd May, the names of such men of high distinction as they may think worthy of this honour.

Postage of Printed Matter and Parcels.

The Council have appointed a Committee to promote the adoption of reduced rates of postage, particularly in reference to printed matter and parcels.

Subscriptions.

The Lady-day subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Thames Embankment Committee.

The fifth meeting of the Committee took place on Tuesday, the 13th inst., at 11 a.m. Present—Lord Elcho, M.P., in the chair; Sir Charles Trevelyan, K.C.B., Col. Ewart, R.E., Captain Ducane, R.E., Messrs. Henry Cole, C.B., Westmacott, R.A., G. E. Street, A.R.A., C. F. Hayward, Baillie Cochrane, and Hyde Clarke.

Mr. F. W. Sheilds attended, and said that he was prepared to state the results which he had arrived at with regard to the comparative advantages of the Carey-street and Embankment sites for the new law courts, with special reference to the question of the approaches.

The Chairman said that the discussion on the law courts had been closed, but he should like to know whether Mr. Sheilds had considered the question of making a carriage-road from the Strand to the Embankment by way of Essex-street.

Mr. Sheilds replied that he did consider that matter in preparing his plan for the Thames Embankment, which was approved by the Royal Commission of 1860, presided over by Lord Mayor Cubitt. At that time he contemplated leaving Essex-street in its present condition, with an access by means of steps to the Embankment, simply because, as he understood at the time, the expense was to be limited. Apart from the question of expense, there would be no engineering difficulty in forming a carriage-road. The ground would have to be cleared, and the road widened, and sloped from the building line of the Embankment to that of the Strand. The gradient would be 1 in 28. The gradient allowed by Parliament in the case of alterations of accommodation roads crossed by railways was 1 in 20, and for turnpike roads 1 in 30.

Sir Charles Trevelyan being requested to place before the Committee the result of his investigations into the contemplated improvements of the Temple, said —I first wish to call attention to the great historical importance of the Temple. From the reign of Henry II. to the reign of Edward III. it was the head-quarters in England of the Knights Templars, and was thereby indissolubly connected with the ancient East and with the foundations of our faith. From the time of Edward III. to the present it has been in the possession of the lawyers, having become at an early period a university of Common Law, as distinguished from the Roman and Ecclesiastical law, which had its chief supporters at Oxford and Cambridge. The Temple became a popular place of resort and education for our young nobility and gentry, and held a distinguished position in our social system. This made it natural for Shakespeare to place the germ of the great civil war of the Roses in the Temple-gardens—

> "The brawl to-day
> Grown to this faction in the Temple-garden
> Shall send between the red rose and the white,
> A thousand souls to death and deadly night."

The situation of the Temple is one of extreme beauty and interest. It is situated on the rising river bank, open on one side to the Thames, while on the other is seen a diadem of towers, consisting at present of the beautiful lantern tower of St. Dunstan's, and the large handsome tower of the new Record Office; and it may be hoped that at no distant period, looking from the Temple-gardens to the west and north-west, we shall see the lofty towers of Mr. Street's new building between the Embankment and the Strand. The difference of level between the Strand and Carey-street is so slight (Mr. Street having arranged to reduce it to twelve feet), that the towers of the law courts on the Strand front of the Embankment site will produce as great an effect as if they were on the Carey-street site.

The existing buildings of the Temple are of no mean kind. First of all there is that famous old church, built according to the exact model of the Church of the Holy Sepulchre at Jerusalem, which has been restored and embellished by the Templars with singularly good taste and unsparing expense. Then there is the grand and beautiful hall of the Middle Temple, erected in the time of James I., during the treasurership of Plowden; and the Benchers of the Inner Temple, under the treasurership of Mr. Whitmore, are erecting a new hall, which will not suffer in comparison with Plowden's old hall. The buildings around the Temple-garden, which form three sides of a square, with the fourth side open to the river, although not the best that could be constructed at the present day, are very good considering the period when they were erected, and are capable of much improvement.

The general plan that has been formed—for it has been heard of from so many quarters that there can be no doubt of the fact—and which occupies the minds of the Templars at present, is one which the position of the ground and the nature of the existing buildings naturally suggest, viz., first to extend the terrace of Somerset-house, and the terrace proposed to be erected in front of the new Law Courts, across both the Middle and Inner Temple, to Alsatia; not necessarily on the same level, or in the same style of architecture, because the terrace would naturally conform to the plan of the buildings opposite to which the different sections of it were placed. The level of the terrace in front of the new Law Courts and Somerset-house would probably be the same; but in passing from the new Law Courts to the Temple there would probably be a slight fall. The position of the existing buildings of the Temple has suggested what appears to be the only plan yet thought of for completing them in connection with the Embankment, viz., to extend Paper-buildings in the Inner Temple, on one side of the Temple garden, to the terrace, with a T head of handsome architectural elevation opening on the terrace, and to extend Harcourt-buildings in the Inner Temple, and Plowden-buildings in the Middle Temple, on the other side of the garden, to the same terrace with a similar T head, and another architectural elevation. So that we should have the famous old historical garden opening upon the terrace and the river between two grand, widely-extended portals, completed according to the best style of which modern art is capable.

There remains the new Middle Temple library, as to which there is a difference of opinion. Many object to it on the ground of taste, and others on the ground of its being impossible to warm it properly. It is said to be unsuitable to study owing to the cold in winter. A friend told me he had been there four times to consult law books and had caught four colds. Anybody who passes it may see that there has been a settlement in the

upper part of the building in front, and an unpleasing effect is produced by the library having been built across the line of the adjoining buildings. However that may be, many of the Templars are dissatisfied with it, and suggestions have been made for reconstructing it in connection with the new Law Courts. The ground upon which the library stands is not in the least essential to the plan of the Law Courts on the Embankment site; but, nevertheless, it has been suggested that the line of the new Law Courts should be taken from the Strand across the centre of the library, and that the latter should be reconstructed by the society, in a manner not open to the objections named.

The Chairman—You mean that the Templars themselves are willing to consider this.

Sir Charles Trevelyan—Many of the Templars are prepared to consider this, but whether or not they are a majority I cannot say.

All really good public buildings and monuments have an importance from the amount of popular enjoyment they afford; from their educational influence in elevating and refining public taste, and from the effect they have in binding the nation together, by making the whole people proud of their capital, especially in these days of constant locomotion, which brings such multitudes of visitors to see the metropolis. For instance, Italy, France, and other countries have typical examples of ancient Egyptian civilisation present to the eyes of their people, but we have no such advantage in this country. Since Sir John Abercrombie's expedition to Egypt it has been a favourite idea to bring one of the two obelisks called Cleopatra's needles to this country. The Marquis of Westmeath, who, I believe, is, with the exception of F. M. Sir John Burgoyne, the only surviving officer of that expedition, having been only 17 years of age at the time, has kindly furnished me with some papers upon the subject, which have a peculiar interest. In 1851, a representation was made by all the officers of high rank then surviving, who had served in Egypt, to Lord John Russell, then Prime Minister, of which the following is a copy:—

"United Service Club, 12th July, 1851.

"My Lord,—Towards the close of the last session of Parliament (which was too late, your lordship observed, to do anything in the matter that session) you were pleased to receive, very graciously, a deputation composed of officers of the army and navy, who, having served in Egypt, expressed to you their anxious desire that the obelisk known by the appellation of Cleopatra's Needle, and which belongs to England, should be brought home, 'for the purpose of being placed upon some elevated site in this metropolis, in order to perpetuate the recollection of the glorious deeds of our fleet and army in that country.'

"The question has been this session touched upon in both Houses, and, the obelisk having been presented by Mehemet Ali, in 1820, to our then Sovereign King George the 4th, and accepted of, as will be seen by the annexed copy of a letter from Mr. Planta, at that time Under Secretary of State, addressed to Mr. Briggs, our consul in Egypt, surely England is bound, by honour and courtesy, after having accepted the gift, to take the necessary measures to have the obelisk brought home, and to effect which object we would again solicit your assistance.

"We have the honour to be

"Your lordship's most obedient servants,

"(Signed)

James Kempt, General.	Thomas Kenah, Major-Gen.
Charles Ogle, Admiral.	John Rolt, Major-General.
Thomas Cochrane, Vice-Admiral.	D. DeLamotte, Major-Gen. E.I.C. Service.
John Wilson, Lieut.-Gen.	Edward Lloyd, Capt. R.N.
John Hanbury, Lieut.-Gen.	John Forbes, Capt. R.N.
John Duffy, Major-Gen.	

"The Right Hon. Lord John Russell, M.P.,
"First Lord of the Treasury, &c., &c."

"N.B.—Major-General DeLamotte saw the obelisk about four years ago, when it was, he says, in very good preservation, but hacked a little at the angles."*

(*Enclosure.*)

"Foreign Office, 25th July, 1820.

"Sir,—In answer to your letter of the 24th instant, and with reference to the several communications which you have made, of the wish of His Highness the Pasha of Egypt to present to His Majesty one of the obelisks commonly called Cleopatra's Needles, I am directed by Lord Castlereagh to acquaint you that His Majesty has been graciously pleased to accept this testimony of good will on the part of His Highness, and to direct an officer to proceed without delay to Alexandria, in order to inquire into and report upon the practicability and the most proper means of transporting this valuable relic of antiquity to this country.

"I am, &c.,

"(Signed) Joseph Planta, Jun.

"To Samuel Briggs,† Esq."

The Chairman asked what was the result of the memorial.

Sir Charles Trevelyan—I cannot say; I have not gone fully into it. But the following note to the Marquis of Westmeath will show that his Royal Highness Prince Albert took a warm interest in the project:—

"Windsor Castle, January 22nd, 1847.

"My Dear Lord,—I have not failed to communicate to the Prince the contents of your letter of the 21st inst., and have received his Royal Highness's commands to thank you for the trouble you have taken with regard to the Egyptian obelisk. His Royal Highness has already written upon the subject, and will take it in hand, with a view, if possible, to have that monument of the splendid services of the British army in that quarter removed to England. . . . .

"I have the honour to be, &c.,

"C. B. Phipps."

After the lamented death of his Royal Highness, one of the proposals for erecting a monument to his memory was that Cleopatra's needle should be brought to this country and erected on the site of the first Exhibition in Hyde-park; and her Majesty was understood to have taken much interest in the proposal. There was said to be no obstacle to bringing the obelisk into the Thames, but that there would be very considerable difficulty in conveying it from the Thames to Hyde-park.

After the recent discussion of this subject, at the instance of Colonel Sir James Alexander, Lord Houghton was so good as to say to me, "You are quite right about bringing an Egyptian obelisk to this country; but the one to bring is, not Cleopatra's Needle, but the remaining obelisk of Luxor, the fellow of the one which has been erected by the French in the Place de la Concorde." Luxor is the modern Arabic name, but the city is Egyptian Thebes of the hundred gates; and these beautiful obelisks, which are in the highest style of ancient Egyptian art, formed the portal of the great Temple of Thebes. Wilkinson, in his single volume, published by Murray in 1835, entitled "Topography of Thebes, and General View of Egypt," makes this mention of them:—"The two beautiful obelisks of red granite, whose four sides are covered with a profusion of hieroglyphics, no less admirable for the style of their execution than for the depth to which they are engraved, which, in many instances, reaches two inches." In the volume referred to there are two plates, one showing the two obelisks *in situ*, and the other showing one *in situ* and the other in process of removal. These obelisks were given by Mohammed Ali, one to the French and the other to the English. The French brought theirs to Paris; first securing it in a kind of gigantic packing-case, and then

* I have twice seen it. Only an angle of the base, from which the donkey boys knock off strips for visitors, appears above the sand.

† Consul-General at that time in Egypt.

lowering it by means familiar to engineers, they conveyed it to a Nile boat, and so by water to Alexandria, and thence to the Seine. In the same way, and with the advantage of their experience, the other obelisk might, with the help of one of our many old Admiralty hulks, be easily brought to the Thames, and thence to the Temple-gardens. The whole process of transferring the French obelisk from Thebes, in Upper Egypt, to Paris, has, I believe, been recorded in detail in a treatise on the subject.

Whatever may be the general advantages of public monuments, there will be a peculiar advantage in having in this conntry and in this great metropolis so perfect and beautiful a specimen of that by-gone civilisation, the earliest on record, inasmuch as it will suggest to all who see it that there have been other forms of civilisation, which have had characteristic merits of their own. The English and French would then have fellow obelisks, and the Temple-gardens would form a site peculiarly appropriate to the one belonging to us. The difficulty which prevented the transfer of Cleopatra's needle to Hyde-park will not occur in this case, the Temple-gardens being close to the Thames. In the centre of the Temple-gardens, with all London streaming before it on the Embankment and river, the obelisk will be in an extremely conspicuous situation. The Temple is especially connected with the East. It derived its name from a half-religious, half-warlike association, the object of which was the protection of the Holy Sepulchre and the Temple of Jerusalem from the Infidels, and to this day it preserves that name. Its occupants are still called Templars, and the old church still remains without alteration, the exact model of the church of the Holy Sepulchre. As Egypt is associated in so many ways with Palestine, there is a special fitness in placing the obelisk in the Temple-gardens; and there is also this subsidiary advantage, that it would not be dwarfed by the surrounding buildings, but the full beauty of its proportions would be seen.

The Chairman said he believed, at the previous meeting, Sir Charles Trevelyan advocated putting the railway station in front of the Temple-gardens.

Sir Charles Trevelyan said "No;" he thought it should be incorporated with the terrace at the south-eastern end of the new law courts. He was not aware whether the Templars would feel inclined to give up any ground for the purpose of a railway station, nor had he thought it worth while to make the inquiry.

Mr. Cole thought the Committee was appointed to endeavour to protect the Embankment from the spoliation with which it was threatened, and not to form any specific plans. They had already recommended that all designs for building on the Embankment should be publicly exhibited, and approved by an authority responsible to Parliament. He quite agreed with the resolution passed at the last meeting on the subject of the railway station, but he did not think they ought to go further into detail.

Mr. Baillie Cochrane thought that as the railway was in progress it was most important that they should come to some opinion as to the stations, which really would affect the whole of the public buildings on the Embankment.

(Lord Elcho being obliged to leave at this stage, the chair was taken by Mr. Hyde Clarke.)

The Chairman remarked that there was this difficulty with regard to the railway itself—that it was already in progress.

Sir Charles Trevelyan quite agreed that as the Committee was to report upon the best mode of dealing with the Thames Embankment, the point which was now raised was of great importance, and ought to be taken into consideration at the earliest opportunity. Returning to the subject of the Temple-gardens, Sir Charles Trevelyan said his statement did not go beyond this, that a considerable number of the Templars contemplated plans of the nature which he had described; nor had he heard of any alternative plan. He believed they all agreed that the proper way of laying out the Temple was in the beautiful open manner in which it is now laid out, giving full prominence to the garden, which is described by Charles Lamb in his "Elia," as "the genteelest place in London." Of course, if the great gap between the Temple and Somerset House were properly filled up, it would be a great additional inducement to the Templars to do justice to their own beautiful site.

Mr. Cole asked if there were any other public buildings of historical interest or architectural value near to these buildings which could be brought into connection with them.

Sir Charles Trevelyan said the only other public building in the neighbourhood of any importance was the new Record Office, but that was cut off from the Carey-street site by Chancery-lane and the Law Institution. The Embankment site was very preferable in regard to the adjoining buildings; in fact it would be difficult to conceive one more advantageously situated in respect to surrounding objects. It was in immediate communication with the two Temples on one side; with the beautiful historic building of Somerset-house on the other; with the river Thames and the handsome buildings which will doubtless be soon erected on the opposite Embankment, to the south; and with the fine old thoroughfare of the Strand, and the proposed new offices and chambers for solicitors on the Carey-street site to the north.

The Committee then adjourned.

The sixth meeting of the Committee took place on Tuesday, the 20th inst., at 12 o'clock. Present:—Earl Grosvenor, M.P., in the chair; Lord Henry G. Lennox, M.P., Sir Charles Trevelyan, K.C.B., Colonel Scott, R.E., Colonel Ewart, R.E.; Captain Ducane, R.E.; Messrs. H. Cole, C.B., Baillie Cochrane, Seymour Teulon, and C. F. Hayward.

The following resolution was proposed by Sir Charles Trevelyan, seconded by Lord Henry Lennox, and passed:—

"At the first meeting of this Committee on the 9th March last, the following resolution was passed:—'That this Committee inquire whether any, and if so what, controlling power over public works in the metropolis is vested in, and exercised by, any Government department, and whether it might be desirable to establish some such controlling power, in the event of its appearing that none such at present exists.' It has since become apparent, from the proceedings which have been taken by this Committee, that the mode of dealing with the Thames Embankment upon which the improvement of London essentially depends, had been left to the accident of the varying tastes and interests of the different owners of property upon the Embankment. It is also to be observed that the Temple is the dividing point between two jurisdictions, the Corporation of the City having authority to the eastward, and the Metropolitan Board of Works to the westward of that point. For these reasons, in addition to all the previous evidence on the subject, the Committee is strongly of opinion that it should form part of the duty of a responsible minister to exercise a controlling power within the necessary limits over all operations bearing upon any public works in which the convenience and embellishment of the metropolis of this country are concerned, and that the Council be requested to prepare a petition to this effect to be submitted to both Houses of Parliament, and that a memorial also to the same effect be addressed to the First Lord of the Treasury."

Indian Committee.

The third conference on Indian subjects was held on Friday evening, the 16th inst., the Right Hon. Lord William Hay in the Chair. The Paper read was—

ON HILL SETTLEMENTS AND SANITARIA.

By Hyde Clarke, Esq.

In calling the attention of those assembled at these Indian Conferences to the subject of hill settlements and sanitaria, I know that I speak in the presence of men well acquainted with its bearings, and better able to deal with it than myself. In this place, however, I have the plea that, eleven years ago (19th May, 1858), when these questions were quite new to the general public, I brought them before this Society, in a paper on "The English Settlements of the Hill Regions of India" (*Journal*, p. 423). I had also obtained their discussion before Parliament, through the late William Ewart, and by the Government of India.

At that period it was my good fortune to be the instrument of bringing to a state of practical advancement measures which, from time to time, have occupied the attention of the statesmen and friends of India. However chimerical it has been thought, and is still considered by some, to speak of the settlement of Englishmen in India, yet the question of the extension of English population there has, more or less, been considered and encouraged by Clive, Warren Hastings, Wellington, Munro, Bentinck, Auckland, Ellenborough, Dalhousie, and Canning. Indeed, many men have addressed themselves to the public with various propositions for its realisation, the more particularly by the extension of sanitaria in the hills, by the formation of military colonies, and by the development of hill resources. There may be named, Mr. Julius Jeffreys, Sir J. Ronald Martin, Dr. Archibald Campbell, Colonel Haley, Sir James Login, Mr. J. Farley Leith, Mr. B. H. Hodgson, Dr. Hooker, General Tremenheere, Mr. W. P. Andrew, Sir M. Stephenson, Professor Newman, Dr. Robert Barnes, General Sir Vincent Eyre, Capt. Nolan, and Dr. Mouatt.

Thus there is already a large body of co-operators; but there is, on the other hand, to be encountered listlessness and ignorance on the part of the general public, and misapprehension on the part of many men connected with India. We have been told for years that our propositions are chimerical and impracticable; that there is no land for wheat cultivation, or the maintenance of the population; and that we cannot constitute in the hill regions colonies consisting solely of English labourers, because natives are paid three or four annas a day for rough porterage and unskilled work. There is so much truth in these objections that they would have great weight, were they really applicable to the practical results aimed at.

To discuss objections of this kind would take up much of our time, and with the less advantage, as, at this day, hill settlement has not only its beginnings but its progress; the experiment has succeeded, and the only real question now is, how best and how earliest to obtain all the benefits which are desirable.

India, for the purpose of our present inquiry, consists of two regions, the tropical and unhealthy plains, and the temperate and healthy hill regions, bordering on or intersecting the former. In the hills our civilians and soldiers can and do live as healthily and comfortably and work as well as in the plains. Setting aside for the time the consideration of the central and southern hill regions, the northern hill regions constitute a large territory, containing a large population, and capable of holding more. Cashmere and Nepaul are assuredly susceptible of maintaining large English populations, and may be conveniently referred to as examples, on a considerable scale, of what elements the hill regions are composed. The smaller territories within our occupation, Sikhim or Darjeeling, the Dhoon, &c., have resources on a more limited scale, but that is no reason why we should neglect their development, or under-estimate the application of our general policy.

We have, indeed, to set aside our common conception of Dhurmsala or Nynee Tal. These are considered to be very small places, to which are sent small parties of decrepid English soldiers, for the recovery of their health. Most of them do recover their health, and then they are sent down to the plains to get ill again. Nynee Tal is therefore held to be a place of small consideration, and the hill sanitaria are of little and temporary value. We may, however, go a step further beyond this consideration. If the sanitaria can restore the health of the English soldiery and civilians, assuredly they are the places in which the health of healthy men can be maintained, as well as the health of unhealthy men. This is the principle for which we contend, that, so far as is practicable and convenient, the healthy English soldiery and civilians shall be sent to the hills and kept there, instead of in the plains. Thus we shall have a healthy legion, in full vigour of body and mind, ready to pour down on the plains.

If we spend in the hills any portion of the money we expend in the plains, then, instead of maintaining a host of native camp-followers of no political value to us, we shall maintain in the hills a body of English retainers, and of natives under English training. These people and their children will find other means of maintenance besides their participation in the public expenditure. They will engage in such culture of the soil as is practicable, in tea, cinchona, and vine planting, in the growth of orchard produce, in the development of the mineral wealth, and in various branches of industry. What is now being done on a very small scale by retired officers and soldiers, and yet to a practical extent, at Darjeeling and elsewhere, will be carried out so as, with English energy and enterprise, to be a means of subsistence for a large civil population. Then, below the cold hills are the tracts of the Terai, the Dhoon, &c., offering scope for European superintendence and enterprise. To the west are the passes into Tibet and Central Asia, through which, under careful management, a great trade can be conducted, and which will enrich our hill establishments by the interchange of the products of India with the table-land of Asia, and even of our own Darjeeling and hill teas.

Above all, there is the vast country of India itself; a field for enterprise open to the hill-men as to others, not for the mere shipment of produce, but for the development of indigo, sugar, cotton, and all the wealth of the peninsula. Assuredly the energy and enterprise of a healthy man, happy in his wife and family, surrounded by his countrymen and his home associations, will not be less effective than what is displayed by the isolated pioneer, who struggles to maintain health and comfort under unfavourable auspices. Assuredly the Englishman will do in India, under more propitious circumstances, what he has done in America, South Africa, and Australia. He will be able, likewise, to turn native labour to account, as in Natal and New Zealand.

In all fair considerations, as an industrial operation, the occupation of the hill regions by Englishmen augurs well, because they must largely profit by the wealth of the plains. There are, however, other considerations than those of pecuniary profit; there are higher and moral influences to be regarded. If we really wish to promote the real welfare of the native races of India, it can only be by the propagation of European knowledge and European morality, and for that we require a greater body of European labourers than we now possess; we require, too, that those European labourers we do possess shall be under healthier circumstances. He is but a poor missionary of civilisation whose wife is an invalid in England, and whose babes are in the

graveyard. There is, too, a less effective instrument of civilisation, the drunken railway workman, who remains a loafer in the land till cholera sweeps him off. How little can the City of Palaces be regarded as an English centre, may best be estimated by what it has really done within a century in the native population within its precincts.

With districts in the hills containing English cities, towns, villages, and homesteads, of which Simla, Darjeeling, and Hope Town, are the mere working models, we should possess permanent schools for the moral regeneration of India, to which the natives would resort, and which would act as a salutary corrective to the vernacular press.

Thus we have the means of advancing the moral and material welfare of our empire in India, and precisely as we avail ourselves of these, shall we succeed in securing the permanency of the benefits we confer on our subjects. There are two great dangers which menace India, and against which it is our duty to guard, for her benefit and our own. The first of these is internal mutiny and insurrection. To keep peace amongst these discordant races, we must maintain a large English army, and this is most effectually provided for in the hills. Generally speaking, the populations of the plains contain the least warlike races, and have the least requirement for garrisons. In the hills and neighbouring regions are the warlike populations, and it is not beyond our power to attack these populations of Tibetan or Dravidian origin, alien from the people of the plains, and more open to our action.

If the civilisation of India is in danger of being untimely strangled by its own distractions, it has a danger from without in the advance of that great enemy of freedom, the Russian empire. There are statesmen here who seek to look with complacency on the progress of Russia. It is the progress of trade and civilisation over the barbarism and anarchy of High Asia. Let it be so, that Russian trade will be increased. There is something more human than trade—there is the soul and mind of men. Under our empire the nationalities of India are being developed for their own advantage, and their many languages are each rapidly acquiring a copious literature, the living soul of the national thought. Under the Turkish empire, the Armenians, the Roumans, the Servians, and the Bulgarians, are constituting nationalities, and restoring or creating their several literatures. Under Russian rule this is altered; that not only does no such effort advance, but all are repressed; the languages of Poland and Lithuania are doomed, that of Finland discouraged, that of Georgia cannot expand.

To allow Russia to enter India in time of war, or even to menace it in time of peace, is not only to exchange English for Russian, and that is to do no good, but to undo all that we have done and are doing for India in the development of the seeds of freedom. This danger it is our duty to guard against, and the most effective barrier we can create is the promotion of our hill establishments, keeping there a really effective and undebilitated English force, and rendering that more available by a strong reserve of English, and of hill natives under English alliance. The hills are our great barrier against Russia, and the real bulwarks of India.

What has been done for hill settlement—with whatever complacency it may be regarded in India—is really very small. When we proved our case years ago, the Government of India promised us that one-fifth of the European troops should be placed in hill cantonments, but this has not been carried out, because the cantonments have not been provided, and are now in some cases being constructed. Thus the sanitaria have in ten years received a very slight extension and expansion. The measure of their favour is that about 2,000 invalids can yearly be sent up for the recovery of their health. The sanitaria and hill stations available for military and civilians may be briefly grouped. For Bengal there are Darjeeling and Shillong; for Almorah, Nynee Tal, &c.; for Dehra Dhoon, Landour, and Mussoorie; for the Simla district, Simla, Juttogh, Dugshaie, Subathoo, Chikrata, and Kussowlie; for the north-west, Murree, Dalhousie, and Dhurmsala; for Scinde, Ghizree; for Rajpootana, Mount Abos or Erinpore; for the south, Mahabuleshwar and the Neilgherries, with Ootakmund, Koonoor, and Kotageri. Parisnath is now occupied, and Cherrapoonjee is abandoned as being too wet.

Nothing has been done for extending our hill territories beyond the extension of Darjeeling by the annexation of a small portion of Bhotan. It was long since recommended that Lahoul and Kangra should be occupied, and that some arrangement should be made for the transfer of Cashmere, so that it may be adopted as a European country.

Although the railway system has been extended, and affords better access to the mountain regions, the subject has been neglected, and systematic communication has not been supplied. It is only now that transit from Madras to the southern hills is provided. Darjeeling is still without a through railway, no progress having been made in ten years, although 200 miles alone are wanted to place it within a day's journey of Calcutta. Simla is unprovided. During all this time of delay and inaction, what are called mountain railways have been making progress in Europe and America. A comparatively limited series of lines would make the hill stations thoroughly effective and available. The money is not wanting, for Russia is now taking millions out of our market to make the railways, competing with and menacing India.

Another important subject in connection with the hills, is the promotion of military colonies, which has been so long discussed, and remains unaccomplished. It is difficult to enumerate all that has been written on this subject, and, doubtless, much will be said on this occasion. It will be sufficient to point to the valuable remarks in the recent paper by General Sir Vincent Eyre ("The Sikh and European Soldier," *Journal of the United Service Institution*, vol. xi., p. 102). See also my paper on the "Hills for Military Defence," in vol. iii., for 1859, p. 18, and my work on "Colonisation, Defence, and Railways in our Indian Empire," 1867.

A satisfactory step in advance has been the recent settling of English working parties at all the hill stations. It is, however, civil colonisation which is most energetic, and I have long considered that hill settlement, and the measures dependent on it, can only be efficiently promoted by the appointment of commissioners in India and at home, on a similar constitution to Land and Emigration Commissioners. It is chiefly by the subdivision of labour, by special organisation, that these important measures can be systematically practised.

The chief points to which attention has now been directed are, the adoption of the healthy regions of the hills for our chief military and civil establishments; their development and that of the table-lands of northern and southern India by English enterprise; the advancement of trade with Central Asia; the promotion of the material and moral welfare of India by the establishment of permanent centres of English population in temperate climates; and the preservation of these results by greater security against internal revolt and external aggression.

The leading measures by which this is to be accomplished, and which it is necessary for the Indian Government to carry out, are—

1st. The placing of the European troops, arsenals, and military establishments in the hills.

2nd. The immediate construction of cantonments.

3rd. The placing of the civil establishments in the hills.

4th. The completion of the railway connexion.

5th. The constitution of a land and emigration commission.

6th. The promotion of military colonisation.

In advocating these measures, we may feel a firm re-

liance that we are promoting the best interests of both England and India, that we shall establish a firmer and more cordial intercourse between the populations, and that we shall thereby advance the cause of civilisation and the welfare of mankind.

DISCUSSION.

The Hon. George Campbell said he had listened with great interest to the paper read by Mr. Clarke, and would say at once he most thoroughly sympathised with the objects put before them, and admired the energetic way in which those objects had been described, although he could not agree with all the details that had been submitted. The title of the paper was "Hill Settlements and Sanitaria." He had some local knowledge, and would try to put before the meeting the true issue to be discussed, and in that sense they must draw a wide distinction between sanitaria and settlements. The former were places where European residents might have the opportunity of resorting, for temporary purposes, to recruit their health, whereas settlements were things of a more permanent character. There was a wide distinction, not only with regard to the objects of sanitaria and settlements, but also in the physical conditions in which one or the other could be obtained. With regard to sanitaria, he thought the government was hardly open to the censure which Mr. Clarke had so liberally bestowed upon it. With respect to civilians, he could assure them they were not really the ill-used beings which the author of the paper pictured them, but, from the Governor-General and the Lieutenant-Governors of the three Presidencies downwards, they showed ample capacity to take care of themselves, in respect of availing themselves of the benefits and advantages of temporary sojourns in the hill-countries. With reference to the military administration, too, he hardly thought Mr. Clarke had done justice to the government. He said the government had promised that one-fifth of the European soldiers in India should be settled in the hill climates. He (Mr. Campbell) was not clear, if the numbers were added up, there would not be found that one-fifth of the British troops were resident in the hill countries. He had occasionally resided in the hills, where three regiments were quartered in different places, and hill barracks were being added to very considerably; and he might say, wherever available localities were found, the government had not been backward in providing for the health of the troops. But, with respect to Mr. Clarke's observations, two things were to be borne in mind. He need not enter into the question whether the Russians came over the hills, and as to our placing troops on the hills by which they might come, it was out of our power to do so, inasmuch as we did not possess those hills, and they were inhabited by a warlike and independent race, and we could not take possession of those hills without coming into collision with them in a manner to which there were insuperable objections. Then, again, the most warlike of the people were in the plains, and it would not do to hide away the troops in the hills—they must have some in the plains and some in the hills; therefore he did not think in that respect the government of India had been seriously wanting. With reference to communications, his impression was, the government could not be blamed, because, however desirable it might be to help civilians and European subjects, there were great political considerations—military and commercial considerations—which must necessarily take the first place. Many great trunk lines had been carried out under the guarantee of the government. The Madras Railway ran to the foot of the Neilgherries. There was a gap in the communication with Darjeeling, but that was a place practically unimportant, and he thought they could hardly expect an expenditure of five millions to make a railway for the benefit of Calcutta, in respect of sanitaria in that district, unless there were prospects of its being a successful line in a commercial point of view. Hence that line was, he thought, very properly placed in abeyance to the great commercial and military lines which had been already carried out. So much for sanitaria. Coming now to the question of European settlements and colonisation in India, he thought it one of the greatest objects, socially and politically; but they must bear in mind the practical difficulties which stood in the way of it. In the first place, those localities called sanitaria, were not fitted for settlement. There was, with small exception, an entire absence of those industrial pursuits in which settlers were, for the most part, employed. They did not want a European colony on the top of a hill, where there was nothing for them to do, but where it could be useful in developing the resources of the country. He need not say these conditions were not found on the tops of the hills. Even as a matter of health, he thought those stations at 7,000 feet elevation were not the best. They wanted to rear, not an exotic people, incapable of working in the plain, but a people fit to work their way in India. As to the sanitaria, they were fitted to restore health, but not for permanent residence. It was a known fact that many of the troops stationed on these high hills had suffered in health more than they did on the plains. The soldiers did not like them. It was more like being on ship-board; the hills were so precipitous, and the intervening spaces were so narrow, that the soldiers could not take much exercise, and they did not like it. Taking it altogether, he thought the lower elevations, where the cultivation of tea and the cinchona tree might be adopted as an industrial pursuit, would be more suitable to the purpose in view. Even as to the education of the children of the soldiers, great difficulties were experienced in respect of these elevated stations; and the Lawrence Asylum, which was stuck on the top of a hill, he was afraid was not very successful. It was also found that the children themselves were not very healthy, and there was no opportunity of bringing them up to useful trades and industrial pursuits. It was too much isolated, and great objection was taken to the site. The best situations he believed to be those at an elevation of 3,000 or 4,000 feet. Then they must look where such localities were to be found. Mr. Clarke talked of Cashmere as a place fitting for European colonisation; but Cashmere did not belong to us, and was not likely to. They had heard a great deal about the horrors of annexation. They were apt to run into extremes in Indian politics. So long as revenue was to be got, we annexed province after province. Having annexed those of pecuniary value, it would seem we were seized with qualms of conscience, and would not annex any more. Though the policy might be good in a revenue point of view, still, in a colonisation point of view there was a good deal that was unfortunate. We could not have the merit of that excellent conscience which demurred to annexation, and at the same time have the fruits of the country which might be annexed; because it happened that a large portion of country most fitted for European colonisation belonged to native chiefs, and the Maharajah of Cashmere, having a son of adoption, unless he rebelled our recent change of policy would render it impossible to acquire Cashmere, and, therefore, we could not hope for colonisation there. The same might be said of Mysore. There were several cities in the neighbourhood of Simla ripe for annexation. Now, from the change of public opinion, we had set up adopted sons of the present rulers there, and they were not to be annexed at all. We must, therefore, bear in mind that the districts of country suited for colonisation were unfortunately limited. There was Kangra, half of which was possessed by native chiefs. Again, there were the Simla hills, but with no considerable extent of country, and, in addition, Kumâon and Darjeeling, the latter being small in extent. But we must bear in mind these were very precipitous countries. The natives performed the little

labour that was carried on on the sides of the hill with difficulty. There was no great space available for Europeans under the circumstances. Then in Central India they had more land available than in all the other parts together, and there were tracts at a considerable elevation in which the climate was moderate and temperate; but it so happened that those districts were extremely unhealthy, and until they were cleared there could be no hope of European colonisation there. Then at the back of the Ghâts there was a tract of country where colonisation might be carried out, and also in the neighbourhood of the Neilgherries. We must not be too sanguine, but still there was a good deal of land available and we must obtain it, not in the extremely high country, but in districts where products might be grown —say at an elevation of 3,000 or 4,000 feet. The question was, what were we to do to promote colonisation, the object being most desirable. One of the grand difficulties was, how we were to acquire the land. There were rights of native chiefs to be regarded, but this he might say, as a view he had for some time entertained, that it was possible to encourage colonisation, and apportion to Europeans a part of the country where they might feel at home under their own laws and institutions, under a similar division of territory to that which the French had adopted in Algiers, which was, to form tracts for European colonisation as distinct from the great territory beyond. He did not advocate military administration, but it was competent to make distinctions between the territories; and in those regions capable of colonisation, we might draw a distinction between European character and native character. He believed in the lower hills we might have something in the nature of colonisation. We might pass measures to commute the rights of the chiefs, and provide land favourable for Europeans. Another point on which he agreed with Mr. Clarke was that military colonisation was most desirable to carry out. The principle to be adopted was that which was recently so ably advocated in this room by Mr. Cole, that we should not merely have soldiers paid all the year round as soldiers, but that, like the continental system, having passed through military training, they should subside into some useful life of activity. His own idea on the subject was, when soldiers had served a certain time, instead of sending them home with a small pension, it was good economy to offer them larger pensions to remain and settle in the country, and constitute a military colony, available for service in exigencies. They could be called up once a year, as our own militia was. Such a system would encourage men with knowledge of various handicrafts to remain in the country, and exercise their trades for the benefit of the colony. In that way we might do a good deal for the soldiers and for the security of the country. That idea had his most entire concurrence.

Mr. Charles Horne said he had been requested to say a few words with regard to Kumâon, where he had resided for five or six years. He had seen a good deal that was going on in the way of colonisation. Many of the colonists were tea-planters; some were retired serjeants and other non-commissioned officers of the army, who had saved some money, and from superintending plantations came to be planters on their own account. He could say in every case within his knowledge, where they were steady, sober, and well-conducted men, they had succeeded. It would be a great difficulty in any place he had seen on the hills to settle a colony. In the first place, there was no space for any extended industrial occupations. He had seen only one instance in which there was space for one large farm; in others there was space for two or three small farms, a short distance from one another. These were scattered round villages where three or four tradesmen might settle, to supply the material wants of these scattered colonists. If this system were adopted by retired soldiers, and government gave them land, it would be highly desirable. The great difficulties in the matter were, in the first place, the extreme isolation, and the difficulty of educating children. The complaint was that they must grow up like savages; there were no schools for the education of such children. Many of the planters took to growing vegetables and fruit, which they disposed of at the station. But there was one great difficulty which he was afraid would interfere with all colonisation in that part, that was the want of proper roads. Even the footpaths were such that it was with difficulty little ponies could be got along them, and the only means of transporting tea was on the backs of coolies or ponies. He had seen strings of ponies carrying three or four 11 lb. boxes of tea each. The district itself was easy of approach, and he had been informed that the Government had sanctioned the construction of a light line of railway in connection with the East Indian Railway. The Kumâon Iron Company, in which he was interested, broke down some years ago from the want of such railway communication. One of the great difficulties with regard to the hills was the great expense of getting anything to eat, not to say luxuries, but such things as flour, and the simplest necessaries of life. The expense of keeping troops under such circumstances was very great. The men required their rum and beer, and other things, the same as if they were in any other quarters. As to cantonments, when he was there last year they were going on rapidly with the construction of barracks for 1,000 men a few miles from Nynee Tal. It was a hog-backed mountain, so level on the top that one might drive in a carriage, where the roads were made from three to five miles on a level, which was a great thing to say. As the crow flies, the distance to the foot of the hills was not more than ten or twelve miles, but, as the roads were being made, the distance would be forty or fifty miles to come out on the plains of Ramnuggur. In this way another thousand men would be disposed of to Mr. Clarke's satisfaction. There were other localities which might be mentioned as suitable for the objects in view, one of which was Ghorka, where a military station was provided for native troops. That was a place where a colony might be settled, and consisted of a large level basin enclosed by hills, while Nynee Tal was a hollow formed in the hills from the falling in of masses of rocks, &c., extending about one mile in length, by half a mile wide, and was 6,500 feet above the level of the sea. That was of course a very limited valley, but over the whole of the Kumâon district, there were spots favourable for settlement. The formation of these settlements would enable them to understand the tenure of the land—what belonged to one village and what to another. At the present time a man might go to the top of a hill and pointing to the opposite hill, say, "That is my estate." It was not clear where the estates did end. The unfortunate planter settled down and planted his tea on the land obtained from the zemindars, and immediately his land was overrun by hordes of natives. He might be told he must fence in his land, but fancy the difficulty of fencing in an estate on the hill side! The roads were pretty good in that province, particularly that made by Colonel Ramsey into Tartary; but it was like making a road to an impassable ditch, inasmuch as nobody could pass through the tribes of Tartary. There was a curious fact connected with that part of the country. At the time he first went to India, Almorah was the great emporium for borax brought from Thibet. It was the great mart for that article, but the road we had made along the valley had had the effect of diverting that trade almost entirely to Ramnuggur. Mr. Campbell had spoken of the wealthiness of the large tracts of land of the Central Provinces. In 1844, he (Mr. Horne) was engaged in carrying out the canal from Shahpoor in connection with the irrigation of Terai, and such had been the effect of that upon the climate that last July he saw people coming from the hills to the plain. The climate had been so ameliorated by the clearing of the land, that people preferred to reside all the year

through at Terai rather than repair to the hills during the hot season.

Sir Vincent Eyre regretted that he arrived too late to hear the whole of Mr. Clarke's paper, but he perceived that gentleman had made mention of his humble efforts in the direction of military colonisation when he was in India, a subject on which he then and still took a great interest. He agreed with Mr. Campbell that, if colonisation was to succeed in India, it must be military colonisation, because it would be under more perfect control than any other. He had always regarded it as a great mistake that we should not long since have turned our old soldiers to some such excellent account, instead of allowing them to come home to be half starved on small pensions. They would be more happy and more useful as colonists. He had been much struck with regard to Russian progress in India, by the fact that every step of that progress had been marked by the founding of colonies; and he had no doubt that was the only true method of procedure, to advance step by step, and take root as they went along through the wild countries they had had to overcome. With regard to our own position in India, we certainly had a very fine army there, both in the hills and on the plains, but we knew in troublesome times we had to leave large tracts of country almost undefended; and, during the troubles of 1857, it was remarkable how successful small bodies, even of railway engineers, were, located together, in keeping the peace round their own districts, and even aiding in military operations. Hence he was very glad to see Mr. Hyde Clarke make this move with regard to so important a subject, and he hoped it would not be allowed to drop. He thought it would be easy to establish a beginning of military colonisation. He believed in every regiment which remained in India for any time there would be found candidates perfectly qualified and delighted to join in any well-organised attempt of this kind. He knew attempts had been made on a small scale, without proper organisation, and from those no proper idea could be formed of the success of such an undertaking. He believed if in every regiment located in India there was founded a colonisation fund, to which the soldiers might subscribe from the time of their first enlistment, so that, at the end of their period of service, they should have amassed a certain sum with which to set up in life, with the aid of their pension, and such other assistance as the government might be disposed to grant, they might get on extremely well. It would be necessary to select only men of good character. Those of intemperate habits would be worse than useless; but we had an ample supply of good steady soldiers, with wives and children, whom it would be most beneficial to themselves and to the government to organise as military colonists in such places as the Neilgherries and Darjeeling, where they might employ themselves in the cultivation of such products as tea, coffee, and the cinchona plant. It was part of his own experience in India to found a colony himself, but it did not consist of Europeans; they were half-caste natives, descended from the old Portuguese settlers. When he received an appointment at Gwalior, he found a great number of these men turned adrift, on the disbanding of the Mahratta army. They were going about in great distress, and many of them had families. They were all Roman Catholics. He was visited by their priest, a Franciscan friar, who was delighted to find some one who took an interest in his flock, and confirmed all he had heard with regard to the distress of those people. There were between 200 and 300 families. He made an appeal to the public on their behalf, and was able to raise nearly £1,000. His first idea was to settle them in the Gwalior territory, but the Maharajah was opposed to it. He found there was available land in Dherra Dhoon, and there he purchased some excellent land. He first of all sent three or four of them to judge for themselves; they went 300 miles up the country, and came back perfectly delighted with the prospect before them. Not one of these men had ever been employed in husbandry work. They were chiefly drummers and fifers, serjeants, and some native officers. The little band, headed by their Franciscan friar, started in procession for their new quarters, and were favourably received by the superintendent of Dherra Dhoon. On reaching their settlement they immediately commenced building habitations and laying out gardens. They also built a church and school, and for three years that colony went on well. At the end of that time, thinking that, in case of his death, they might come into trouble, he made over the land to the Roman Catholic archbishop, and washed his hands of the thing, but continued to take an interest in it. The experiment would have gone on well, so far as the people themselves were concerned, for they bred fowls and goats, and cultivated sugar cane and other things, as well as vegetables for the market; but the climate proved unfavourable—less favourable than he was led to expect. For two successive years they lost their cattle from murrain, and the people were smitten with fever. They gradually emigrated up to the mountains, and the land was disposed of to good account, and was now occupied as a large tea garden, under European planters. If such men as those could succeed, he did not see why Europeans with greater physical powers and higher class of character, should not also succeed.

Mr. Edwin Chadwick, C.B., said—I beg to submit for consideration one set of means necessary to getting settlement and succession by Anglo-Saxons in India, namely, by practical applications of sanitary science and art, which shall make it habitable for children. It is asserted by many as a dogma, which is widely prevalent (and it is very generally tacitly assumed by civil officers of India), that the children of English parents, as they do not, so they cannot, thrive there, but die out, and that there can be no British succession. It thence follows, according to this doctrine, that all there is to do, at least for civil servants and men in office, is to get as much money as they can—get as long furloughs as they can, and leave India as quickly as they can—leaving the lower sort of people, who know no better, to stay and die out. The truth of this dogma is the primary question to be determined, for it determines the question of settlement and our policy in relation to India. Now, my own sanitary researches would enable me to point out conditions of urban districts at home of which the same dogma may be predicated—conditions in which there is now no succession. Here in London, there in Liverpool, in Manchester, and in Glasgow, there are districts inhabited chiefly by immigrants from the rural districts, who become sickly and squalid, have their period of working ability considerably diminished, and of whose children more than half are in their graves before their fifth year, and those who survive are stunted and puny, and the successors rapidly die out. I directed particular inquiries on this point in some old and low districts in the metropolis, and it was reported to me that there really was no succession, and that the population was an immigrant one, there being very few who had been born there. My sanitary service rendered it necessary that, on the advent of the cholera in 1847, I should inquire as to its sources in India. I had, with my colleagues, to take measures to meet the epidemic visitation in the West Indies. For these purposes I carefully consulted returned medical officers—who, in India or in the tropics, had served in the most severe attacks of epidemics—as to the conditions in which those epidemics arose and were propagated, and especially as to infantile mortalities. From all I could learn, it was clear to me that the European of good condition can stand simple heat—the heat of pure air, uncontaminated by any aërial poison. Excessive heat certainly reduces strength somewhat, and diminishes the restorative effects of sleep, but does not, that I could learn, of itself induce disease, though, of course, it increases the susceptibility to malaria, or to passing causes of disease. The main causes, however, of excessive in-

fantile mortality in India, into which I have specially inquired, are everywhere gross, and such as occasion sickness and more or less of infantile mortality here, and are such as we know to be, in a great degree, and often entirely, preventible by sanitary means; and when by proper sanitary measures—which have yet to be made prevalent in India—you prevent them, you may have succession and permanent settlement. In the West Indies also, it is a dogma that pure white people cannot work there, or rear children, or have succession, yet I met with an instance of a settlement, in one parish, of Germans, who had cleared a wood, had performed labour such as it is declared that no whites and only the negroes can perform, and these produced sugar, and had children, and, being of temperate habits, are now in a third generation and advancing to a fourth, refuting the superficial dogma, and proving the possibility of succession. In India the death-rate in our army has averaged upwards of sixty in a thousand, and, if it had gone on at that rate, it would have been difficult to maintain an army there. In answer to the revelations of our Sanitary Commission for the Indian army, this rate was attempted to be denied by the Indian Government, and it was represented that they had not been neglectful of the physical well-being of the army, but had improved it; and, taking one exceptional year, it was made out that the death-rate was not above twenty in a thousand. The Sanitary Commission gave a remarkably complete and decisive answer to this discreditable misrepresentation, which ought to have been visited with serious official censure. But the death-rate is now, I believe, by measures which ought to have been taken long before, brought down to about twenty in a thousand. I observed it stated in the French army medical statistics that the death-rate in their army in Algeria had been reduced to twelve in a thousand—that of our Guards in London having been 20. I thought it my duty to bring this fact of the results of the application of sanitary science in Algeria under the notice of the Sanitary Department of the War Office. At first it was disbelieved, for the death rate in Algeria had been seventy, eighty, and even as much as a hundred in a thousand, and the ravages amongst the first colonists even proportionate, and settlement, by the French race, pronounced dogmatically to be as impracticable in Algeria as certain official men lazily allege it to be in India. But Earl de Grey was good enough to appoint a committee to visit Algeria, and, with the assent of the French Government, to examine into these most important facts for India. This committee included Dr. Sutherland of the Army and the Indian Sanitary Committee, Dr. Logan, the present chief of the Army Medical Department, with Colonel Ewart, of the Engineers, who had served in India, and Mr. Robert Ellis, C.B., secretary of the Sanitary Commission of India, now secretary of the Madras Presidency, one of the ablest of the able administrators that India has produced, and who himself has, on two great occasions, by his measures, warded off severe visitations of cholera. This committee, after a full examination, verified the French army medical statistics, and the fact of the sanitary achievement of reducing the death-rate of the army, and maintaining its strength; and, more than that, they found example-districts where three bodies of troops had been decimated and three sets of colonists had been cleared away; where, by the sanitary improvement of the habitations for the settlers, as well as of the barracks, by bringing in fresh water, and by proper house and court drainage works, carrying away the foul water and excreta, and, apparently, more especially by carefully opening up the adjacent lands by culture, at proper times, and in proper modes, so as to avoid the fevers common to that process in such climates, by clearing away redundant timber, and by a high and complete culture, they succeeded in subduing malaria, whilst they raised produce, and reduced the excessive sickness and the death rates. Previously, the infantile death-rates had exceeded the birth-rates; a condition in which, of course, settlement and succession was impossible. But now in these spots the birth-rate exceeds the death-rate, and they found that upon those former seats of deadly pestilence—now of good agricultural production—crops also of strong healthy children, as strong as any in the agricultural districts of France, are raised and flourish. The able Indian commissioners agreed that these great examples were applicable to India, and they have yet, by honest competent government, to be made known there—and by officers competent in sanitary science to be made prevalent there. But not a single model town or district for the civil population has yet been produced or attempted there, as far as I can learn. The first thing for settlement, be it borne in mind, is to provide assured sanitary means and care of the living of the children of settlers. The only means that appear to be thought of are the hill sanitaria. It appears to be considered that, as you rise in height, you rise above the sources of disease; of some diseases, from bad sanitary conditions in the plains, you do, but you enter into others of bad sanitary conditions also. As you leave a hot for a cold climate, you by no means ascend into the perfect salubrity assumed, for such changes are too frequently only changes of the forms of disease; a change of the diseases of a hot for the diseases of a cold climate—if the hills be not, under competent sanitary science, put in befitting sanitary conditions. I beg to present some examples of the conditions of the so-called hill sanitaria. I cite the report of the Indian Sanitary Commission, from Indian official evidence on this most important point. They state generally as respects the hill stations:—"The stations being generally on ridges and near ravines, afford great facilities for perpetrating all kinds of nuisance. There is a large native population, over whom very little sanitary inspection is exercised. At Simla, the 'conservancy' is described as being as bad as it could be, the ravines full of dead animals, together with the ordure of many thousand natives. There are no public conveniences. The water supply was scanty, and liable to pollution. The effluvia from the ravines were 'as strong as on going into a sewer.' A large amount of hill diarrhœa prevailed among the residents, which Surgeon-Major Grant attributed mainly to want of sanitary precautions, and neither to the elevation nor to the damp atmosphere. He states that the disease had gradually increased with the increase of population, and that 'the authorities seemed to think that, because the climate was cold, the men might be crowded together, and all sanitary arrangements neglected with impunity.' The men were crowded together at Kussowlie with fatal results. Colonel Greathed informs us that, when the rains begin, the nuisance produced by the washing down of the filth is intolerable. The reports on the stations give the evidence of a number of officers on this same subject. We learn from them that the barracks at several stations in the Simla group, such as Subathoo and Kussowlie, are bad in structure and plan; that at Mount Aboo the barracks are erected in a malarious gully; that at Nynee Tâl, 7,600 feet above the sea, the huts have been built in a narrow defile, where the earth is damp, and a perfect marsh during rains, and where the huts are exposed to violent gusts of wind. The bazaars are filthy and crowded. There are neither drains nor latrines, and 'the stench is at times overpowering,' causing nuisance in the barracks. At Darjeeling the medical officer reports the sanitary condition of the hospital for convalescents as 'bad,' and he states that he had been making representations for five years as to a privy under a verandah connected with the hospital, before he could get the nuisance abated, which rendered the ward so offensive that the sick had to be removed out of it. The drainage is defective, and 'the inducements for the sick to remain dirty are,' he thinks, 'greater than those to be clean.' The hill stations on the Neilgherries are not exposed to the same objection

as regards climate; the rain-fall is much less, and the air is drier; there are fewer fogs, and altogether this group of stations is perhaps the best yet occupied. But even here the usual fatality followed neglect of very obvious sanitary measures. When the station at Jackatalla, now called Wellington, was first occupied, much disappointment was experienced on account of the high rate of sickness and mortality. The mortality of the 74th Highlanders, during three years at Jackatalla, was at the rate of 39 per 1,000. Of the 68 deaths in the regiment, 19 deaths were by dysentery, 6 by diarrhœa, 8 by cholera, 6 by apoplexy, 9 by hepatitis. The barrack square 'was frequently an immense swamp.' In 1860 the mortality of the 60th Rifles, third battalion, was at the rate of 24 in 1,000 at Jackatalla; the mortality of the 66th Foot at Cannanore was 11 in 1,000 during the same year. Cannanore is on the coast, and 20 feet above the sea level. On inquiry into the causes of this sickness, it was discovered that, besides want of attention to drainage, the large body of from 2,000 to 3,000 workmen employed on the buildings had been under no sanitary control, so that the ground for miles about was 'one immense privy,' and the troops suffered to a great extent from bowel disease in consequence; but since sanitary arrangements were thoroughly carried out, the sickness has been under one per cent. of the strength. One thing is quite clear, that it will never do to trust simply to elevation above the plains to keep the army in health. Malaria has been blown up ravines in India far above the fever range, over sites otherwise perfectly healthy; and those who slept within its influence have been attacked with fever and died. We have shown that epidemic disease originates at hill stations just as it would do at unhealthy stations at home. Hence, in selecting sites on hills, all the precautions necessary for selecting sites on plains are just as necessary. The climate, exposure, sub-soils, drainage, water-supply, local diseases, and the relation to distant sources of malaria, require careful examination; and all buildings, whether for European troops or natives, must be subjected to the sanitary conditions as to structure and supervision which are everywhere required." Now, this is a mild statement—an epitome of much of the civil government of India. To one conversant with sanitary science, it is only necessary to know of such death-rates, and to know of such cases of death by dysentery, diarrhœa, and epidemic cholera, to be certain of the existence of such local causes or antecedents as those above described. And if they mow down strong men, what chance have women and children against them? What chances are there of succession under such neglect? Mr. Campbell states that civilians in India know how to take care of themselves. This may be questioned, from the extent of their invaliding, and their squalid appearance here. But, most certainly, they as yet have a miserably small knowledge of how to take sanitary care of the people they are appointed to govern. It may be said that better care has been taken of these matters since the returns I have cited were made. But here is the fact, that cholera and preventible disease are yet rife in the hill sanitaria—the places of refuge. In 1867, Murree (which is 7,800 feet above the sea), Sabathoo, Dhurmsala, and Kassowlie, were all ravaged by cholera. Ottacammund, a place of a particularly fine climate, 6,000 feet above the sea, vaunted as a sanitarium—and justly so, probably, if there were any proper sanitary care of it—has recently been infested with typhoid fevers, and has gone on from bad to worse, and is now reported to be in so bad a condition, with all its elevation and climate, as to make it dangerous for invalids to resort to it at all. Here is a pretty state of civil care and local government! It is characteristic of it, that objections are made to sanitary service and works on the score of expense, which, if the works be properly prepared, is an ignorant objection to the means of staying waste—pecuniary waste—objection to the means of the largest economy. Sanitary works, like other things, are to be tested by the results—the saving of sickness and the prevention of premature mortality. In India, I find works condemned for their inutility here reproduced there—enormous expenditure for large main-sized sewers, which detain what sewers properly adjusted should remove — sewers made without due and complete connection with houses; water carried into town districts without due means of removing the foul water, and thus aggravating bad subsoil drainage and creating swamps; water for the supply of town populations, gathered into open reservoirs, so as to engender dangerous impurities; foul surfaces attempted to be corrected by latrines which, not having due provision of water for constant cleansing, were concentrated poison pits for all those who used them—large works, by per-centage-fed civil engineers, who profited by the extravagant cost of works, irrespective of results. All this in defiance of exposures at home, and of principles and works proved by long trial, and the reduction of death-rates. There must be better government than this in India, or children cannot be raised there, and there can be no succession and no settlement. And certainly the recent great lesson gathered in Algeria must be made known and made prevalent, for it does not suffice, even for the protection and maintenance of our military force, to put camps and cantonments in a good sanitary condition, without putting also the surrounding land, the adjacent towns and civil populations, in the like condition for rearing children, and keeping settlers for cultivation.

Mr. Turnbull remarked that Mr. Campbell had drawn a distinction between the character of the hill people and those inhabiting the plains. His own experience had been with the latter; and if Mr. Hyde Clarke meant to set up a large tract of land in Bengal, and place there as many Europeans as could live on it, under habits and institutions of their own, he could understand it; but unless he was going to fence them round, it was one of the most dangerous things he ever heard of. To introduce thousands of Europeans into the middle of Bengal in that way would be frightful. He knew what Europeans could do perfectly well. The regulations of Bengal, so far as the English were concerned, were right and just, and they must have some code of regulations, but they would be inapplicable to the native character. It would be like using a net in the Ganges with meshes large enough to let every fish go through. They would be obliged to take care of themselves in the best way they could. With regard to what Mr. Chadwick had said as to sanitary conditions in India, he agreed with every word. He knew many of the stations, and had been in some. In Bengal he never strolled outside one of the stations without seeing exactly what Mr. Chadwick had described. It was the same in Calcutta. The moment one got beyond the fine houses of the Europeans, they found the same state of things, indescribable by Englishmen. He had been told by artillery officers that their station was under water for a great part of the time. The higher ranks of civilians might avail themselves of the sanitaria, but there were a great many who could not. He knew habitations in which four or five families lived, amounting to 30 or 40 persons. That locality was visited by cholera, and it carried off sometimes over 20 people in one house. There was no necessity for the people to live in that way, and he thought some efforts ought to be made in that direction. He had been struck, on going to Calcutta, with the appearance of the Europeans living there; he presumed it was from the general unhealthiness of the place.

Mr. Edwin Chadwick said, as a general rule, one might test the nature of the civil administration in going through a town by the nose.

The Hon. George Campbell wished to explain, with regard to the sanitary question, that he was not altogether a believer in the sanitary science of the present day. He thought they were groping their way. He denied that sanitary science alone could put a stop to cholera and fever; but, whether sanitary science were

good or bad, we were overrun with it, and parties ran wild on sanitation. He thought Mr. Chadwick had put Algiers in a more favourable light, and British India in a less favourable light than it deserved.

Colonel Hayley moved the adjournment of the discussion to Friday evening, 23rd instant, which was agreed to.

Cantor Lectures.

The second lecture of the course "On Applied Mechanics," was delivered by John Anderson, Esq., C.E., Superintendent of Machinery to the War Department, on Monday evening, the 19th inst., the subject being "Applied Mechanics in relation to Natural Properties of Materials." John Hick, Esq., M.P., occupied the chair.

This course of lectures will be published in the *Journal* during the vacation.

Nineteenth Ordinary Meeting.

Wednesday, April 21st, 1869; Edwin Chadwick, Esq., C.B., Member of Council, in the chair.

The following candidates were proposed for election as members of the Society:—

Addison, Colonel, 23, Argyll-street, W.
Ansten, Frederick G., 32, Alpha-road, N.W.
Bayley, Charles John, C.B., 51, Victoria-road, Kensington, W.
Blaikley, Alexander, 6, Courtland-ter., Kensington, W.
Bodmer, Louis Rudolph, 2, Lansdowne-road, Notting-hill, W.
Braid, Charles, 13, Westbourne-park-road, W.
Brandon, Thomas Cooke, 22, The Grove, Boltons, S.W.
Burstow, Charles, Saville-house, Lorrimore-square, S.E.
Bycott, Thomas, 7, Gloucester-place, Portman-square, W.
Calvo, Nicholas Antonio, 8, Devonport-street, Hyde-park, W.
De Marcoartu, Arturo, Langham-hotel, W.
Earnshaw, Edwin, 17, Fenchurch-street, E.C.
Gregson, Matthew, Liverpool.
Lock, Frederick, Epsom.
Pitcairn, Robert, 2, Old-square, W.C.
Thomson, E. H., 12, Buckingham-street, Strand, W.C.
Watt, Robert, Ashley-avenue, Belfast.
Wimshurst, Henry William, 22, Great St. Helen's, E.C.

The following candidates were balloted for, and duly elected members of the Society:—

Alex, Ephraim, 5, Brook-street, Grosvenor-square, W.
Altmann, Henry J., 16, Caroline-street, Bedford-square, W.C.
Anderson, Francis, M.D., 47, Arundel-gardens, Kensington-park, W.
Armstead, H. H., Bridge-house, Eccleston-bridge, S.W.
Barlow, W. H., High Combe, Old Charlton.
Bath, Edward, Law Clerk's Office, Waterloo-bridge Station, S.E.
Bedford, Edwin, 5, Royal-crescent, Notting-hill, W.
Bell, George S., 110, Great Russell-street, W.C.
Benson, William, 147, Albany-street, N.W.
Brooke, George, 72, Myddelton-square, E.C.
Brooks, James, 11, Serle-street, W.C.
Berry, Thomas, 1, Halkin-street, Hyde-park-corner, S.W.
D'Orsey, Rev. Alexander J. D., 13, Prince's-square, W.
Hichens, Captain William, Royal Engineers.
Norton, Thomas Sterry, Lestelle, Sydenham-rise, Forest-hill, S.E.
Thorne, Eliseus, The Thorns, Worcester-park, near Kingston-on-Thames.
Wigan, Frederick, Clare-lawn, East-sheen, S.W.

The Paper read was—

ON TRADE MARKS.

By W. Wybrow Robertson, Esq.

I find, on referring back so far as to the evening of of Tuesday, the 23rd of March, 1762, that the ladies and gentlemen of London were informed at their tea-table, by means of the then fashionable journal of the day, the *St. James's Chronicle*, of the following fact:—

POSTSCRIPT.
Intelligence Extraordinary.

Strand.—The Society of Arts, Manufactures, and Commerce are preparing for the annual Exhibition of Polite Arts, hoping by degrees to render this nation as eminent in taste as war; and that by bestowing premiums, and encouraging a generous emulation among the artists, the productions of paintings, sculpture, &c., may no longer be considered as exotics, but naturally flourish in the soil of Great Britain.

Immediately under this notice there followed another, which, even in this assembly, I must admit was in the nature somewhat of a squib on the Society:—

Grand Exhibition.—The Society of Sign Painters are also preparing a most magnificent collection of portraits, landscapes, fancy pieces, flower pieces, history pieces, night pieces, sea pieces, sculpture pieces, &c., designed by the ablest masters, and executed by the best hands in these kingdoms, &c.

But a little while after, this exhibition was opened in Bow-street—the hours, nine till four; admission, one shilling—and a perfect storm of controversy arose in the journals of the day. The then, as I trust now, worthy members of the Society of Arts were terribly ruffled, and persisted in seeing in it a *persiflage* of their exhibition just then opened. To this animosity, however, we owe a record of the signs then exhibited; and Bonnell Thornton's Exhibition of Sign-boards became famous in its way. I have touched on this point, for to sign-boards we can trace the origin of trade marks, the affinity between them being very strongly marked.

Taking a retrospective glance, we find that the Egyptians, without doubt, displayed incriptions denoting their trade, with the emblem which indicated it. The Greeks also used signs. Athenæus says, "*αἐν Προτεροῖς θηκη διδασκαλίην*;" he hung the well-known sign in front of his house. Amongst the ruins of Herculaneum and Pompeii, many Roman signs have been found let into the pilasters at the side of the open shop, as a goat, by a dairy; a mule driving a mill, at the bakers; whilst at the door of the schoolmaster was the not over tempting allurement to knowledge of a boy receiving a good birching. Doubtless, in this country, our ancestors adopted the sign-board from the Romans. At first an object typical of the trade was used, but as the number of traders dealing in like wares multiplied, something more was needed. The desideratum was to give to the shop a name or token by which it might be known, and customers sent to it, and rival tradesmen tried to outvie each other in the magnificence and size of the particular mark or sign denoting their business. These signs were looked upon as heirlooms, and descended from generation to generation, like the coat-of-arms of the nobility. The booksellers, for instance, had a wood-cut of their signs for the colophon of their books, and this was the case with the "Brazen Serpent," the sign of Reynold Wolfe. His trade was continued a good while after his demise by his wife Joan, who made her will on the 1st of July, 1574, whereby she desired to be buried near her husband, in St. Faith's Church, and bequeathed to her son, Robert Wolfe, the Chapel-house (their printing office), the "Brazen Serpent," and all the prints, letters, furniture, &c.

Whilst at as early a date as that of Benedict Hector, one of the early Bolognese printers, complaints of piracy are recorded—in his "Justinus et Florus" he thus writes:—"Purchaser, be aware, when you wish to buy books issued from my printing-office; look at my sign, which is represented on the title-page, and you can never be mistaken; for some evil-disposed printers have affixed my name to their uncorrected and faulty

works, in order to secure a better sale for them"—so, also, we find a like complaint in the preface to Alder's "Livy," 1518:—"Lastly, I must draw the attention of the student to the fact that some Florentine printers, seeing that they could not equal our diligence in correcting and printing, have resorted to their usual artifices. To Alder's 'Institutiones Grammaticæ,' printed in their offices, they have affixed our well-known sign of the 'Dolphin wound round the Anchor.' But they have so managed, that any person who is in the least acquainted with the books of our production, cannot fail to observe that this is an impudent fraud. For the head of the dolphin is turned to the left, whereas that of ours is well known to be turned to the right."

At a time when few could read or write, sign-boards were indispensable to the trader, and even as late as 1802-3, C. A. G. Gœde, in his "Memorials of Nature and Art, on a Journey in Great Britain," writes—"As it is one of the principal secrets of the trade to attract the attention of that tide of people which is constantly ebbing and flowing in the streets, great pains are taken with the signs and devices that are hanging before the shops, and, as soon as a shop has acquired some degree of reputation, the younger brethren of the trade copy its device. A grocer in the city, who had a large beehive for his sign, had allured a great many customers; no sooner did the people swarm about this hive, than at other shops the old signs disappeared and beehives elegantly gilt were substituted. Hence the grocer was obliged to insert an advertisement in the newspapers, importing that he was the sole proprietor of the original and celebrated beehive. A similar accident befell the shop of one E——, in Cheapside, who had a considerable demand for his goods on account of their cheapness and excellence. The sign of this gentleman consisted of a prodigious grasshopper, and as the insect was quickly propagated throughout the City, Mr. E——, in his advertisements repeatedly requested the public to observe 'that the genuine grasshopper is only to be found at his warehouse.' He was, however, enabled to persuade several young beginners to enter into engagements with him on advantageous conditions, by which they obtained a licence for hanging out the sign of a grasshopper before their shops, expressly adding this clause in large capitals, that 'they are genuine descendants of the renowned and matchless grasshopper of Mr. E——, in Cheapside.'" But these were rather isolated instances, for as education spread abroad, so had sign-boards fallen into disuse, and when the system of naming each thoroughfare and numbering each house came into use, the chief value of the sign-board was gone, and they lingered on, rather as instances of decorative fancy or as advertisements of established reputation and business success.

I will not trespass longer on signs or their history. They call up many a picture of the olden time, many a trait of bye-gone manners and customs, old shops, old residents, and many an hour might be whiled away in pondering over the ancient tenements known by their signs, the tavern, with its noisy company, the coffee-house, with its politicians and beaux, the mercer's, crowded with many a dame and admiring fop, or the bookseller's, filled with the monuments of departed minds.

The sign-board has served its purpose and died away, but from it we can trace the origin of trade marks. The merchant or manufacturer who had placed his sign before his shop had, in the seventeenth century, transferred the same to his trade tokens, or brass farthings, which were issued stamped with the sign of the shop and the name of its owner, whilst, from a still earlier date, as we have seen, printers had used a woodcut of their signs for the colophon of their books. So, in time, other manufacturers came to stamp or mark the goods they sold, either with their name and address or with some peculiar mark or device, for having acquired some reputation in the trade and with the public generally, the manufacturer sought to protect his good name therein by affixing some mark or brand by which his goods might specially be known. As this custom became more general in trade, as gradually well-known marked and branded goods came into demand, so also did a system of piracy spring up amongst a set of unprincipled traders, destroying the fruits of honest industry, intelligence, and skill. Not only was the merchant's trade injured, but the character and reputation of his manufacture was impaired, if not destroyed. The home trade, without question, suffers extensively from this fraud, and the British manufacturer is seriously injured by it in his colonial and foreign intercourse. There is scarcely a single article of British manufacture that is not now fraudulently imitated in France or Germany, and thence spread over the rest of the Continent. The spurious goods thus manufactured are exported also in large quantities into British as well as foreign dependencies, whilst the greater part of the merchandise passing for English manufacture in the East and China, has no claim whatsoever to that character.

I have already noted how, as early as 1518, the printer had complained of his trade-mark being imitated, and we know that in the time of Elizabeth an action on a case for a deceit was held to be against a clothier, who put on his inferior cloths the trade-mark of a clothier who made superior cloths. The first reported case on the subject at law was in 1783, before Lord Mansfield, who said that the plaintiff had no property in the name of his medicine (Dr. Johnson's Yellow Ointment), yet, if the defendant had sold medicine of his own under plaintiff's name or mark, that would be a fraud, for which an action would lie. The remedy at law was firmly established by this decision, and in the next reported case, in 1824, Sykes *v.* Sykes, the principle was admitted, for the case was defended on the ground that the defendant had no intention to defraud. This principle has been further developed and confirmed in Blofield *v.* Payne, 1833; Morison *v.* Salmon, 1841; Crawshay *v.* Thompson, 1845; Rodgers *v.* Nowill, 1847; and now under the Merchandise Marks Act of 1862, the Court of Common Law can grant an injunction to restrain the use of a trade-mark. In the Court of Chancery the remedy for infringement of trade-marks was accorded later than in the courts of law. In 1742, Lord Hardwicke, refused to restrain a defendant from imitating the plaintiff's mark on cards. In 1803, Lord Eldon granted an injunction against a printer who had published a magazine which was an imitation of, and had been sold as and for the magazine of another proprietor, but he directed the plaintiff to bring an action, to try his right at law. This case appears to have rested solely on misrepresentation, and not on any right of the plaintiff to the title-page of his magazine as a trade-mark. It was not till 1833 that a case of restraining a trade-mark was decided in the Court of Chancery; and this case was followed by many others, in some of which the plaintiff was successful, in some not. In the decisions on these cases great discrepancy existed, for where in some cases the plaintiff's relief in Chancery was made to depend on his success at an action at law, of which intentional fraud is the essence, in other cases it was decided that intentional deceit was not necessary to ground an injunction.

Thus for many years the law relating to trade marks was in a very unsatisfactory state, but, in 1862, owing to the exertions of Mr. Travers Smith, Mr. Poland, Mr. Underdown, and the assistance afforded them by Mr. Roebuck, Mr. Milner Gibson, Mr. Hadfield, Mr. Bass, and others in the House of Commons, the Merchandise Marks Act of 1862, entitled, "An Act to Amend the Law relating to the Fraudulent Marking of Merchandise," drawn by Mr. Hindmarch, was passed.

This Act has much remedied the evils, and simplified the whole matter, by making it a misdemeanour to forge or counterfeit any trade mark. It is now an offence to sell or expose articles with forged or false trade marks, under a penalty of a sum equal to the value of such

articles, and a sum besides not exceeding £5 or less than 10s. Every addition to or alteration and imitation of, any trade mark made with intent to defraud, is to be deemed a forgery, and punished as such. It is further made obligatory on every person who shall sell an article having a false trade mark to give information as to where he procured it, on a demand being made to him in writing. To mark any false indication of quantity is also punishable with penalties. The indictment, moreover, need not specify who is intended to be defrauded by the fraudulent use of spurious marks. The vendor of the article with a trade mark is to be deemed to warrant to the purchaser that the mark is genuine, unless otherwise vouched for in writing, and the time during which proceedings may be taken is limited to three years. Taking into consideration the clauses of this Act, and reviewing the decisions in the various courts of law, both previous and subsequent to its passing, the following deductions, I take it, may be fairly inferred:—

A trade mark is any name or device adopted by a person to designate goods to be of his manufacture. It is both a guarantee of origin and of quality, and has for its object the protection of the manufacturer from a fraudulent sale of another's goods as his, as also the protection of the public or consumer from the sale to him of inferior goods. Goods so marked, in time, consequent on quality, obtain a reputation, and custom is directed to that particular manufacture. If a consumer buy an article with a counterfeit mark, the manufacturer is defrauded of the sale of his goods, for which he has often, at a great expenditure of capital and time, gained a reputation. If the consumer buy such an article, and it be of inferior quality, he also is defrauded by the counterfeit.

A most important point for notice is that a trade mark is property. Since 1863, it has clearly been laid down, in the cases of Edelsten *v.* Edelsten, Hall *v.* Barrows, and the Leather Cloth Company *v.* American Leather Cloth Company, that the right to a trade mark is a right to the exclusive use of it; that it is, therefore, property, and will be protected by the court as if it were property, whether the infringement is mentioned or not. This principle was broadly stated by Lord Westbury in Hall *v.* Barrows, and again maintained by the same learned judge in the Leather Cloth Company *v.* American Leather Cloth Company; and, moreover, was approved by the House of Lords in the same case. But though a trade mark is undoubtedly property, it is not so for all purposes; for a proprietor of a trade mark cannot prevent another person from using the same mark for other descriptions of goods; and, even when applied to the same goods, he must show in an action at law that there has been a false representation, calculated to mislead the public. Now, as a trade mark is acquired by use, it is necessary for the plaintiff, in all suits for infringement, to show that he or his predecessors used the mark before the defendant, and that it was known in the market to be so used, a proof which frequently causes very great expense and trouble.

There is no question or doubt that the Merchandise Marks Act has been of great public service, but many traders have found the vehicle a cumbersome and expensive means of redress, and therefore have failed to avail themselves of its advantages, awaiting the time when a system of registration of trade marks would materially simplify, cheapen, and expedite their means of remedy. Both Mr. Poland and Mr. Edward Lloyd, of Lincoln's-inn, have published admirable treatises on the Merchandise Marks Act, and both these gentlemen, whose knowledge of the subject is unchallenged, complain that the present difficulties of proving a fraudulent intention, and at law actual damage, deprive the Act of many of its advantages; and both believe that a system of registration of trade marks will render process for infringement of trade marks more easy and effectual. Any measure tending towards so desirable an end would, I am sure, be thankfully received as a boon by the commercial body of the country. In 1862, the subject was discussed by the Select Committee, but who postponed the further consideration of the matter until it should be seen how the Merchandise Marks Act operated. In 1866 a further Bill was drawn up by Mr. Underdown, under instructions from Mr. Travers Smith, but failed to become law. In 1868 the Government again had under its consideration a scheme for a system of registration, but this also fell through for the time; and, should any Act ever be passed, much will be due to those gentlemen whose names I have mentioned, and to them I would also add the names of Mr. Edmund Johnson and Mr. Arthur Ryland, who have been untiring in their exertions to ameliorate the law upon the great question of commercial fraud.

It is with this object in view that I have ventured to call your attention to the subject this evening, feeling certain that all public discussion on the question will be of use, and strengthen the good cause of those anxious to see a system of registration of trade marks become the law of the land.

The object, firstly, of having a registry is twofold—to assist the owner of a trade mark in proving his right to it against an infringer, and to enable persons about to adopt a trade mark to ascertain what trade marks there are, and so avoid imitation. The registration of a trade mark would give the person registering it a *primâ facie* right to the exclusive use of it, and would materially assist the person registering by throwing on the infringer the burden of disproving the title of the person registered by showing prior use or misrepresentation. The register would also be conclusive evidence of the use of a trade mark at the date of registering, and thus facilitate that proof now necessary for showing a title, so often very troublesome and costly. It would further create a new and most useful right, *i.e.* the right to a trade mark without use, for the register being necessarily an open one, it would be the duty of any one registering a mark to inspect the register beforehand, to see that he has not been anticipated. The system of registration will therefore facilitate and cheapen proof of trade marks in legal proceedings, on the one side by supplying evidence; on the other, by rendering evidence unnecessary where the defendent does not impugn the plaintiff's title. The registry should be a voluntary one, for, were registry compulsory an unregistered trade mark would be deprived of protection. Now, in many instances, we know a trade mark grows up gradually, and it would be unfair to deprive the possessor of protection because he had, meanwhile, failed to recognise its character as a trade mark and to register it.

The measure should be a tentative one, and in making it tentative we should alter no existing right, nor should we introduce any new one. It would be better to allow the courts, as each case arises, to deal with it according to its special circumstances, rather than to establish a rule.

A registered trade mark should be distinguished from others by the addition of the letter "Rd," and the public knowing that all honest manufacturers wish to identify themselves, will look for the trade mark and see if it be registered, and will at a glance see where and how they can verify the same. Another and very strong argument in favour of registration is, that it would give English manufacturers facilities for obtaining protection in foreign countries, and be useful in urging on a scheme for international commercial reciprocity. Hamburg, for instance, has refused to listen to any mutual scheme, on the ground that no registration of marks exists in this country. Until our present system is amended by some such scheme, great difficulties will always be experienced in negociating with foreign countries for protection under their laws. I have cited these as a few of the many advantages that would arise from a system of registration. The imitation and piracy of trade marks is a scandal to the country, and any measure tending to lighten the enormous expense which the present state of the law requires for the protection

of trade marks, will be of inestimable advantage not only to the manufacturer, but also to the consumer; and, moreover, will materially strengthen the reputation for integrity of English commerce in foreign countries. In 1869, after several years' fair trial, the Merchandise Marks Act had been found to be of great use, but I believe it to be the universal opinion of the commercial community that, although it has effected much, yet it wants a system of registration to be appended to it in order to give complete satisfaction. If by venturing this evening to bring before your notice the question, and inviting discussion on the same, I shall in any way have assisted to ameliorate the law on the great question of commercial fraud and piracy I shall feel myself fully rewarded.

DISCUSSION.

Mr. Hyde Clarke said that a few remarks on the history of the subject might not be inappropriate. They had had from the author a most interesting and amusing account of the origin of trade-marks, but he apprehended that his view was hardly consistent with the facts. Mr. Robertson had traced the origin of trade-marks to sign-boards, and had referred to an interesting passage in the history of the Society many years ago, but if they looked to the history of sign-boards themselves, they would see that there were many things which showed that they had no connection with trade-marks. They knew that, in mediæval times, signs were often adopted from the patron saints, either of the trade or of the individual, and were used for purposes of religious protection, and in no sense as trade-marks. Others, again, as for instance the Bear and Ragged Staff, the cognisance of the Nevills, were adopted by the retainers of noble families; and the well-known arms of the Lombards was another instance of a very common sign, which had no affinity with a trade-mark. In the same way he should much doubt whether the tokens to which reference had been made, and which originated in the times of Charles the First and the Commonwealth, had any connection with trade-marks, many being issued not by manufacturers at all, but by the keepers of public-houses, and others who had occasion to issue tokens. A far better origin for the system of trade-marks might be found, at an early period, in the operation of the great Hanseatic Guild. There was a great trade in wool with this country conducted by that guild, and each pack bore a peculiar mark, very different in character from a sign-board, but which was useful, in those unlettered days, in making out the ship's manifest, in the same way as the trader in the Far West, who, not being able to read and write, kept his accounts in symbols, and once charged his customer with a cheese instead of a grindstone, through not marking the hole in the centre. Many articles at the present day bore trade-marks which had been connected with them from the Middle Ages, as, for instance, swords and articles used in warfare. With regard to the system of registration, he was sorry that Mr. Robertson had not given them fuller information as to the practice in many foreign countries, and even in the City of London itself, for the registering of trade-marks had been provided for by the bye-laws of many trade guilds and corporations from very ancient times, even in England. There was no doubt that the successors or descendants of persons in trade had been in the habit of continuing the signs of their predecessors, and in this way antiquaries were accustomed to account for the many instances of double signs which were to be met with, the person using them having inherited signs from two parties, which he had combined. His own experience afforded ample example of the evil arising from the imitation of goods and trade marks. In the most remote part of Asia he had found it very common for men who could not read a word of English to depend in the purchase of an article—as for instance a watch—upon the English trade mark, having had it once interpreted to them by the merchant. On one occasion he remembered a number of Turkish country gentlemen displaying their valuables, when one of them produced his watch, the name and mark upon which were well-known in the Levant trade, but which, in this instance, had been pirated. He himself had actually brought back from Constantinople, unwittingly, a Swiss piracy of a well-known English watchmaker's goods. Hardware and goods of that class were sold throughout the East, not with the marks of the real German, Belgium, or Swiss makers, but with English marks upon them. In almost any part of the East you might find what were called English shops in the bazaars, and pedlars calling out in the language of the country that they had English goods for sale, when in reality hardly a single article was really English, the majority being foreign imitations with pirated English marks. Certainly if any registration of trade-marks would secure anything like the protection of English articles in foreign markets, it would be a great advantage. At the same time it must be remembered that this was not a matter connected with the manufacturers alone; the indolence and ignorance of the traders had a great deal to do with it. In any part of the world almost, unless where the language had an affinity with the French, it would be found that the English merchant did not make himself properly acquainted with it, while the German dealer began to do so at once, and the consequence was that he had far greater facilities for transacting business than the Englishman, and he was able to sell his goods with an English forged mark upon them, instead of their being obtained from an English house. With regard to the instance mentioned by Mr. Robertson, that of Hamburgh, he looked upon the excuse made that there was no registration of trade marks in England as a mere pretext. Hamburgh was not a manufacturing place, and he questioned very much whether there was any registration of trade marks there of any value; but he knew that the Hamburgh merchants had a considerable hand in the exportation of imitations of English goods. They must not delude themselves with the supposition that the registration of trade marks would completely extirpate this system of piracy, but at the same time there was no reason why they should not do the best they could to limit the evil, particularly in the mode indicated.

Mr. Edmund Johnson said that the last speaker had very properly alluded to the system of registration already in existence in certain trade guilds, and a very good illustration might be found in Sheffield, where the registration by the corporation of cutlers was so perfect, and they were so jealous of any interference with their established usage, that they always procured an exemption for themselves from any Act which was passed on the subject. In drawing any scheme to apply to the whole country, therefore, he thought they could not do better than endeavour to extend the system which had worked so successfully in Sheffield. Manufacturers might be divided into three sections or classes; first, those engaged in trades which did not admit of, or had never been in the habit of using, distinctive marks; secondly, those who were now using trade-marks; and, thirdly, a very much larger class, who were waiting to adopt trade-marks until they saw complete protection established. Such a case as this had very often happened; a manufacturer, say in the north, finding his business much increasing, went to a great expense in advertising and making known his trade-mark; suddenly another manufacturer, at the other end of the kingdom, finding the trade-mark of value, set up a claim, alleging that he had priority by some months, or perhaps some years, in the use of it, and commenced proceedings for an injunction, and, perhaps, an account of profits. Both parties might be, to a certain extent, in the right, and this state of things could only be met by a regular system of registration; the party registering would, of course, have to ascertain that no such mark as he

proposed to adopt was already in use, for, if it were, he would have to take another. There was another class of cases, in which the trade-marks of different manufacturers very closely resembled each other, and of course, in any efficient system of registration, means must be provided to prevent any such confusion arising. About two years ago there was a very important case tried, in which two manufacturers used, one the head of an elephant, and the other that of a horse; the two marks were quite distinct when on a large scale, but when reduced to about one-sixteenth of an inch, so as to go on a packet of needles, it almost required a microscope to distinguish between them. These two gentlemen spent a great deal of money in Chancery proceedings, but neither of them gained the victory. A proper system of registration would prevent such confusion, and form in fact a corollary of the Merchandise Marks Act, which was incomplete without it. The Society of Arts had been constant advocates of such a measure. In 1859 Mr. Leone Levi read a paper on the subject, and it was again taken up in 1863, at his own solicitation, in connection with the Exhibition Medals Act (which was to a certain extent a trade-marks bill), when, by dint of great exertion, they accomplished the remarkable feat of getting an Act of Parliament passed in five days. Again, in 1866 a Trade Marks Committee was appointed (of which he had the honour to be reporter), and in that capacity a number of instances came under his notice which showed that whatever importance the subject might appear to possess at first sight, further investigation proved even more strongly the necessity for dealing with it. Great manufacturers of every class gave evidence as to what they required, and all were unanimous as to the necessity for a system of registration. Next came the Bill to which Mr. Robertson had alluded, drawn by Mr. Underdown and others, which he much regretted had not become the law of the land. Manufacturers constantly hesitated before adopting a trade-mark, and only within the last few days he had had three letters asking whether certain devices were already in use as trade-marks. One gentleman wrote about corrugated iron, and wanted to know whether there was any "camel iron" or "leopard iron" known in the market, so that he might decide what animal to choose for a mark. Under present circumstances no one could tell what was in use as a trade-mark and what was not, but he hoped that these difficulties would shortly be removed, to which end the present agitation and discussion of the subject would no doubt greatly tend.

Mr. Underdown, remarking that his name had been more than once referred to, said it was true that he had for some years past devoted a good deal of attention to this and cognate subjects; such as the protection of copyright in works of art and the Exhibition Medals Bill, of the passing of which in five days he had a very lively recollection. He had read a paper to the Society on the subject, in 1866.* The latest legislation was the Hop Prevention of Frauds Act, with which he had something to do, the object being to prevent the marking upon pockets of hops a different year from that in which they were grown, and the putting of the Kentish horse upon hops grown in Sussex. All these measures depended on the same principle; and, whatever might be said on the history of the subject, he thought they had gone past that now. The subject had been very little discussed; and, although it was to the interest of a great many manufacturers to oppose any legislation of this kind, they being makers of imitation goods, still almost all were agreed that some measure was necessary. The first question to be asked was, what was a mark? and he really thought, without going into the question whether trade marks arose from sign boards, medals, or anything else, they would all agree that when a man sold an article with a certain mark upon it, that mark represented something; it was a statement of a simple fact, and common sense and the oldest law of the country recognised the fact that if a man gave a distinct description to another man of the goods which he sold, that was a warranty to the extent of that description, and a warranty to the extent to which that description was understood by the party buying; for it was a well-known principle of equity that a contract must be understood in the sense in which it was understood by the man with whom the contract was made, and in the sense in which the man who sold knew that the other did so understand it. In all these cases, therefore, the principle of *caveat emptor*, upon which many sought to lay too great a stress, was inapplicable. The question was, not whether the counterfeit goods were equal in quality to the genuine, but a man bought a certain article which was represented to be made by a certain manufacturer whose mark it bore, while in reality it was made by some one else and bore a forged mark. There was no mystery in the matter; it was to him one of the plainest propositions which could be entertained, that a man putting a false trade mark on an article committed a fraud at law; such was not the opinion, however, for a long time, although it had now been pretty well established. With regard to the question as affecting foreign commerce, it was quite true, as stated by Mr. Hyde Clarke, that persons who could not read English depended on the mark, and they need not leave Europe in order to find instances of the frauds which were committed. He had observed, during two years' residence in Spain, many instances of the kind. Madrid was full of imitations by German makers of English goods, many of the articles being such trash as could hardly be conceived by anyone who had not seen them. After an immense deal of difficulty he succeeded in getting a genuine two-bladed knife, by Rodgers, for which he paid 4s., but he believed that was the only one in Madrid. Whilst he was there he was consulted by an English watchmaker of considerable reputation, who, having obtained prize medals at the Exhibition of 1862, and at the Paris Exposition, had given a Madrid tradesman permission to sell his goods. After a short time this man declined any further dealing with the English watchmaker, but continued to make use of his name to sell other watches. He (Mr. Underdown) was obliged to tell the manufacturer that, owing to the state of law in England, he would have great difficulty in protecting himself. If in England, as in most other countries, there had been a system of registration of trade marks, he would only have had to produce evidence of his registration, and although (as he had stated on a former occasion) the Spanish law was not administered in the best possible manner, in such a case he would have obtained speedy redress. As it was, however, he was obliged to proceed in quite a different way. Such an instance strongly showed the necessity for a system of registration of trade marks, but although the thing seemed so plain, it was astonishing how difficult it was to get it realised by men who had not turned their attention to the subject, for it was only very recently that one of the members of the Government had become a convert, and was prepared now to support a bill such as was brought in last year, and now he believed the only remaining question was as to the manner of registration, and how it might be made most effective and least troublesome. The bill which he had the honour of drawing in 1866, in conjunction with Mr. Poland, under the instruction of Mr. Travers Smith, was most amply discussed at the time, when they had the advantage of the presence of Mr. Daniel and Mr. Webster, both of whom were well acquainted with the law of patents; and there was no dissentient voice, except, perhaps, that of the Chairman, who was not satisfied that the public would be protected. He was confident, however, that they would be, at least indirectly, because proof of fraud would be so much more easily afforded. The differences between that bill and the one introduced last year—

* *Journal*, vol. xiv., p. 370.

which probably would form the basis of future legislation, were very trifling, the principal one, with which he agreed, being that, although the registration would be purely voluntary, a man losing none of his property in his trade-mark by neglecting to register, still, unless a person did register, and so give notice to the public, under the Bill of 1866 he could not bring legal process against another for an infringement of his right. Certainly, if they wanted to have the system thoroughly carried out, in his opinion some such provision would be necessary or desirable. The great advantage of registration, as Mr. Robertson had justly observed, was the evidence which it would afford of the right of user and priority of user in a certain mark. Another alteration in the last Bill was, that to meet, if possible, the views of all parties, provisional registration for a certain time would be allowed. It was proposed that merchandise should be divided into different classes, such as hardware, porcelain, &c., each having a distinctive letter, with a numeral differing in each instance. A person would register a mark, say for three months, and after that time, if no objection were made, it would be regularly entered, still being liable, however, to be removed, at the request of any one who could show that he had a prior right to the mark. The mode of registration recommended was exceedingly simple, and he was quite at a loss to know how it was it had not yet been carried out. Whatever trifling difficulties there might be would be easily got over, and the result would be a great advantage, not only to the manufacturer, but to the public as well, and its effect would be felt not more in England than in the colonies and in foreign countries.

Mr. Arthur Ryland desired to protest against the assertion which he understood Mr. Underdown to make, that it was the interest of a majority of manufacturers to oppose registration or any other system which would give an easy remedy against the piracy of trade-marks. He had always understood it to be an acknowledged principle that honesty was the best policy, and he believed those who were base enough to pirate trade-marks were in a considerable minority.

Mr. Underdown said he would withdraw the expression majority if he had used it.

Mr. Ryland said he could not help expressing his great pleasure at hearing that probably something would be done in the way of registration, and, although Mr. Robertson had nearly exhausted the reasons for such a measure, he might add this, that were there a system of registration, the owner of a trade-mark would only have to go through the process of proving his property in it once, whereas at present, if he were called upon to take proceedings against imitators twenty times, on each occasion he must go through the whole process. On this subject he believed all the Chambers of Commerce were unanimous, much as they differed on other points, and if the Society of Arts, which had taken so active a part in this matter (he himself having been a member of the Committee to which reference had been made), were to put itself in communication with the various Chambers of Commerce throughout the kingdom, he was quite satisfied they would receive such support as would materially assist in carrying a measure through Parliament. The Committee of the House of Commons which investigated this subject, had before them the officers of both the Patent office and the office for the Registration of Designs, each of whom expressed a willingness to undertake the registration of trade marks, so that there was no force in the objection sometimes made that the amount of work would be very great. In conclusion, he hoped that in any measure which was passed, provision would be made for the summary punishment of any one who pirated a registered mark, in addition to the civil remedy in the way of damages. In some Continental states he understood that the owner of a trade mark had a right to seize any article bearing an imitation of his mark in the hands of another person, and to demand from him proof that he had used it innocently himself, or the name of the party from whom he had bought the article. He should be a strong advocate for some stringent measure of that kind.

Mr. P. L. Simmonds said that Mr. Robertson had devoted so large a portion of his paper to the assumed origin of trade marks, which had been further amplified by Mr. Hyde Clarke, that but little more need be said on that part of the question. It was well known that the workman's mark on his work had been in use in many trades and countries from time immemorial. Many guilds and crafts still perpetuated the custom, as with our goldsmiths, cutlers, &c. Even in remote China and Japan skilled workmen affix their mark to specimens of pottery, metal work, or carving in ivory, which they consider creditable to their skill, and these marks had come to be well known and appreciated by connoisseurs. But, besides the ordinary use of Chinese trade marks in the commercial papers of Hong Kong, Shanghai, &c., there was scarcely a state on the Continent in which trade marks were not adopted, and the manufactures of many firms, distinguished by their marks, had risen into great importance, and obtained world-wide reputation. The subject of trade marks was not a new one before this Society, although Mr. Robertson was apparently unacquainted with what had been done here and elsewhere in the matter. He had not alluded to the paper of Professor Levi,* delivered ten years ago, nor to the able one of Mr. Underdown, on the "Piracy of Trade Marks," read in that room three years ago, and which dealt so well with the legal part of the question, citing not only the law cases quoted by Mr. Robertson, but numbers of others. Mr. Johnson had alluded to the committee formed three years ago by this Society for inquiring into the laws of England and foreign states upon the subject of trade marks, &c., a committee consisting of some seventy or eighty of the most influential manufacturers, representatives of commercial towns, and others, and on which he (Mr. Simmonds) had the honour to serve. He was glad to find Mr. Ryland present supporting the movement, for he held in his hand copies of the very important papers published by that gentlemen ten years ago on "Trade Marks," in which he so ably urged that registration was essential to successful legislation. The subject was not, therefore, a new one, although it wanted continual agitation before its success could be ensured. Early in 1860 the Associated Chambers of Commerce, at their annual meeting, memorialised the Government, urging that the proceedings in our courts, both civil and criminal, would be simplified and rendered less costly by a registry of trade marks, and asking for the establishment of such a registry, and for conventions with foreign states on the subject. And yet no progress had been made, for, at their last annual meeting, two months ago, a deputation again waited on the Board of Trade, urging upon the Government the importance of introducing a Bill into Parliament for the registration of trade marks. He (Mr. Simmonds) had taken some interest in this matter, from its being brought prominently under his notice at the various International Exhibitions with which he had been officially connected, and during his visits to our leading manufacturing towns. In a recent tour which he had made last month to the chief seats of our manufacturing industry, he had looked narrowly into the subject, and had found a general desire expressed for registration, and further protection of trade mark rights. There were many merchants and shippers who had their marks as well as manufacturers. It was disgraceful to think that in this, the chief manufacturing country of the world, we had not like advantages for registering trade-marks to those enjoyed in France, Austria, the United States, Canada, India, and other British possessions. In several of these the penalty for imitating or using trade-marks with intent to deceive were very heavy, and, in some, accompanied by imprisonment. He must admit that he was somewhat disap-

* *Journal*, vol. vii., p. 262.

pointed in the scope of the paper read that evening. He had hoped that a gentleman enjoying the official experience and advantages which Mr. Robertson did, would have favoured them with some useful suggestions as to the form of registration to be adopted, the best system of classification for trade-marks, the mode of publicity, the most suitable fees for registration and for searching the register, and the limit of time for registration, founded upon the practice and experience of other countries. But at all events the subject had been once more discussed, and he hoped soon to find some other official and legitimate register for trade-marks adopted, than the heterogeneous one of the Stationers' Hall, where book-titles, newspapers, and trade-marks were jumbled together without system, illustration, or classification, and utterly inaccessible for reference, comparison, or even legal proof. Ten or twelve years ago France had passed an excellent law dealing with the whole question, and there the marks might be deposited at the nearest Tribunal of Commerce, but the complete register was kept for reference at the Conservatoire des Arts et Métiers, Paris. Although we had protection for our trade marks under the Treaty of Commerce, we had absolutely no register to which we could refer.

Mr. Campin, having had some experience of patent matters, was convinced that the registration of trade-marks was a very desirable thing, and would be useful in many ways, more especially in affording facilities for the establishment of a title to property in a particular mark. On the other hand, it must not be supposed that it would accomplish everything which was desired, and he should strongly oppose a provision which would allow the registration of a mark not actually in use. Such a thing would really increase the difficulty which Mr. Johnson spoke of, that manufacturers would be at a loss what mark to select. As to registration being voluntary, he was convinced that if it were so it would be necessary to deprive those who did not register of all facilities for prosecuting piracies, but he saw no objection to its being compulsory. He could not quite agree in the eulogium passed by Mr. Robertson on the Merchandise Marks Act, for, to his thinking, it was needlessly encumbered, in almost every clause, with a tremendous farrago of words, such as bottle, stopper, package, case, wrapper, and so forth, but, at the same time, it was undeniable that any action under it was very much embarrassed by the want of registration. His idea was, however, that many persons adopted the same course with regard to trade marks as they did with patents, instead of copying a thing exactly, they attempted to evade it, making a label which in colour and general arrangement appeared at first sight exactly like the genuine label, but which, on an attentive examination, showed material differences. A case of this sort had occurred very recently with regard to Mr. Bass's trade mark, which consisted of a red triangle, another person having adopted a Spanish shield reversed, which at first sight appeared very similar, though there were certain points of difference. When the case was heard it was further complicated by the fact, which was clearly shown, that the label bore almost as great a resemblance to some used by other brewers as it did to Mr. Bass's; so that in this case the registration of the triangle would not have decided the question whether the other party was an infringer. The rule as to resemblance was thus laid down by Lord Chancellor Cranworth. "It was a mistake to suppose that the resemblance must be such as to deceive persons, who should see the two marks placed side by side; a rule so restricted would be of no practical use. If a purchaser looking at the article offered to him would naturally be led from the mark annexed to suppose it to be the production of a rival manufacturer, and purchase it in that belief, the court considers the use of such a mark to be fraudulent." This was a very important point to be considered, but he quite agreed in the main principle enunciated in the paper.

Mr. J. W. May (Consul-General for the Netherlands) desired to say a word or two on the subject from an international point of view. A great deal had been said as to the imitation of British trade marks by foreigners, but his attention had lately been called to the imitation of foreign trade marks by English makers, with regard to articles sold in British colonies. On inquiry he found that the only attempt at protection of an article for the foreign markets was, to take a sort of underhand advantage of the Foreign International Copyright Act, and register the trade mark under that act as a book or printed matter, or some vague term which was to be found in some of the clauses. That, of course, was very unsatisfactory, and this part of the subject should not be forgotten in any legislation on the question. The interest of the buyer was to be considered as much as, and was in fact identical with, that of the producer.

The Chairman said there was one economical effect in respect to trade-marks which had been overlooked, namely, the saving of what Mr. Babbage had well designated "as the labour of verification." This labour, in social life, in seeking supplies, in comparing different articles, in trying to get evidence as to their real qualities and values, was often very considerable, very uncertain, and very annoying. The saving this labour, in respect to the real qualities of articles of gold and silver, made it worth while to incur the expense of the "Hall mark," and so it would be with trade-marks when protected. By saving this labour of verification, an obstacle to free trade was removed, and consumption was stimulated, and in that point of view he thought the use of intermediate trade-marks was quite warrantable. If they found a merchant's mark upon an article, it did not imply necessarily that he had made it, but that he had examined it, and, in fact, gave his warranty for it. All that was required was, that the mark should denote a truth, and represent a property, because the merchant who had spent time and labour in searching for articles and examining them, so as to enable himself to give credit to them, had acquired a property in them, and was entitled to protection. The Trade Marks Bill went to the source of gross, wide-spread, and grievous immorality in trade, which had become the opprobrium of the trading community. It might be said that our religious teaching in churches as well as schools was in default in respect to it. It had been well pointed out by Mr. Froude, in his admirable inaugural address at St. Andrew's, that the clergy were to blame for doing nothing to repress cheating and demoralisation in trade. For a number of years he had never, amidst a mass of sermons, seen one against these sins; the text that "Lying lips are an abomination to the Lord" had been neglected by them, and churches and chapels turned out liars and cheats unreformed. Not very long ago he had visited a French pottery, where he found the workmen busily employed imitating English goods and putting English marks upon them; and shortly afterwards, on visiting a pottery in England, he found the compliment was returned by imitations of French goods being made, with pirated French marks. It was, moreover, curious that the proprietor of this concern, who was very proud of his skill in these imitations, happened to be a man of remarkable piety, who then or formerly was accustomed to preach, hold prayer meetings, and so forth. Positive law must correct these defaults. Some advances had been made against the vice in the home trade, but international frauds had to be repressed by treaty. It was to be hoped that the time would come when nations would be as tenacious of their seals and their trade-marks as they assumed to be of the honour of their flags. It behoved us not to be behind others, and to be in advance in maintaining the honour of our trade statements, and respect for trade property. Improved legislation should give facilities for proving property in trade marks and punishing infringers, and he thought the only question now was, how that could most easily, cheaply, and efficiently be accomplished. In conclusion, he proposed a cordial vote of thanks to Mr. Robertson for his valuable and interesting paper.

The vote having been passed,

Mr. Robertson, after acknowledging the compliment paid him, said he had not touched upon the details of any proposed legislation on account of his official position. Last year he had had the honour of giving birth to a little bill on the subject which proved abortive, and had to give way to another one more complete, which he believed would have passed, but for the sudden action in connection with the Irish Church Bill, upon which the Government went out of office. His real object in reading the paper was to invite discussion, feeling satisfied that the subject only required to be talked about and understood in order to ensure action on the part of the Legislature.

THE SITE FOR THE LAW COURTS.

This subject, which has been discussed at length before the Society's "Thames Embankment Committee" (see *Journal*, Nos. 853, 854, and 856), was debated in the House of Commons on Tuesday evening last. According to the abstract of the debate given in the *Times* of Wednesday last—

Mr. W. H. Gregory moved a resolution calling for the reconsideration of the present arrangement to build on the Carey-street site, and argued earnestly for the Thames Embankment, which he maintained had never yet been considered. Altogether he calculated the Carey-street site, including approaches, would cost £3,150,000, while the river site would not cost more than £1,500,000, and would require no new approaches. The Embankment, he argued, would be most convenient for the lawyers (both barristers and solicitors) and the general public; it would secure the important *desiderata* of light, quiet, and ample accommodation; and, among other inducements, he mentioned that a company was ready to buy the land recently cleared in the Strand, for the purpose of building chambers and offices. The change, he held, would not involve a month's delay, and he insisted on the change of design as the last means left of redeeming this town from the opprobrium of being the dingiest and meanest of capitals.

Sir Roundell Palmer moved, as an amendment, a counter-resolution, calling for the immediate prosecution of the Carey-street design, and the purchase of whatever additional land might be necessary in immediate proximity to that site. In his turn he insisted on the superior advantages of Carey-street, as being midway between the Temple and Lincoln's-inn, and by far the most convenient for the solicitors, the great majority of whom lived north of the Strand. It gave, too, the greatest facilities for enlargement, and its levels were incomparably the most favourable for architectural effect. The Thames Embankment scheme was as yet *in nubibus*, though he contended, in opposition to Mr. Gregory, that it had been fully considered on its merits before Carey-street was chosen, and that all the reasons which then prevailed against it remained in full force. At the very least, before a stone was laid, it would cost £3,000,000, and by its selection all the benefits of concentration would be lost. Sir Roundell Palmer urged the House very earnestly not to sacrifice all the money, time, and labour which had been spent, to what he ridiculed as the visionary dreams of the "*dilettanti* gentlemen" and "the demon of good taste."

Mr. Beresford Hope was anxious to secure both sites, and, while unwilling to surrender Carey-street, the artistic capabilities of which he warmly eulogised, he recommended that the Thames Embankment should be utilised for the Probate Registry, or some other public building, which would be an ornament to it.

Lord Bury grounded his support of the Thames Embankment on its architectural capacity and its admirable ready-made communications, while Mr. Denman, Mr. G. Gregory, Mr. Cowper, and Mr. Wheelhouse defended the Carey-street site as the most central and the most convenient. Mr. Gregory also urged the House not to waste more time in closing this controversy finally, and, on what he held to be good authority, declared that the Carey-street site could not be re-sold under a loss of half a million.

Mr. Tite decidedly preferred the Embankment site, but agreed with Mr. Beresford Hope that both ought to be secured, and suggested that a depository for wills should be built between Arundel-street and Essex-street.

Lord John Manners held that this would lead to great confusion, and would violate one of the chief recommendations of the Commission—that the courts and their offices should be in close contiguity. Lord John supported the present arrangement, and pointed out that the change was opposed by the lawyers and all who had business in the courts, and was only promoted on æsthetic grounds by people who wished to make "a great metropolitan improvement." But even in that light he contended that a building on the Carey-street site might be made the greater adornment; and he urged that though the suitors might fairly pay for the site and a convenient building, it was not fair that they should pay for architectural whims. He analysed Mr. Gregory's estimates, and advanced some of his own, from which he argued that the river site, from the additional foundations, the alterations which would be needed in Somerset-house, and other features of it, would be infinitely the most costly. He earnestly deprecated a change in the plan merely for the sake of one Government reversing the decision of its predecessor—a deplorable practice, which had caused much expenditure and delay in these matters.

The Chancellor of the Exchequer went elaborately into the finances of the question, and startled the House by stating that the estimate now made by the Commissioners for site and building, &c., was £3,200,000, and that, with approaches and other accompaniments, we should not get out of the business for less than £4,000,000, whereas the original estimate was only £1,500,000. This increase Mr. Lowe attributed to the frenzy for concentration which had led the Commissioners to enlarge their original plan, and to propose what he called a "Tower of Babel" and a "Vanity Fair." Believing that there was a great disadvantage in over-concentration, Mr. Lowe advised the House to retrace its steps and to return to the original modest scheme. Acting on his own responsibility, he said he had already stopped all the expenditure on the present scheme within his reach, and had refused his sanction to the outlay of £600,000 for additional land until the pleasure of the House could be taken. Before giving his opinion as to the course the House ought to pursue, he dispelled a general delusion that the cost was to be paid by the suitors, by showing that the courts as a whole required £52,000 from the Consolidated Fund beyond the sum they received in fees. The security which the Commissioners offered for the £1,395,000, which they proposed to borrow from the Treasury, was the imposition of a storeage fee on every probate, and this Mr. Lowe contended was merely another form of Imperial taxation. He advised the House to dissolve this Commission, with which it was impossible for him to co-operate, and to place the power and responsibility in the hands of the Government, and he stated that the mode in which the Government would propose to exercise this power would be by building on a site of six acres between Howard-street, running from Surrey-street across Norfolk-street to Arundel-street, and the Embankment. This, he anticipated, might be bought for £600,000, and a building which would contain all the courts and their offices might be erected for £1,000,000 there; and he suggested that the façade designed by Inigo Jones for Charles I.'s palace might be placed in front of it. Asked by Sir John Pakington what he proposed to do with the Carey-street site already cleared, Mr. Lowe was strongly of opinion that by a little confidence and patience the Government might dispose of it without a sacrifice. At any rate, it would be wise to know when to make a loss,

but above everything he urged the House to shake itself free at the earliest moment from the extravagance to which the Commissioners' latest plan would lead it to.

Mr. Henley remarked that the issue now raised was an entirely fresh one, and as the House could not possibly decide on the new plan submitted to it, he proposed that the debate should be adjourned.

Mr. Crawford seconded this, and animadverted rather sharply on the dilatoriness of the Ministry in acquainting the house with its change of mind.

Lord John Manners suggested that, as the motion and amendment were now equally irrelevant, the adjournment should be merely formal, to enable the Government to submit a scheme entirely on their own responsibility.

The Chancellor of the Exchequer acceded to this understanding, and after some further conversation the debate was adjourned for a month.

In commenting on the above debate, the *Times* says:—"Mr. Gregory's motion for placing the new courts of law on the Thames Embankment has been adjourned, after a debate in which such extraordinary difference of opinion prevailed, that the necessity for delay and inquiry was fully established. The upholders of the scheme which has already received the assent of the Legislature have had every advantage. They are, as it were, in possession; their plan has been sanctioned, and on those who question the fitness of the Carey-street site has been naturally imposed the burden of giving reasons for the change they recommend. The defenders of the position have been fortunate in enlisting the ablest of modern advocates, whose prepossessions in favour of his own Inn of Court, make him, as we think, blind to many of the advantages which the rival scheme possesses. They are also strong in numbers, they are united, and they have done all that numbers and union could effect to make it appear that the friends of the new site are either foolish *dilettanti* or interested speculators. Yet, when the matter is brought before the House of Commons, the change that has been effected in the minds of the Legislature is evident. Whereas some time since, when the Embankment site was first seriously proposed, most people were disposed to think the matter settled, and further discussion useless, the debate of last night shows that in the House of Commons there is a large number so convinced the existing Acts have been hastily passed, that they would, at the cost of considerable further delay, inquire into the subject. Certain it is, that if we were now legislating for the first time, the Carey-street site would find nothing of the favour which it met with years ago. Mr. Gregory had not much difficulty in showing that the cost of the present site will be enormously greater than was anticipated. A sum of £800,000 has been already spent, and as much more will be called for before the first brick can be laid. The place is bordered on three sides by narrow thoroughfares, among the meanest and most inconvenient in London. It cannot be denied that other edifices not comprised in the present estimate must necessarily be removed, even though the Courts of Law themselves do not assume any extraordinary dimensions, and the cost of approaches will be, as every one who knows the neighbourhood is aware, beyond all calculation. On the other hand, sufficient has been proved concerning the Thames Embankment site to induce further inquiry. It has been shown that it possesses manifest advantages; that it will have a broad thoroughfare front and back, a broad river before it, a good light, such as Somerset-house possesses, and, indeed, every advantage which a place of public business ought to have. The contrast between a building on this site, and another which would be almost as unfortunately placed as the Rolls building in Fetter-lane, has struck most of the unprejudiced people who have examined the question, and there has consequently been a general demand for reconsideration. This was what the House of Commons decided on Tuesday night. Mr. Lowe's remarkable speech gives, we believe, the death-blow to the Carey-street scheme. He startled the House, and he will certainly startle the public, by his statement of the enormous expenditure into which this gigantic undertaking has been leading us. He stated that the estimate now made by the Commissioners for the site and building was £3,200,000, and that, with approaches and the rest, the total cost would not be less than £4,000,000—a calculation which shows how little dependence is to be placed on the assertions of Sir Roundell Palmer's clients. Mr. Lowe and the Government will receive the approbation of the country for having at once stopped all expenditure in the matter. Four millions instead of a million and a-half are enough to compel a new examination of the whole subject. So Mr. Lowe has refused to sanction any further outlay for land, and the Government desires that the question of the law courts and their site should be once more entrusted to themselves for further inquiry. With this the House of Commons was satisfied, and we hope the subject will be entered upon *de novo* with greater knowledge and with greater prudence. Mr. Gregory's motion has resulted in a substantial victory, for the advocates of the Embankment site now have all they can in fairness demand—the opportunity of stating their case before an unpledged and unprejudiced tribunal. There are also other considerations which make it advisable that the subject should be reconsidered. Mr. Lowe strongly deprecated excessive centralisation, and his remarks are especially apposite when the report of the Judicature Commission makes it probable that our legal system will be reformed in the opposite direction. It is possible that in a few years this country will have its provincial courts sitting in the great centres of industry and commerce, and that little more than the proceedings in appeal will be brought to London. Everything, indeed, portends that the congestion of legal business in the capital, which now characterises our system, will be greatly lessened. If so, the scheme of an enormous legal Babel in the middle of London will fall to the ground, and the moderate building which will then be necessary may be erected on some more eligible site, and at a cost less absolutely outrageous."

The *Telegraph* says:—"Let us see how the matter stands. Already Parliament has decreed that the new law courts shall be built on the space between Carey-street and the Strand, and the ground is almost prepared for the builders. At a cost of no less than £850,000 we have pulled down the nest of houses that once occupied the spot, and have compensated the owners. At first sight, therefore, it might seem a matter of course that we should make use of the ground which has been obtained at the cost of so much labour and so much money. But, on the other hand, we have other considerations, of which Mr. Gregory made the most on Tuesday night. It is now found that the Carey-street site is too small, and that, to carry out the plans of the architects, and secure the convenience of the public, we must spend an additional £700,000. What the building itself will cost, Heaven only knows; but, since we must have a building in one of the places, we may, at present, leave that question out of sight. Mr. Gregory, however, has another plea. After paying one million and a-half for the bare ground, he tells us that we may have to pay ever so much more to make the courts accessible to the public. He argues that a new street must be run through Covent-garden to Lincoln's-inn-fields; another thoroughfare must be made between Farringdon-street and Carey-street. Again, King's College Hospital stands in the way, and it may have to be pulled down. The Law Institution also blocks the way, and that must certainly be levelled to the ground. Thus, an enormous expense would be thrown on the public, apart from the cost of the edifice itself. And, asks Mr. Gregory, what should we have for our money when the whole work should be completed? Nothing, he replies, but a big house so shut

in by small houses that it would not be seen. On the other hand, he contends that, for a smaller expenditure, we could obtain on the Thames Embankment one of the noblest sites that an artist could desire; grand approaches to the building by the Strand and the river side; freedom from the roar of the traffic; everything, in short, that the taxpayers, the architects, or the lawyers could covet. So far from being fascinated by the brilliant picture, Sir Roundell Palmer treated it with indignation. The Embankment advocates were, he said, mere dilettanti, and for the debates of dilettanti he entertained profound contempt. With him the sole question was, whether Carey-street would best suit the lawyers and the public. Sir Roundell contended that the Embankment site would cost much more than the sum which we have already paid for Carey-street; but, as everybody is in the dark on that subject, and as it can be matter of nothing beyond conjecture, we may for the present set it aside. The most formidable argument was that, if the courts were built by the river's side, the barristers would lose a great deal of time, for which, of course, the suitors would have to pay. On the other hand, were the courts located in Carey-street, the Lincoln's-inn barristers could reach the scene of action by merely crossing the road. Nor, it was urged, would their brethren of the Temple have to go many steps further. A bridge across Fleet-street would take them to the courts in two or three minutes. Narrow and technical as these arguments may seem, they are entitled to consideration."

The *Morning Star* says:—"Mr. Gregory was bitter in the extreme in his references to the Lincoln's-inn lawyers, to whose petty interests and prejudices he attributed the opposition to the Embankment site. The debate which followed afforded strong ground for supposing that this special imputation on the Lincoln's-inn solicitors and barristers is by no means well-founded. The Temple barristers make no fight for the Embankment site; nor do the City solicitors. There are 1,212 London solicitors, representing 3,875 country solicitors, to whom, from the places in which they live, the Carey-street site would be greatly more convenient than the rival situation. On the other hand, there are only 134 London solicitors, representing 477 country solicitors, to whom, judging by the same criterion, the Embankment site would be the more convenient of the two. The question is, we venture to say, between gratifying the public taste by a splendid building on the Embankment, and gratifying the lawyers by an eminently convenient building in Carey-street. All other things being equal, it may, perhaps, be said without reserve, that the lawyers ought to carry it. And perhaps their case is strengthened by one or two important minor considerations. For instance, the proposal to erect a grand building near Somerset-house is encumbered with a supposed necessity for remodelling the "dumpy domes and narrow windows" of the Somerset-house façade. This is rather alarming. Again, it must be allowed that the superior height of the Carey-street site gives it some status, even architecturally. And, once more, it would be fairer, in talking so much of the closeness and obscurity of the Carey-street site, to remember that it will have an open Strand aspect, which cannot fail, if completely treated, to be very splendid in its effect. After all, however, it is the question of money which will eventually settle this question. Mr. Lowe exposes the fallacy of the supposition that there is any fund, apart from the general revenue of the country, from which the expenses of this 'outrageous building' can be derived. In order to do what is necessary under these circumstances, the Chancellor of the Exchequer proposes to relieve the Commission of their duties, and to hand over the work to the Chief Commissioner of Works. The Government plan is to let the Carey-street plot lie till good offers are made for it, and to buy an Embankment site, bounded on the north by Howard-street (lying behind the Strand). This can be got for £600,000, and the whole cost of a 'modest and manly' Palace of Justice, such as was originally contemplated on that site, will not, in the opinion of the Government, cost more than £1,600,000—about £100,000 more than the original Carey-street estimate. The issue is an entirely new one, and it was raised so late that the House was annoyed by its suddenness, and Mr. Henley was justified in demanding ample opportunity for its consideration; but the speech of Mr. Lowe, and his anticipation of a statement of plans which Mr. Layard is to make, while they revolutionise the whole subject, induce us to believe that the Government have found means of securing and well using an Embankment site, while at the same time saving the country a million and a half of money."

The *Daily News* says:—"There are simply two ways of regarding the question—that of show and that of use; that of facilitating the administration of justice, and that of building a handsome building; and it is not too much to say that all who supremely regarded the actual purpose of the building were on one side, and those who thought of scarcely anything but its appearance were on the other. Sir Roundell Palmer put the lawyers' view of the question in a speech which, from that point of view, was entirely conclusive. The great argument for the Carey-street site is that which has been reiterated from the beginning of the discussion, and was repeated by almost every legal speaker on Tuesday night. It is essential to the real value of the building that it should stand in the midst of a legal quarter. The Carey-street site was selected because nearly all the lawyers who have business in the courts can be in the courts from their offices in two or three minutes. Mr. Gregory ridiculed the idea of stalwart gentlemen objecting to four or five minutes' additional walk, and being afraid to cross a thoroughfare; but in those few minutes lie the waste of hours. It is very rarely that a court will wait five or six minutes after a case is called, and if the counsel and solicitors are not all present within three or four minutes the case is passed over, and must begin *de novo*. The question of five minutes' extra walk is, therefore, just the question whether barristers, solicitors, and others shall idle away hours in waiting for their cases to come on, or whether they shall run the risk of the case being passed over. Either way the expense to the public is so vastly increased that it is reckoned that every day thus lost by the profession costs the suitors no less a sum than £25,000. The Carey-street site is, therefore, not only the lawyers' site, but that of the clients too. We can scarcely believe that the House will consent to Mr. Lowe's suggestion, to put an end to the Royal Commission and begin again, unless some very clear, definite, and certain plan is before it, and a whole volume of information which has not been discovered as yet."

The *Standard* says:—"Mr. Gregory's speech on Tuesday night in support of the proposition to build the new Law Courts on the Thames Embankment was necessarily nothing but a *rechauffée* of the assertions and imaginings with which Sir Charles Trevelyan and Mr. Baillie Cochrane have urged the perpetration of that costly folly. The member for Galway took the leading points of the Embankment case as they are presented in Sir Charles Trevelyan's letter and in the discussions at the Society of Arts, and put them before the House with all that earnestness of delivery and ponderosity of humour which characterise his oratory. That the result was a failure, was not Mr. Gregory's fault as a speaker, but the consequence of the emptiness of the case itself. It did not need Sir Roundell Palmer's masterly speech to show that there are no sufficient grounds for interfering with the erection of the courts on the Carey-street site. Mr. Gregory sat down without having given a single reason which would have induced an impartial hearer to allow that a case had been made out even for delay or for further inquiry. Not only is the architectural adornment of the metropolis the object which the supporters of the Embankment site really have in in view, but it is the best argument they have in favour

of the scheme. The contention that the Embankment site will cost less, and give greater facilities to the public, is an after-thought, and, what is more, utterly worthless, as anybody who will read Sir Charles Trevelyan's statements will see at once, and without any reference to the replies of the defenders of the present site. It may be admitted that it is desirable to have one building, or a series of buildings—public or private it does not matter—on the Embankment, between the Temple and Somerset-house, worthy of the neighbourhood; but it does not follow that we should place our Palace of Justice there. Mr. Street says, and he gives reasons of the utmost cogency in support of an opinion which his authority would of itself recommend, that the Carey-street or northern Strand site, is, architecturally, far superior to the Embankment site; and that a building of the character necessary for the purpose of concentrating the law courts and offices will be far more effective on the higher ground now cleared than on the lower level of the Embankment. We believe that this is a convincing reason in favour of erecting the law courts on the site at present fixed, looking at the matter merely from the *dilettante* point of view. But does it follow that the Embankment between the Temple and Somerset-house cannot be utilised for the adornment of London? Certainly not. The Board of Works, which owns the ground upon which the buildings "giving" immediately upon the Embankment-road and the river must be erected, can and ought to stipulate for such an architectural arrangement as would not only obviate all danger of disfigurement, but ensure all that Mr. Gregory and his friends desire."

Colonies.

Soap-making in Adelaide.—The manufacture of soap may now be added to the list of the local industries of this colony, a soap-boiling factory having lately been established at Port Macdonald, capable of producing about two tons of soap weekly. Besides the advantage of an important local industry in connection with this manufacture, the butchers will now find a ready market for tallow and fatty refuse, and the money hitherto sent out of the colony for the purchase of soap will, in part at least, be kept there for profitable employment.

Emigration from Liverpool.—During the quarter ending 31st March last, the number of emigrants from Liverpool was 20,789, showing an increase of 5,310 over the first quarter of last year.

Forthcoming Publications.

The Food Journal. (*Wyman, Great Queen-street.*)—The object of this journal, which is shortly to be published quarterly, will be to present in one focus, and in a readable form, everything that relates to the food question, which has become one of the most important of the day, with a view to develop fresh sources and economise existing supplies. Special attention will be given to the Australian and colonial trade, and to the various efforts that are being made to introduce fresh meat into England, at prices accessible to all—while every new fact as to the chemistry and hygiene of food, both animal and vegetable, will be carefully noted. Original articles will be given on the sources and countries from whence our supplies are obtained—on the medical and sanitary relations of food, and on the requirements of the culinary department, whether gentle or simple, together with reports and information as to food statistics in every country, in connection with the physical condition of the inhabitants. The interests of the trade will be attended to by careful statements of prices, exports and imports, and Board of trade returns, both for agriculture and produce.

Notes.

Preserving Meat.—The following notification, dated Board of Trade, 12th April, appeared in the *London Gazette* of the 13th instant:—With reference to the notice inserted in the *London Gazette* of the 1st of January last, stating that the Argentine Government had offered a prize of £1,000 for the best system of preserving fresh meat, the Board of Trade have received from the Secretary of State for Foreign Affairs a copy of a further despatch from her Majesty's Minister at Buenos Ayres, reporting that the Government of the Argentine Confederation have issued a further decree, to the effect that the prize can only be obtained by those persons who, whether at home or abroad, have carried out their discovery in practice, and who produce the result at the Ministry of the Interior, in order that the scientific commission which will be named for that purpose may, after examining the results, adjudge the prize to the one offering the greatest advantages to industry. As a consequence of this decree the period for the presentation of proposals has been extended till the 31st of August next.

South Kensington Museum.—The Lord President of the Council has requested Sir Charles Wheatstone, Sir Michael Costa, Professor Tyndall, Lieut.-Col. Scott, R.E., Capt. Donnelly, R.E., and Mr. Bowley, to report on the acoustics of the new lecture theatre. There will be three trials; one by a lecture, with demonstrations, on musical pitch, by Professor Guthrie; a second by voices, directed by Mr. Arthur Sullivan, and the third by instruments, directed by Mr. Ella.

Correspondence.

Mr. Underdown's Paper on Spain.—Sir,—I was unable to remain long enough at the meeting on the 14th inst., or I should have offered a few observations, expressive of disappointment that more facts or suggestions of an economical and commercial character were not given by Mr. Underdown. His paper had a stronger political tinge than the Society might have expected from its title. The recommendation that Spain should abandon Cuba, or any other colony, overlooks the fact that the best outlet for the energies and enterprise of a nation is in its colonies. What would be England's position, were it not for its colonies and dependencies offering us an ever-enlarging field for the manufacturing, commercial, and shipping interests at home, and for the stout hands and indomitable perseverance of those who leave our shores, either to settle in what would otherwise remain waste places, or else to become administrators in the governments of the colonies, and to return in numbers to their mother country, enriched by the results of their industry? Complaint was made by Mr. Underdown that the religious creed of Spain prevented national progress. But many of us Protestants will find ourselves unable to believe that the Roman Catholic faith, combined with that tolerance for other religions now inaugurated in Spain, will present any bar to economical and commercial improvement. We have the examples in point of Belgium and Austria, both eminently Roman Catholic countries, whose progress in manufactures and in commerce is remarkable. Mr. Underdown has not given sufficient credit to the efforts made in Spain, for many years past, to diminish the number of ecclesiastical functionaries to reasonable limits. In 1860 I read a paper to the Statistical Society of London on the "Statistics of Spain" (vide Journal of that Society, vol. xxiii.) in which I showed that, adding the number of monks (12,593) to the clergy, cathedral, collegiate, parochial, and regular (43,661 altogether), a grand total appears of 56,254 as the number in 1857. Comparing this with the proportions ascertained at previous periods, it will be found that the diminution, admitted to be a national blessing by all truly patriotic

Spanish writers, has been, respectively, from 1 in 43 of the population in 1769; down to 1 in 56 of the population in 1787; and to 1 in 275 of the population in 1857. There is no reason to doubt that a further large diminution has taken place since 1857. On the want of financial honour in Spain, Mr. Underdown is, I think, too sweeping in his condemnation. We must not forget that, within a very few years, Spain voluntarily came forward and discharged a debt to England that had gone out of the recollection of our statesmen, and the recovery of which had not entered into the imagination of our financiers. Then Mr. Underdown complained of jobbery in public enterprises and railways in Spain; but before we scrutinise the frost on our neighbour's tiles we should sweep the snow from before our own doors, and ask if railway contracting, and financing, and jobbing have not contributed many dark pages to the commercial history of England? Mr. Underdown takes exception to the too great preponderance of the military element in the Spanish population. That is a very difficult question to solve, as every nation of the importance of Spain in population, 15¾ millions, must be the best judge of the amount of military force, offensive and defensive, it is necessary to keep up. As regards the national expense of its soldiery, an examination of the statistics in 1860, proved to me that it was extraordinarily low. And the experience of Spain, in its then recent campaign in Morocco, had shown of what good stuff the cheaply kept up army of Spain was composed, and that it could rank in military education, discipline, and *physique*, with the more expensive armies of other European powers. The members of our Society who, like Mr. Underdown, take a warm interest in the reawakening of an active economical and social life in Spain, may not, perhaps, take it amiss if I venture to occupy a few more lines of your space in referring to the Society of Arts, Agriculture, and Commerce of Spain, known by the title of the Economic Society of Madrid (*Sociedad Económica Matritense*). This Society dates from the year 1775, and, in the now nearly 100 years since its first conception, has effected very much good in an economical and commercial point of view. It has always numbered amongst its members men of eminence in all parts of Spain, and has had the warm support of the government. It has affiliated to it many provincial societies (*Sociedades económicas de amigos del pais*), and has a philanthropic branch, presided over by ladies of high social position (*Junta de Damas de honor y merito*). Last year's lectures included many practical and interesting subjects, such as three by Don Antonio Balbin de Unquera, on "Foreign Benevolent Institutions, and their application to Spain;" those upon "Industry and Art in the Prehistoric Epoch," by Don Francisco M. Turbino; upon the "Calculus of Probabilities," by Don Augustin M. Alcibar, and upon the "Encouragment of Arboriculture," by Don José Salofre. The Society also has committees on the diffusion of knowledge and of public education, has a large library of works on arts, sciences, and agriculture, publishes memoirs of importance on these subjects, and offers prizes in each branch. For example, I see announced for this year:—1. A prize on the causes which lead to the silkworm disease, and on the methods of remedying it. 2. A prize on the manufacture of white and other wines not containing more than 12 to 14 per cent. of alcohol. 3. A prize for an analysis of the natural laws of agriculture of Baron Liebig, as applicable to the circumstances of Spain. 4. A prize for Spanish paper for printing purposes, superior to foreign paper of this class. 5. A prize for mineral oils of Spanish manufacture. 6. A prize for glass manufacture. 7. A prize for starch flour of rice, made in Spain, and competing in price and quality with wheat starch. 8. A prize for an essay on improved railway administration, particularly as regards the unification of charges for transit of goods. 9. A prize on the causes of failure of provincial banks of issue in Spain, and on free banking. The Society has also recently taken the initiative in promoting the cultivation in Spain of the *Eucalyptus globulus* (Tasmanian blue-gum tree). Faithful to its motto of "*Socorre ensenando*," the Society has placed its services freely at the command of the new government of Spain, in the hope that a new era of prosperity may be, in no slight degree, assisted by the teaching of its members—friends of their country (*amigos del pais*), as they deem themselves proud to be termed, and, as such, they will certainly deserve the best sympathies of our Society of Arts here.—I am, &c., Frederick Hendriks, Honorary Member of the Economic Society of Madrid.

Mr. Underdown's Paper on Spain.—Sir,—I observe that Mr. Marcoartu, in his remarks on my paper, states that minerals are found in all the provinces of Spain except Valladolid and the "Canaries." Only recently has it been discovered that in the Grand Canary, near Las Palmas, there is perhaps the most remarkable iron deposit in the world—a perfect shore of iron-sand. A patent for making this sand into bricks for the purposes of smelting, which I believe will be worked on the spot, is likely, as I am informed, to give remarkable results. Its situation of course gives great facility for shipment.—I am, &c., E. M. Underdown.

Temple, April 22, 1869.

MEETINGS FOR THE ENSUING WEEK.

Mon.....Society of Arts, 8. Cantor Lecture. Mr. John Anderson, C.E., "On Applied Mechanics."
Social Science Assoc., 8. Education Department. Mr. Joseph Payne, "The Theory of Teaching compared with its ordinary Practice."
R. United Service Inst., 8½. Col. T. Bernard Collinson, R.E., "A Proposition for one General Military School for the Army."
R. Geographical, 8½. 1. Rev. F. W. Holland, "Recent Explorations in the Peninsula of Sinai." 2. Mr. Werner Munzinger, "Journey through the Afar Country."
Actuaries, 7. 1. Mr. T. B. Sprague, "On the Value of Reversionary Annuities payable half-yearly, quarterly, &c., according to the conditions which prevail in practice." 2. Mr. H. W. Manly, "On Different Modes of Constructing Tables of the Value of Policies."
Medical, 8.
Tues ...Royal Inst., 3. Prof. Grant, "Astronomy."
R. Medical and Chirurgical, 8½.
Civil Engineers, 8. Mr. Wm. Shelford, "On the Outfall of the River Humber."
Ethnological, 8. 1. Mr. Wm. Blackmore, "Notes on some of the principal Tribes of the Indians of the United States, with a brief Account of the late Indian War." 2. Mr. E. T. Stevens, "Some Characteristics of the Stone Implements and Objects found in the Mounds of Ohio."
Wed ...Society of Arts, 8. Mr. Roger Smith, "On the Duties of the Architect with reference to the Arrangement and Structure of a Building."
Geological, 8. 1. Mr T. C. Wallbridge, "On the Geology and Mineralogy of Hastings County, Canada West." Communicated by Dr. Percy. 2. Mr. J. W. Flower, "On the Distribution of Flint Implements in the Drift, with reference to some Recent Discoveries in Norfolk and Suffolk." 3. Mr. W. Whitaker, "On a raised Beach at Portland Bill."
R. Society of Literature, 8½. Dr. Ingleby, "On some Points connected with the Philosophy of Coleridge."
Archæological Assoc., 8.
London Inst., 12. Annual Meeting.
Thur ...Royal, 8½.
Antiquaries, 8½.
Zoological, 1. Annual Meeting.
Royal Society Club, 6.
Royal Inst., 3. Prof. Tyndall, "On Light."
Society of Fine Arts, 8. Third Musical Evening. Conductor, Mr. A. Gilbert.
Fri .....Royal Inst., 8. Mr. R. H. Scott, "On the Work of the Meteorological Office."
R. United Service Inst., 3. Mr. Fred. Wingfield, "Military Transport."
Society of Arts, 8. India Conference on the subject of Fibres. Chair taken by the Hon. George Campbell.
Sat .....Royal Inst., 2. Annual Meeting.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Delivered on 12th April, 1869.

Par. Numb.
63. Bill—Court of Exchequer (Ireland) Offices.
66. „ Newspapers, &c.

125. Fenian Convicts—Return.
130. Poor Law (Indoor Relief)—Return.
141. Assessed Taxes and License Duties—Statement.

Session 1868.

344. (B.) Poor Rates and Pauperism—Return (B).

Delivered on 13th April, 1869.

69. Bill—Post-office Savings Banks.
70 „ Government Annuities, &c.
126. Dublin Metropolitan Police—Abstract Account.
134. Dartmouth, &c., Port—Correspondence.
135. Convicts—Return.
137. Admiralty—Correspondence.
122. Civil Services, Revenue Departments, and Packet Service—Estimates (1869-70).
Prison Discipline (Colonies)—Further Correspondence.

Delivered on 14th April, 1869.

68. Bill—Trades Unions, &c.
71. „ Capital Punishment Abolition.
72. „ Parochial Schoolmasters (Scotland).
"Tornado" (No. 1, 1869)—Correspondence.
Public Petitions—Twelfth Report.

Delivered on 15th April, 1869.

73. Bill—Habitual Criminals.
102. (I.) Maynooth College—Further Return.
114. Ships' Lights—Correspondence.
115. Rule of the Road at Sea—Correspondence.
139. Lord Lawrence's Annuity—Resolution.
142. Volunteer Capitation Grant—Memorial.
Colonial Possessions—Reports, Part I., West Indies.

Delivered on 16th April, 1869.

74. Bill—Common Law Courts (Ireland).
76. „ Oyster and Mussel Fisheries Supplemental.
79. „ Endowed Hospitals, &c. (Scotland.)
80. „ Poor-law (Scotland) Act (1845) Amendment.
0·8. (IV.) Civil Services (Vote 2, Class IV.)—Corrected Pages.
113. Increase and Diminution (Public Offices)—Abstract of Accounts.

Delivered on 17th April, 1869.

78. Bill—Adulteration of Food or Drink Act (1860) Amendment.
81. „ Hospitals, &c., Rating Exemption.
48. Augmentation of Benefices—Return.
127. Civil Offices (Pensions)—Returns.
145. Barrack Repairs—Reports.
0·47. Poor Rates Assessment, &c.—Report (reprint).
Great Britain and the Zollverein—Declaration.
Public Petitions—Thirteenth Report.

Delivered on 19th April, 1869.

144. Spirits—Returns.

Delivered on 20th April, 1869.

82. Bill—Militia.
83. „ Water Supply.
84. „ Mines Regulation.
121. Cashel Election—Minutes of Evidence.
147. Parliamentary Elections Act, 1868—Additional General Rules.
149. Ecclesiastical Fees—Table.

Patents.

From Commissioners of Patents' Journal, April 16.

Grants of Provisional Protection.

Anvils—1023—J. U. Askham.
Bags, &c., locks and fastenings for—1006—M. Wolfsky.
Ballot, mechanism for facilitating voting by—1001—J. Cruttenden and T. Wells.
Baking ovens—1040—A. V. Newton.
Boilers—1027—W. Jones and T. Sheffield.
Boots or shoes, apparatus for putting on or taking off—1052—J. H. Teale.
Bottling apparatus—1028—J. Winter, jun.
Carriage shafts, &c.—1034—G. T. Bousfield.
Cartridge cases—1062—W. T. Eley.
Caskets for jewels, &c.—1049—H. B. Barlow.
Cements—1044—W. T. Rickard.
Concrete building, apparatus to be employed in—1003—D. Osborn.
Cotton gins—1072—J. A. Chaufourier.
Cultivators—883—J. Fryer.
Decorating surfaces—961—W. E. Cadman.
Feeding infants, &c., apparatus for—987—E. O'Connell.
Fire-arms, breech-loading—1055—W. Powell.
Fire-arms, &c., breech-loading—1020—G. A. Ermen.
Fire bars—1024—J. Fletcher.
Food safes—1008—D. Nicoll.
Fuel, &c., manufacturing compressed—1021—W. Johnson.
Furnace doors—1042—W. Goodreds.
Furnaces—655—W. H. Tooth, sen., and W. H. Tooth, jun.
Furnaces—827—A. de Pindray.
Gas, apparatus for the combustion of—1046—G. S. Chase.
Glove fasteners—1056—W. H. Douglas.
Grain, &c., beam-balance for weighing—1038—E. O'Brien.
Guns, breech-loading—1043—J. Mason.
Guns, working—921—J. Macintosh.
Heating by steam for manufacturing and other purposes—1029—C. Cairns.
Hydraulic presses—1058—G. Ashcroft.
Iron safes, &c.—1026—W. G. White.
Iron, utilising the ammoniacal skimmings obtained in galvanising—1070—J. Pattinson.
Jet ornaments, &c.—1010—W. H. Douglas.
Lamps—1018—F. W. H. Melhurst.
Lavatories, &c.—1037—J. M. Johnson.
Leather, composition for joining—1066—A. H. Brandon.
Looms—1022—J. Woods, J. Hampson, and L. and G. Fish.
Looms—1030—J. W. Drummond.
Metal tubes, &c., cutting—1068—A. Stewart and J. Wotherspoon.
Motive-power—1025—F. Tommasi.
Oxidising agents, preparing certain—1059—W. H. Balmain.
Paper, beating engines employed in manufacturing—1041—A. K. B. Granville.
Paper-making machinery—1007—R. Allan.
Paper, manufacturing—1033—G. T. Bousfield.
Petroleum, &c., burning—845—C. E. Brooman.
Planes—995—W. Bayne and O. E. MacGregor.
Printing and copying presses—997—J. Bath.
Pulleys for blind cords, &c.—851—F. Holmes.
Pumps—1054—J. Robbins and J. Allbut.
Railway carriages—69—F. S. Thomas.
Railway carriages, &c.—1012—U. Scott.
Railway signals—1074—W. T. C. Pratt.
Railway wheels, &c.—1013—W. E. Broad.
Railways—1050—W. R. Lake.
Railways and tramways—1014—G. F. Griffin.
Roofs—1016—S. Sharrock.
Safety lamps—1002—W. Y. Craig and S. P. Bidder, jun.
Seeds, &c., expressing oils from—1032—J. Sterriker.
Sewing machines—1036—A. Helwig.
Ships, applying sheathing to—1039—R. B. Hooper and T. and H. R. Nickson.
Shuttles—1051—J. Menzies, sen., and J. Menzies, jun.
Sleeve links—1057—W. H Douglas.
Soda and potash waste, utilising products arising from—1060—L. Mond.
Steam engines—985—G. Holcroft and W. N. Dack.
Steam generators—998—H. A. Fletcher.
Steam generators—1061—W. E. Newton.
Traction engines—1031—J. Greenslade.
Umbrellas and parasols—991—J. Caplin.
Umbrellas and parasols—1019—J. G. Tongue.
Ventilating apparatus—1048—W. E. Gedge.
Vessels, covers for, and clips for bottles placed in such vessels—1000—F. Schäfer.
Watches and clocks—983—C. Lange.
Wheels, &c., casting screw threads on the naves of—1045—R. Norfolk.
Window fastenings—993—G. H. Wilson and G. E. Pullen.

Inventions with Complete Specifications Filed.

Dental wash—1138—J. H. Johnson.
Fire-arms—1093—S. F. Van Choate.
Paper, woven fabrics, &c., rendering waterproof—1090—W. R. Lake.

Patents Sealed.

3187. T. Wrigley & J. Richardson.
3193. W. H. Howes.
3195. J. Rae.
3204. E. T. Hughes.
3205. E. Harrison.
3208. E. T. Hughes.
3213. W. Maudslay and W. C. Rawlins.
3214. J. Westwood, jun.
3218. C. Shaw.
3219. I. Holden.
3220. H. Clifton.
3221. J. H. Johnson.
3224. E. O. W. Whitehouse.
3228. F. Bennett and R. Ward.
3231. J. Ryder.
3250. J. Spratt.
3282. A. H. Smith.
3298. A. Wilson.
3306. B. Dobson and J. Clough.
3314. H. Wallwork.
3362. J. Corbett.
3374. F. E. Martineau.
3449. C. E. Brooman.

From Commissioners of Patents' Journal, April 20.

Patents Sealed.

3093. J. and S. W. Varley.
3240. J. Birch.
3247. J. Bernard.
3254. G. Nurse.
3256. A. Giraud.
3257. W. Reid.
3259. S. Clark.
3261. H. Mayhew.
3273. W. E. Gedge.
3288. W. D. Young.
3290. E. T. Van Hecke.
3300. G. E. Donisthorpe.
3315. R. Oxland.
3343. G. F. Morant.
3359. B. Hunt.
3392. W. Corden.
3400. P. E. de Wissocq.
3417. W. Riddle.
3424. W. S. Thomson.
3450. J. Stephens.
3470. J. C. MacDonald and J. Calverley.
3542. J. Sims.
3567. J. H. Johnson.
3659. H. W. Fuller and I. W. Barnum.
545. G. A. Fall.
713. H. A. Bonneville.

Patents on which the Stamp Duty of £50 has been paid.

1083. T. Haimes.
1093. C. A. Girard and G. de Laire.
1088. G. White.
1112. C. Hastings, J. Briggs, J. Law, and H. Mitchell.
1208. E. J. Beard.
1097. J. Holmes and J. C. H. Slack.
1107. E. C. Nicholson.
1152. R. Thompson.

Patents on which the Stamp Duty of £100 has been Paid.

1063. J. F. Spencer.
1113. J. W. Ford.
1127. C. D. Abel.
1150. H. Lumley.
1078. G. Fell and W. Haynes.
1164. J. C. Amos.

Journal of the Society of Arts.

FRIDAY, APRIL 30, 1869.

Announcements by the Council.

Ordinary Meetings.

Wednesday Evenings at eight o'clock :—

May 5. "On the Formation of Industrial Settlements in our Colonies." By Col. Francis C. Maude, C.B.

May 12.—"On the Ventilation of Drains." By James Lovegrove, Esq., Assoc. Inst. C.E. On this evening Earl Ducie will preside.

May 19.—"On the Progress of the Colonies." By John Robinson, Esq., of Natal.

May 26.—"On Silk Supply." By Thomas Dickins, Esq., President of the Silk Supply Association.

Cantor Lectures.

The concluding lecture "On Applied Mechanics," by John Anderson, Esq., C.E., Superintendent of Machinery to the War Department, will be delivered as follows :—

Lecture IV.—Monday, May 3rd.

Applied Mechanics in relation to Natural Power.

The lecture will begin at eight o'clock. These Lectures are open to Members, each of whom has the privilege of introducing two friends to each lecture. Tickets for this purpose have been forwarded to each Member.

Committee on India.

Conferences are now in course of being held for the discussion of various subjects connected with India.

The following arrangements have been made for the remaining three conferences :—

This Evening (Friday), April 30.—"Indian Fibres." By Leonard Wray, Esq. The Chair will be taken by George Campbell, Esq.

Friday Evening, May 14.—"Waste Lands." By George Campbell, Esq.

Friday Evening, May 28.—"Trade with Central Asia, Thibet, and South-Western China."

At these Meetings the chair will be taken at 8 o'clock, and the discussion will be opened by a paper.

Members of the Society interested in Indian questions are invited to attend.

Piscicultural Committee.

On Friday Evening, May 7th, a paper "On Oyster Culture and Legislation" by Arthur F. Pennell, Esq., will be read and discussed. The Chair will be taken at eight o'clock.

Members of the Society interested in this subject are invited to attend.

Final Examinations, 1869.—Notice to Candidates.

The Court of the Worshipful Company of Coachmakers have resolved to place one silver and one bronze medal of the Company at the disposal of the Council of the Society of Arts, to be presented to the candidates (actually engaged in the trade of coach-building) who shall pass the best examination in "Free-hand Drawing" and "Practical Mechanics."

These medals will not be awarded unless, in the opinion of the Council, the candidates possess sufficient merit.

Designs for Channel Steamers.

The Council of the Society of Arts offer the Gold Medal of the Society, and the large Silver Medal of the Society, for the best and the second-best block model of a steamer, which shall afford the most convenient shelter and accommodation to passengers on the deck of the vessels crossing the Channel between France and England. The steamer is not to exceed in tonnage and draught the best vessels now in use between Folkestone and Boulogne, and the model must be on a scale of a quarter of an inch to a foot. The models, marked in cypher, are to be sent in to the Society of Arts' House, John-street, Adelphi, on or before the 1st November next, with a sealed envelope, giving the name and address of the designer.

Albert Medal.

The Council will proceed to consider the award of the Albert Medal early in May next. This medal was instituted to reward "distinguished merit in promoting Arts, Manufactures, or Commerce," and has been awarded as follows :—

In 1864, to Sir Rowland Hill, K.C.B., "for his great services to Arts, Manufactures, and Commerce in the creation of the penny postage, and for his other reforms in the postal system of this country, the benefits of which have, however, not been confined to this country, but have extended over the civilised world."

In 1865, to his Imperial Majesty the Emperor of the French, "for distinguished merit in promoting, in many ways, by his personal exertions, the international progress of Arts, Manufactures, and Commerce, the proofs of which are afforded by his judicious patronage of Art, his enlightened commercial policy, and especially by the abolition of passports in favour of British subjects."

In 1866, to Professor Faraday, D.C.L., F.R.S., for "discoveries in electricity, magnetism, and chemistry, which, in their relation to the industries of the world, have so largely promoted Arts, Manufactures, and Commerce."

In 1867, to Mr. W. Fothergill Cooke and Professor Charles Wheatstone, F.R.S., in recog-

nition of their joint labours in establishing the first electric telegraph.

In 1868, to Mr. Joseph Whitworth, F.R.S., LL.D., "for the invention and manufacture of instruments of measurement and uniform standards, by which the production of machinery has been brought to a degree of perfection hitherto unapproached, to the great advancement of Arts, Manufactures, and Commerce."

The Council invite Members of the Society to forward to the Secretary, before the 2nd May, the names of such men of high distinction as they may think worthy of this honour.

Thames Embankment Committee.

The proceedings of this Committee, so far as they relate to the question of the site for the Law Courts, have been reprinted in the form of a pamphlet, which may be had of the Society's publishers, Messrs. Bell and Daldy, York-street, Covent-garden, price threepence.

Subscriptions.

The Lady-day subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Thames Embankment Committee.

The sixth meeting of the Committee took place on Tuesday, the 20th inst., at 12 o'clock. Present:—Earl Grosvenor, M.P., in the chair; Lord Henry G. Lennox, M.P., Sir Charles Trevelyan, K.C.B., Colonel Scott, R.E., Colonel Ewart, R.E.; Captain Ducane, R.E.; Messrs. H. Cole, C.B., Baillie Cochrane, Seymour Teulon, and C. F. Hayward.

Mr. Charles F. Hayward, F.S.A., described to the Committee, with the aid of plans and elevations, ordnance maps, and other data, his design for the arrangement of the Embankment between Hungerford and Waterloo-bridges. He brought this matter forward with especial reference to the hoped-for abolition of the "Viaduct" (as it had been called, though it was chiefly an inclined street from the foot of Hungerford-bridge to Lancaster-place, on the level of Waterloo-bridge), as to which Lord Elcho's Committee was sitting at the House of Commons, because, in the event of that viaduct being done away with, the necessity would arise of reconsidering the whole arrangement of that part of the Embankment, and upon the result of such deliberations would very much depend the public benefit to be derived from this great work. Putting aside for one moment the question of the Law Courts, there could be no doubt that, both with regard to the extent of land reclaimed from the river, and to the character of existing buildings and approaches as likely to influence the ultimate result, this was the most important part of the Embankment. The first plan and designs were made in 1861, at the time the Bill was being discussed, and these were exhibited in the 1862 Exhibition. Of course the existence of the proposed viaduct was taken for granted, but very little reflection would show anyone—while a slight examination of the plan would convince anyone sceptical of the fact—how fatal would be this inclined street to the proper utilisation of the ground reclaimed from the river. But what he (Mr. Hayward) was able to show by a fresh plan was, that even if the viaduct was decided against, the space would still be completely spoiled without proper management. The construction of the viaduct would leave only small or shallow plots of ground next the river; but, that being abandoned, it was shown by the plan that a large piece of ground could be secured, not only without any sacrifice of accommodation, but with great convenience to the traffic in the neighbourhood. In arranging the streets and communications of this peculiar locality, the great point to settle was, how satisfactorily to get over the difference of level between the Strand and the Embankment, so that access should be afforded both to foot-passengers and conveyances at a moderate gradient, and at the same time to secure, if possible, the large space of ground, on which a public building, if desired, might be erected, the ground being what had been gained by reclaiming from the river the deep bend between Waterloo-bridge and Whitehall. One feature in the case, which had hitherto proved a stumbling block, was the steep bank or cliff of the Savoy, forming quite a precipice on the western side, where the walls of the old Savoy Palace, once the residence of John of Gaunt, still exist. As at first laid out, he believed the street was to pass through the burial-ground attached to the Savoy Chapel, but it was afterwards agreed to be diverted, and this "viaduct" was designed (although only a small portion of the roadway was to be carried on arches), in order to avoid opposition. The object to be attained was to bring the high level of Waterloo-bridge and Somerset-house, at Lancaster-place, into direct connection with the low-level of the Embankment near the Savoy, yet not to disturb the chapel or churchyard, and at the same time to obtain communications with the Adelphi on the high level with the bottom of the Adelphi on the low level, and with the various streets leading from the Strand. In order to accomplish this, he (Mr. Hayward) proposed to form the present open space westward of the walls of the Savoy (measuring about 300 feet across), and immediately below Beaufort-buildings, into a "piazza" or "place," to be called the "Savoy-square" or "Savoy-garden," open to the river, which would be just in that angle of the curve where it would command views of Westminster on the one side and of St. Paul's on the other. Between this and Lancaster-place he would erect a building to correspond with Somerset-house, the present western façade being repeated, and that beautiful feature of the river frontage, the open colonnade on an open archway, being also repeated, Wellington-street passing between them in a kind of square, and the terrace being continued westward, and returning around the eastern side of the proposed new square or garden. By these means neither the Savoy nor German burial-grounds would be disturbed; the old wall of the Savoy-palace, with the chapel itself, would remain, and, by a continuation of the buildings to the Strand, the architecture of Somerset-house would flank the Waterloo-bridge roadway from the Strand to the water. Then, instead of bringing a street or viaduct all the way from Hungerford to Waterloo-bridge, he proposed that the roadways enclosing Savoy-garden on the east and west sides should slope upwards in the same way as Trafalgar-square, and that from the north-east and north-west corners of a mid-level terrace streets should ascend—forking eastwards and westwards, and enclosing the block of Beaufort-buildings—to the Strand, the gradients being about 1 in 26 to 1 in 28. The square itself would be on the slope (with fountain and grass-plats, or paved), while, from the mid-level, a street running westward would give a communication with Adelphi-terrace, taking up on its way Salisbury and

Cecil-streets. A parallel but descending footpath, or roadway if desired, would throw open those grand, though at present dirty and disreputable, arches upon which Adelphi-terrace stands, and which would be useful for shops or ware-rooms. These streets would afford all requisite accommodation for the traffic, and, at the same time, leave an open space towards the river, 780 feet long, by 300 feet wide at one end, and 200 feet at the other. At the western end of this, however, the railway made a curve in and out again in a way which, if it were impossible to alter that arrangement, might necessitate the sacrifice of a portion of the ground as far as the continuation of George-street, widened as he proposed. Of course, everybody who had a door or window all along this line would have a right of opposition (if rights were all reserved, as had been stated), but he apprehended the objections to this plan, as compared with the viaduct, would be infinitesimal; and the buildings on the large plot of land he had mentioned, might be arranged with open gardens at the back, so as to be an ornament rather than an inconvenience to the houses in the Adelphi.

Mr. Seymour Teulon remarked that an Act had been obtained, the powers of which he did not think had expired, for taking a number of buildings near the Charing-cross Station, by a company formed to make a railway connecting the Charing-cross and Euston-square stations.

Mr. Hayward said it would be rather an advantage to his design than otherwise if this scheme were carried out, as it would settle the doubt on the plot west of George-street he had referred to, and leave a frontage of 500 feet still for the new building. He suggested that there should be through communication from the Embankment by George-street, Adelphi (which would be widened) leading to King William-street, to take the Regent-street traffic, which came mainly through Leicester-square. There ought also of course to be a direct communication with Charing-cross, as he had shown it might be without touching Northumberland-house, but this would be on the other side of the railway bridge, with regard to which he was not so particularly anxious just now, as the communication would be partially provided by the intended continuation of Whitehall-place, and the rest must come in due time. He felt very strongly, however, that some plan should be decided upon, whereby, when the viaduct had been abolished, as he did not doubt it would be by the decision of Lord Elcho's Committee, they should endeavour to provide that something else be done which would not be equally fatal to the proper utilisation of the Embankment. Mr. Hayward then laid before the Committee some designs for the purpose of adjusting the levels of the various streets from the Strand within the buildings on the Embankment, the principal feature being a double row of shops or offices, one above the other, a light footway running along the whole length of the buildings, and so arranged as to communicate on a level with the various intersecting streets. This, however, Mr. Hayward stated, was a mere matter of detail, and quite independent of the plan which he had described for laying out the communications in the neighbourhood of the Savoy and the Adelphi, which he considered of the utmost importance eight years ago, when the Embankment was not begun, but much more so now it was an accomplished fact.

Sir Charles Trevelyan said there appeared to be many excellent points in the plan which Mr. Hayward had laid before them.

In the first place it preserved the individuality of the Old Savoy Palace, and it was a great thing, when they were able, *stare super antiquas vias*. This ancient palace was indissolubly connected with many cherished historical and popular associations, having been built by Peter of Savoy, uncle of Eleanor of Provence, queen of Henry III., and having been the residence of the captive King John of France; and to this he returned and died, when he was unable to fulfil the engagements he had entered into for the payment of his ransom. After that, the famous John of Gaunt, Duke of Lancaster, lived here; and when the Reformer Wickliffe was cited by the Bishop of London to appear before him in St. Paul's Cathedral, John of Gaunt attended him there, and used expressions towards the Bishop which were resented by the Londoners, who advanced against the Savoy in a tumultuous manner; and the palace was soon after sacked and burnt in Wat Tyler's insurrection. It was rebuilt by Henry VII. and Henry VIII., and, after having been the scene of other historical events, it became a place of refuge for the French and German refugees in the religious persecutions. A fragment of the palace remains to this day, and the ancient ducal and royal chapel has lately been fitted up in a very interesting manner, under the immediate directions of her Majesty.

Another admirable feature of Mr. Hayward's plan was, that it provided a satisfactory communication between the Embankment and the Strand, a short distance to the west of Somerset House. It was proposed that there should be another lateral communication, on the other side of Somerset House and the law courts, between them and the Temple, opposite the steam-boat pier at the bottom of Essex-street, which would lead direct to the three northern railways, across the Strand and Holborn, without any expense beyond the removal of a screen of inferior houses between Lincoln's-inn-fields and the wide thoroughfare of Bedford-row; and if there were this communication also on the western side of Somerset-house, he thought the public requirements would be satisfactorily provided for.

The plan also provided an ample site for any public building which it might be determined to place on the Embankment in the ancient bend of the river, and combined with this every end intended to be accomplished by the hideous projected viaduct. He thought that Mr. Hayward's bifurcated communication between the Embankment and the Strand, by way of "Savoy-square," taken in connection with the proposed transverse communication with the Adelphi and George-street widened, would answer every necessary purpose. But all would be incomplete and out of joint if the *direct* communication between Cockspur-street and the Embankment, originally recommended by the Metropolitan Board of Works, was not carried into effect.

The following additional particulars relating to Cleopatra's Needle have been kindly furnished by Field Marshal Sir John Burgoyne. They will be read with interest, in continuation of the proceedings of the Thames Embankment Committee, reported in the last number of the *Journal* :—

"With regard to the 'prostrate Alexandrian obelisk,' or Cleopatra's Needle, as it was called, I have a keen memory of it generally, but very vague in particulars. I did not serve in the first expedition to Egypt of 1801. I sailed from England with the force under Abercrombie but was detached from it at Minorca, for the blockade of Malta, at which place, after its capture, I was left, desperately ill of a fever, when the army passed it; but I visited Egypt on leave, in 1802, after our troops had left it, and heard all about the Needle.

"We considered it among the trophies or property we had gained from the French, for, with the disputed claims between the Mamelukes and the Sultan, there was then no recognised rightful proprietor.

"After the French were expelled, Major-General Lord Cavan was left in command, and took a great interest in the project for the removal to England of the prostrate obelisk (for there is one near it erect), and I think it was meant to do it by subscription, which failed; but the arrangement went so far that a transport was selected for its conveyance, and the manner for its stowage defined, which was a somewhat delicate operation with such an enormous single block,

and the size of the vessel; and even a temporary timber jetty, to the end of which the ship could lie, was constructed from the shore close to the monument, when the whole was interrupted for want of funds.

"Some officer drew a caricature of the said General carrying off the Needle, Pompey's Pillar, and I think some of the Pyramids, to which were attached some doggrel rhymes, of which by some perverse effort of memory I can call a part to mind, as here annexed:—

Attached to a Caricature.*

How you thus, Atlas-like, sustain
Such ponderous weights, nor yet complain
Of toils attendant on your station;
And how, in your g'gantic eyes
Vast mountains shrink to molehill size,
I note my Lord, with admiration.

The needle on the Egyptian shore,
Beheld by you, appears no more
Than a small bodkin stuck through paper;
And Pompey's pillar, I declare,
I w sh your lordship had a pair,
'Twould serve you just to hold a taper.

Proceed, my lord, complete your work,
Leave not a pebble to the Turk,
A fickle, false, degraded creature.
. . . . .
And render our prize-money greater.

"Whatever right we may have had to abstract this monument in the first instance, it seems to have been formally granted to us by the Pasha, in 1820, and it is to be regretted that we should not avail ourselves of the opportunity of possessing so fine a specimen."

The following letter from Mr. John Macgregor brings the history of the Alexandrian obelisk to the present time:—

"In 1849, I saw the English obelisk at Alexandria, and then two-thirds of it might be inspected. In 1869, I went to see it, travelling with my canoe, and with more interest, because I saw in a local paper, in Cairo, that you had made an effort to get this splendid monument brought here—I mean to the Temple.

"I was positively shocked to find that the obelisk was entirely covered, and not one atom of it is now visible. It is in a stone-yard, and is completely covered up by good hard, honest-looking ground. The exact site of it is now not quite remembered, but the man there thinks he knows where it is. In a very few years we may have to dig shafts, like those I have been in at Jerusalem, to see where a gift-stone is, second to none in Egypt for interest, and to few in grandeur and dignity. Is not this perfectly monstrous? The sea breaks against a high wall a few yards from the assumed place of this magnificent stone, and it would be a matter of mere ordinary mechanical work to float it and carry it home. My father, who was in the expedition to Egypt, when Lake Mœrstis was formed, to resist Napoleon's attack, told me that the English officers at that time actually subscribed a sum enough to bring this stone to England. A vessel was procured, but a storm broke her to pieces. The government of that day cared little, and did less, to help this worthy effort; but now we are surely wiser.

"Look at the French in comparison. Why, they actually opened up the enormous sand-hills at Zoan, three years ago, and I went up the Murcha River in my canoe to see them. There they have seven or eight huge obelisks, and a dozen monolith statues, and pillars innumerable, all unearthed by French money, without even the chance of bringing one of them away. Yet here, we, the greatest, richest nation on earth, are allowing the earth to conceal, perhaps for ever, the ancient glory of the past, which, already ours, though far off, would be tenfold more speaking, suggestive, and interesting, if we brought it here.

"If I could help at all in bringing this Alexandrian stone to London, it would be a real pleasure, if even to remove a stigma on our nation, for we are often and justly blamed in Egypt, because we spend thousands in digging up things all over the globe, but will not spend hundreds to bring this one home, or spend tens to keep it from being lost for ever. Better, perhaps, for us that it should be buried and forgotten too, so as to be no longer a record of our insular inconsistency."

"Temple, April 24th, 1869."

* The caricature was a tolerable likeness of Lord Cavan. He had the Needle under one arm, and Pompey's Pillar, and one or two Pyramids, in a basket like that in which a carpenter carries his tools on his back.

India Committee.

The adjourned conference on Mr. Hyde Clarke's paper, "On Hill Settlements and Sanitaria," took place on Friday evening, 23rd April, Lord William Hay in the chair.

Colonel Haly, in re-opening the discussion, said—I am sorry to hear from those who ought to know the capabilities of Bengal, that it is limited both in means and space for colonisation and settlement. I believe this to be somewhat of a libel on the supreme Presidency which will be easily contraverted. I leave it, however, to others better acquainted than myself with actual localities in Bengal to do so; and proceed to the minor and more humble Presidency of Madras, where will be found space sufficient for a large influx of England's children, and with a fair opening for European labour and enterprise. The localities to which I allude are, the Neilgherry hills, the Shevaroys, the Pulneys (where I may mention that the present Governor, Lord Napier, is now erecting a summer residence), Cotallum, in Travancore, and the Jeypore mountain tracts in Orissa. These latter, it is true, have never yet been what may be called tested, though, from my experience of them, I believe that they will be found second to none, both in climate and soil, and with space on their plateaux for a good round number of English homesteads, and with a surrounding population perhaps more open to improvement and ready to receive the fruits of civilisation than most others throughout our dominions in India, simply from the fact that many of the surrounding tribes are in a state of greater ignorance, and untrammelled by those religious prejudices which have been found the greatest of all bars to the advance of Christianity in India. I am not now, however, going to advocate European colonisation on the score of proselytism, though I do believe that, until you bring the European element more in immediate contact with the natives, and make their interests more identical, the missionaries will continue to find their work, as heretofore, of a very uphill description, My advocacy is on the score of economy, which is more likely to gain the object in view. The economy that I allude to is the reduction of the European military force in India, which the European colonisation of that country would eventually, and that speedily, lead to, as the fact of there being at hand an able body of acclimatised Englishmen would carry its own influence, and obviate the necessity for keeping up so large and expensive a purely military force of Europeans as is now found requisite, and be the means, in fact, of "turning their swords into reaping-hooks," though still having at hand an ever-reliable material in case of emergency. Although the advisability of European colonisation first suggested itself to me, as I have already said, some twelve or fourteen years ago, yet it was not till after the mutiny had broken out that I ventured to bring it to the notice of the authorities, which I did in 1858, in the form of some suggestions submitted to Lord Stanley, the then Secretary of State for India, which, had they been acted on at that time, would have ensured by this

not only some thriving colonies of Europeans in that country, but the State would have been saved enormous amounts expended in the passage-money alone of invalids, to say nothing of the valuable lives that might have been saved, by having established more sanitaria and settlements for those to resort to whose constitutions are as incapable of withstanding the climate of the plains of India as that of England, after being broken down by having to encounter a tropical climate at the too early age at which many of our soldiers are sent out to it. This was more particularly the case during the mutiny, from the fatigues and hardships to which many succumbed who might have made good settlers, had there been European hill-colonies to which they could have been sent, instead of being returned, as is but too often the case, as paupers on their parishes at home in England. The plan I proposed for carrying out this desirable object was to endeavour to induce the time-expired soldier, as well as those "invalided home," to remain and settle on the hills in India, by the offer of grants of land, and thus save the expense of this transit back to this country. The amount for transit thus saved, together with pay that must of necessity be given to them ere they could receive their discharge, would have gone a long way to have settled them down as useful squatters, as well as good material for the formation of a reserve force. This plan is, of course, still open to be carried out, though not with the same immediate results, or on so extended a scale as it might have been when first proposed by me, when there was at hand so much larger and, after a time, unrequired military force to work on. Now, if added to this, on the questionable reduction of the officers of the Native Army, they had likewise been in the same manner induced to settle in India, instead of having been so cruelly and injudiciously forced, it may be said, out of it, the material for the organisation of a reserved military force would have been complete, and at the same time the agricultural interest of the empire would have been better studied, and a large portion saved of that present enormous outlay of ten millions sterling for barracks, in part at least obviated. With reference to the suitability of the climate of the mountain ranges of India to the European constitution, I cannot do better than refer to the papers read by Dr. Mowatt, at the United Service Institution, in 1866; where will be found an opinion by this well-acknowledged authority, which I would recommend to the serious attention of those who would still wish to see our soldiers stewed and grilled in the plains. Great necessity exists for care being observed in the selection of good and dry positions for sites for several of the hill-stations, and that they be drained previous to becoming settled. Look at the several stations on the Neilgherry Hills, only one out of the four, viz., Kotagherry, has been judiciously selected; the original sites of the other three are mere basins, so surrounded with hills as to prevent the possibility of a free and healthy circulation of air, with drainage almost unthought of, though peat bogs, swamps, &c., exist in their very midst. This is the more extraordinary, as, close at hand, viz., Wynaad, formerly one of the most deadly places, perhaps, throughout India, has been converted by cultivation and drainage into a salubrious tract, now inhabited by European planters and their families. Most of these ranges are much under the supposed safe altitude, which shows that if the necessary sanitary precautions are taken, even the lower ranges or plateaux of India, with well-selected elevated dry sites, may prove to be genial and healthy localities.

Dr. Archibald Campbell said:—Having served a long time at hill-stations, I am glad to give some of the results of my experience to this meeting. My first connection with the hills was in 1829, when I accompanied the first detachment of European convalescent soldiers from Meerut to Landour. It was in April, and very hot on the plains. I shall never forget the delightful impression made upon me by the first ascent of the Himalaya; a cool and invigorating breeze put new life into every-one. The hill-sides, above 5,000 feet, were gorgeous with the scarlet tree-rhododendron in full flower, and the snowy range stood out bright and clear against a blue and cloudless sky. The rapidity with which the change of climate to an elevation of 7,000 feet effected a recovery in all the men recently suffering from acute attacks of fever and liver disease—notwithstanding the bad accommodation in barracks and hospital, hastily run up and not finished, the bad bread, and indifferent rations—was very remarkable. I again visited Landour and Mussoree, in 1831, and travelled across the mountains to Simla, and onwards to the Sutlej, whence I went to Nepaul, where I was for eight years. From Nepaul I went to Darjeeling, where I remained 22 years, in the course of which I travelled all over Sikhim and into Thibet. I have, therefore, seen a good portion of the Himalaya, in the north-west, in the central region, and in the south-east, and had experience of its climates at all elevations, up to 19,000 feet. I quite agree with all that Mr. Hyde Clarke has said in their favour, and as to the large field for occupancy, although we are quite shut out from Nepaul and Cashmere. The great features of all the stations are much alike; the following distinguish Darjeeling:—The hill portion is about 460 square miles. The elevation varies from 1,200 to 10,000 feet above the level of the sea. All elevations above 3,000 feet are healthy for Europeans. Indian corn grows up to 5,000 feet, potatoes to 7,500. Tea thrives best at elevations up to 4,500 feet. It does not grow at elevations above 7,000. English vegetables do very well up to 7,500; they have not been tried at higher points. The scenery is unsurpassed in grandeur; the climate excellent. It is cooler in summer, and warmer in winter, than the western stations at similar elevations. The rain-fall is 120 inches per annum. The spring is showery; the rains commence about a month earlier and continue a month later than at Landour and Simla. There is still much land available for settlers, and it is a fine field for them. Access is still difficult; of this I shall speak presently. Labour is abundant and cheap. Mr. Hyde Clarke has said, and it is a very general subject of remark, that although the British Government has possessed India for so long a time, and although the climate of the country is, upon the whole, inimical to the European constitution, so little has been done to utilise the hills, the climates of which are so salubrious. There is no part of India proper in which we can avoid six months of hot weather, with a great proneness to tropical diseases, nor can we ever colonise it. Throughout the Himalaya we can have every variety of temperature, and cold healthy climates, according to the elevation we may select. No doubt the remark is, to a great extent, well-founded; but, on the other hand, it must be recollected that there was everything to learn of these hills at starting, and that it was not until 1815, when the war with Nepaul was brought to a successful termination, that we had any footing at all in the hills. Our first stations were Almorah and Subathoo, for civil government and military occupation. Then followed Simla, in 1825, as a general sanitarium; Landour as a sanitary depôt for European soldiers; with Mussooree, adjoining, in 1829; Darjeeling, to the east of Nepaul, ceded by the Rajah of Sikhim in 1835, was opened in 1839; and then followed the military cantonments of Kussowlie, Juttogh, and Dugshai, near Simla. Since the Punjab war, of 1848, the hill-stations of Murree, Dalhousie, Dhurmsala, Chumba, Kangra, and Bukloh have been formed as sanitaria and governing stations, to which has been added Cashmere for officers during the hot season only. There is also Nynee Tal, a general sanitarium in the province of Kumâon, with Ranakhet and Chukrata; so that we have many stations on the whole, although the total number of European soldiers on the hills, for this hot season, sick and well included, will not exceed 6,000, or about eight per cent.

of the whole army, taking it at 72,000 men. Mr. Clarke has very truly said that the range of subjects connected with the hill-stations is so great that they can only be glanced at in a meeting of this kind. This is all I shall attempt to do, and it will be under six heads:—1. As sanitaria for Europeans of all classes requiring change from the plains. 2. As sanitary depots for European soldiers. 3. As cantonments for the European troops. 4. As places of settlement for Europeans. 5. As places for colonists and military colonies. 6. The means of communication, internal and with the plains. 1. As general sanitaria for Europeans who require a change of climate after acute attacks of disease in the plains, or who are suffering from weakness caused by hard official work, or long residence in India, and for ladies and children who are not ill, but for whom it is very desirable to be removed from the heat and disease of the plains during the hot and rainy season, they have been of the greatest benefit. The advantages in these respects have hitherto been principally derived by the officers of government, civil and military, lawyers, merchants, and high railway officials, their wives and families. The cost of travelling and high house-rents have hitherto deprived the middle class of Europeans of all the sanitary advantages of the hill-stations. To Europeans who are near enough a hill-station to be able to afford to keep their families there for six months of every year, the advantages are immense, and the value of Indian service is thereby greatly enhanced. Their children are quite as well off for climate as if they were in England, and can be kept with their parents for four or five years longer than those of other officers stationed at a distance. 2. As convalescent depôts for European soldiers whose regiments are stationed in the plains. This was the earliest use we made of the hills. The first depôt was formed at Landour, in the N.W. Himalaya, in 1829, for 100 men, to be supplied from the regiments at Meerut and other stations at and above Cawnpore. It was followed by Cheerapoonjee, in the Khassia Hills, which was a failure; then by Darjeeling, in 1842, for the regiments at Calcutta; Dinapoor, and upwards to Allahabad; by Murree, in the Punjab, Himalaya, for the Punjab regiments; by Dalhousie and Kangra, in the same division of the hills. It may be quite safely asserted that all the depôts have successfully answered their purpose. They are all at elevations of about 7,000 feet—1,000 or 1,500 feet lower would be better perhaps. Many soldiers are every year restored to health, and long continued in the service by these means. Very much, however, depends upon the proper selection of cases to be sent to the depôts by the regimental surgeons, and the station committees. As a general rule, I believe it may be admitted that men who have had acute attacks of fever, liver disease, rheumatism, and dysentery, will be certainly restored to health by a hot and rainy season in the hills; while cases of chronic dysentery and rheumatism, with or without syphilitic taint, will not be benefited. It is within my own knowledge that, for three successive seasons, the cases sent to Darjeeling were so badly selected, that the result at length attracted the serious attention of government in Calcutta and in England, when more care in the selection altogether altered the results, and established a confidence in the sanitary effects of the climate of that station which has never since been shaken. The convalescents go to the hill depôts in March and April, and return to their regiments in November and December. They are carried in doolies—*i.e.*, litters on men's shoulders—or in country carts, to the hills, and marched back on foot. The exposure and tediousness of both modes are sometimes very injurious; but in this, as in all other matters affecting the value of the sanitaria, the want of railways to the foot of the hills is greatly felt. 3. As cantonments for the permanent quartering of European troops, the value of the hills has not been so generally assented to. There is some diversity of opinion on this subject; to this, as well as to other serious military and political considerations, is, in some degree, to be attributed the slowness of progress in this important direction. The want of railways, however, by which alone the locking-up of troops in the hills can be obviated, is another great cause of delay, which ought to be removed. The regimental cantonments are at Darjeeling, which has proved to be as healthy as any station of the British army, home or foreign, and at Kussowlie, Juttogh, Dugshaie, and Subathoo, all in the North-west Himalaya, and convenient to the Punjab. Except Subathoo, they are all about 7,000 feet above the sea. The prevalence of diarrhœa at some of the north-west hill-stations has been unfavourably reported on by the medical officers. There are no objections to Darjeeling on this score, but the want of railway communication presses upon it more heavily than on any of the north-west stations, as it would be more difficult, from the nature of the country, to bring a regiment from Darjeeling to a railway line during the rains than from other hill stations. 4. As places of settlement for European officers of government and others who have resided long in India, the hills are, by general consent, highly approved of, and, no doubt, the opinion is well founded; still, the number of persons of this class who have adopted them as places to live and die in, and to settle their families in, is not very large. The great advantages are, the healthy climate, the retention of Indian servants, and Indian modes of life and society, which are very genial to the old Indian, as compared with the new career he has to enter on if he returns to England. The disadvantages are, the want of educational establishments, the reluctance to give up all hope of joining in the civilisation of Europe, and the craving for a return "home," which never seems to be quite obliterated in any British heart. 5. As places for colonists, and suited to the planting of military colonies. On the first of these propositions there has not been much interest taken by the Indian Government, but a good deal has been written on the subject by well-qualified persons. The finest published essay on the subject was by Mr. Hyde Clarke, the author of the able paper we have listened to; it is entitled "Indian Colonisation, Defence, and Railways." It is exhaustive of all that that was then known of the advantages of the hills for European colonists. The next was a very elaborate paper by Mr. Hodgson, formerly Resident in Nepaul, which was published in 1858 by the Government of Bengal. More recently, Dr. Graham has published a treatise on the same subject, and Dr. Hooker in his Himalayan journals, has touched on the same question. These authorities, and they are eminent ones, are unanimous as to the suitability of the climate for European colonists, and on this point I agree with them, but there is one drawback to the scheme which I cannot overlook, and it is justified, I think, by the experience of colonisation in America and Australia. In those two great countries, the colonist was necessitated to work with his own hands, from the beginning and to the end, without the help of servile native races. In the Himalaya there is an abundant native population, ready and willing to serve the white man at very low wages. Wherever this exists, the European will have recourse to it, and, in doing so, he will at once, I consider, depart from the essential conditions of a real colonist. Having said this much to qualify the strong opinions of others in favour of colonisation pure and simple, I must ask your indulgence for a few minutes, to record the strongest instances in my experience in favour of settling Europeans in the hills, with the advantages of native help. In 1840, Mr. Start, an English missionary, brought four Germans from the neighbourhood of Berlin to Darjeeling. Three of them were married men, and of the labouring class; the fourth was an educated man, who devoted himself to mission work only, and who married an English woman. All had families. The three married men at once procured land, built houses for themselves, cultivated the land to supply Darjeeling with potatoes and vegetables, reared poultry

and pigs for the same market, and even advanced to keeping dairies and supplying the station with milk, butter, beef, and mutton; to this was added a shop or store, by one of them, for groceries, hardware, tools, glass, crockery-ware, &c. Another took up house and land agency; and the third went into tea-cultivation with eminent success, leaving off, two or three years ago, with a fortune little short of £20,000. All were successful; all were very industrious, sober, and hard working men; their families grew up, under my own eye, to be vigorous and healthy men and women, and their grandchildren, still at Darjeeling, are as strong and healthy as any persons in Europe. These men had their passages and outfit provided by the missionary, who also advanced them a small capital at starting, not more, I believe, than £50 each; all the rest was the result of hard work, frugal habits, and good moral character, with the advantage, however, of cheap native labour. Nothing can be more encouraging than the career of these men, and there is plenty of room for such at all the hill stations, but still they were not out-and-out colonists, depending on the work of their own hands alone, as the emigrant to Canada, America, Australia, and New Zealand must do, and under which he thrives and peoples these countries. On the second scheme, or military colonisation of the hills, I have only to say it is still untried; and, although I gave the subject a good deal of consideration at Darjeeling, I was not able to propose any plan to government, with the practical character of which I was quite satisfied. Mr. George Campbell and General Eyre have each given us their views on this subject. Another practical suggestion I have seen is made by Dr. Mouatt, Inspector of Jails in Bengal, who has frequently resided at Darjeeling. He made it in a paper on this subject, read before the Royal United Service Institution, three years ago, on the subject of military colonisation of the Himalayas. Dr. Mouatt says:—"My plan would be this. I would, in the first instance, select most carefully 300 well-conducted, healthy soldiers, whose term of service had nearly expired, and I would take equal care that my intended colonists had healthy, well-conducted wives, with young families. These 300 families I would form into one village community, with grants of land of sufficient extent to admit of their supporting the village when fully cultivated. To each village I would appoint a captain and subaltern, married men with growing families, to control and direct it in all matters in which guidance was required. The officers should also have grants of land, and become *bonâ-fide* settlers, and they should be armed with all the powers necessary for the entire management of their charges. Medical attendance and education, with which religious offices and instruction should be combined, I would likewise provide, every member of the community having his grant of land, and being thoroughly identified with it. In addition to attaching some light condition of military service to each soldier-settler, from each family I would exact the condition suggested by Sir Henry Lawrence, of supplying a recruit for service for ten years to the European force in India. By some such plan as this, carefully worked for five years, the practicability of military colonisation would be fully tested, at a cost that could be more easily borne by the revenues of India than the large outlay now incurred in in sending time-expired soldiers to Europe, and removing regiments without any real necessity, as frequently as seems to be contemplated, on pleas of health and necessity, which are utterly untenable." 6. The internal communications are bad everywhere. In conclusion, I will, therefore, submit only one very important matter to your consideration, in the hope that, through so many well-informed persons, who are, no doubt, well wishers of their countrymen and women in Bengal, it may make some impression beyond these walls. Although Darjeeling is the only sanitarium for Bengal, and that province and Calcutta have by far the largest European and Eurasian population in all India, invalids are deprived of the blessing of healthful change of air because there is no railway. Hundreds of our countrymen, who are too poor to take a voyage to England, are really languishing and dying in Calcutta and other parts of Bengal, while a few hours of slow railway travelling would suffice to place them in a most healthy climate, and in the grandest scenery in the world. The total distance from the capital of India to Darjeeling is under 400 miles, 200 miles of which may now be travelled by rail. With a continuous line and express train, the high officials and merchant princes of Calcutta might dine at home, and breakfast next morning in the hills, while the sick sailor and artisan could reach the same delightful and invigorating change in twenty-four hours by Parliamentary trains. It is no undue partiality of mine for the sanitarium I have had most to do with that induces me to press this matter on your attention; nor have I any personal object whatever to serve by doing so. The facts of the case—and they are painful ones—are all I appeal to, and if any one desires explanations on the subject, or further particulars, it will give me the greatest pleasure to meet their wishes. Mr. Clarke has put the matter very strongly and well before you. Mr. G. Campbell has, I think, underrated the importance of this matter, and over-rated the expense of remedying the evil. It is not for the necessities of Darjeeling alone that a railway is wanted. It is to give the blessing of healthful change of air to the sick of Bengal that it is so urgently wanted; and instead of four or five millions being required, I have an idea that less than a million would give a single line from Rajmahal or Caragola to the foot of the hills at Darjeeling. But Mr. Turnbull, who opened the East Indian Railway so successfully, and knows Darjeeling well, can say more to this point, and I hope he will do so. The choice of a line lies, I think, between Rajmahal and Caragola. The proposed one from Koostea is twice the length, and not so likely to be a paying one. The engineering difficulties on the lines communicating with the East Indian Railway are confined to bridge work, for the country is very flat. From Caragola to the foot of the hills there is a wide roadway laid down by Mr. Login, C.E., now present, the curves and gradients of which are suited to laying rails on, should that line be adopted. The road, however, is not metalled nor efficiently bridged, so that the means of communication in the rains is dreadfully bad. I have shown how injuriously and unjustly the want of a railway affects invalids and soldiers. The obstructions to commerce are also excessive, but Mr. Ward will, perhaps, enlighten us on this subject.

Mr. T. Login said—I venture to bring forward some facts on this important question, brought before us by Mr. Hyde Clarke, which I trust will be of some use in enabling us to arrive at some practical conclusions on the question now under consideration. Some twelve years ago, I made some careful inquiries concerning labour in India compared to England, and I arrived at the conclusion that an up-country beldar can perform three-fifths of the work done by an English navvy. Now, as the average price of wheat in England may be taken at 60s. a quarter, or eight seers per rupee, the price of food here, under ordinary circumstances, may be said to be three times that in India, where usually wheat sells at twenty-four seers per rupee. Consequently, a labourer in India can live and support his family at one-third the cost, as to the staff of life; but, as the average pay of a navvy is about fifteen shillings a week, or thirty rupees a month, and that of a beldar is hardly five rupees a month, the cost of labour as to money in England is six times what it is India. Therefore for one-sixth the pay we get three-fifths the actual work done; that is, in India a labourer receives only five rupees for work which in England would cost eighteen rupees, or the English navvy receives $3\frac{3}{5}$ times as much as the Indian labourer for the same work. But as to the price of food in England (taking wheat as the standard), the

English labourer is rather better paid than the Indian coolie, and consequently is better fed and clothed, for in India cloth costs more than here, though, happily, in India the coolie does not require so much clothing. This is taking the most favourable state of things, where the labourers are paid by job-work, but if we descend in our comparison to the agricultural labourer and the village coolie, the comparison would still be in favour of the English labourer. Now, no one can suppose that an English workman could perform three times the work if food was three times as cheap, even here in England; and, in a climate like that of the plains of India, it is probable he could not perform anything like the same amount of labour that he could in his native country, let the price of food be ever so cheap. The deduction is that, throughout the plains of India, European labour cannot for one moment compete with the labour market in India. In among the hills, however, the circumstances change, for there we have only a very limited supply of workmen, and to induce men from the plains to go and work among the hills we must raise their pay, so the European comes to have a somewhat better chance of competing with the Indian coolie, for he is in a climate where he can do out-door work all day long without injuring his health, and the little experience gained by employing European soldiers among the hills supports this view of the case. Surely no one will say that a soldier who has done a good hard day's work out of doors, and is paid for it, can be a worse man or soldier by having done so, if he is better able to support his family, for surely the soldier is worthy of his hire, and should be paid for what he does, as well as any other class of men. In a pamphlet which lies on the table I have gone into the question of communications in India, which goes to show that, in a commercial point of view, railways can convey troops and munitions of war, as well as merchandise, cheaper and faster than by roads; so financially there is every reason why this network of rails should be carried out to completion with the least possible delay. Once this has been accomplished, and what then? Are we to continue our present system of cantoning troops near large Indian cities, the hot-beds of cholera and fevers, not to speak of the immoral dens of vice in our bazaars, where diseases are contracted that ruin both body and soul? It is said that it is necessary that the natives of India should *see* before they will believe that there are European troops in the country, and no one is more satisfied of this than I am. The question is, cannot our troops be *seen* without exposing them to the unhealthiness of a cantonment near large cities, and all its concomitant evils? Is it necessary that the natives should not only see the European on the parade-ground, but also that it should be an almost every-day sight to see a poor unfortunate soldier intoxicated in the bazaar, thus lowering us individually and collectively as a nation, in the Asiatic's eye. Once there is a network of railways, with branch lines to the foot of the hills, to all the military stations among the hills, in less than one week our troops could be marched down, and an army collected at any point, with the same expedition as if they were scattered over all the cantonments of India; and is not a man living in a European climate all the hot season, removed from the heat of the plains, better able to withstand the fatigues of a campaign than one confined in a hot, close barrack-room for twenty out of the twenty-four hours? But what of their families? We see a poor set of children, sickly and pale, with a mortality amongst them that is frightful to contemplate, while those at the Lawrence Asylum are as rosy as children at home. I believe that, by following the valleys of most of our main rivers among the hills, a good cart-road can be constructed of some five or six days' march, that would reach a sufficient elevation, and be, in a great measure, beyond the excessive rains of the monsoons; and, by establishing military colonies at such spots, not only would the troops be in a climate where they could take out-door exercise all day with impunity, but they could be usefully employed in making roads or building their own cottages, and thus have the pleasure of seeing spring up about them a healthy generation. In the cold season, camps of several thousand Europeans could be collected, and, after a few weeks spent in reviews and other military duties, near some large city, in one day the camp could be struck, and next day another camp formed near some other city 100 miles off. By this means the native population would have ample opportunities for *seeing* much larger bodies of Europeans than ever they have done heretofore, and the troops would be improved by having to act together in large masses, and at the same time the railway establishments would be broken in to know how to move on large bodies of troops without necessitating commanding officers to place in arrest station-masters, as at Howrah, in 1857. To carry this out, instead of building large expensive barracks that are easily demolished and cannot be defended (remember Meerut and Cawnpore), there will require to be small forts, armed with the heaviest artillery, that could be held by a company of Europeans, and at one and the same time overawe the neighbouring city, and give protection to the civil station, affording shelter in time of need to the European population. Thus, whether an insurrection should break out, or there should be a frontier war, the troops would know that those left behind would be comparatively safe, which they are not at present. Not being a military engineer I cannot venture to give an opinion as to how these small forts should be built and defended, nor as to how the hill stations should be be laid out so as to ensure proper military discipline, of which I am supposed to know nothing; but I could venture to express an opinion as to how roads should be made, and how to get a water-supply. I have, however, already occupied too much time, and cannot now enter into these two important subjects, but must confine myself to saying that for roads the gradients should never, except for a hundred yards or so, exceed 1 in 25 feet; and that the supply of water should be brought in by a closed canal, at a high level above rather than below the station, while the stations themselves should not be exposed to the full beat of the monsoons. To secure these advantages the roads should ascend the valleys of rivers, and the stations be situated on the spurs of hills which rise 1,000, 2,000 or even 5,000 feet higher than the station, so as to afford a constant supply of good water at high levels, while at the same time this high hill would protect the station from excessive rain—points which have been lost sight of in selecting most of the old hill stations. If 15 gallons a head, or, in round numbers, say 150 lbs. of water, has to be carried 500 feet up hill for every man, woman, and child, the expense of conveying this water up to the top of the hill can be imagined. And if a less quantity than is found necessary in England be used, we can form our conclusions as to the effect this scarcity of water must have on our troops. When, however, it is also known that this very water is also often impregnated with organic matter, is it to be wondered at that we hear complaints of many of our old hill stations? In conclusion, I hope that the subject Mr. Hyde Clarke has brought before us will not be allowed to drop, as the future prosperity of India, I believe, greatly depends on hill sanitaria.

Sir Andrew Scott Waugh said he found he had been anticipated by preceding speakers on almost all the subjects he could touch upon. Dr. Campbell had said that the transition from the plains to the hills in India was perfectly delightful; it was, in fact, a transition from the infernal regions to paradise. He did not believe any person who ever ascended in one hour, as he had done, from the climate of India to that of England, had ever dreamt of anything else but how delightful it would be to colonise those spots with Europeans; and he believed every commander-in-chief, every governor-general, and every officer in command of the hill districts, had had an eye to this great desideratum. If it could

have been done by Aladdin's wonderful lamp, it would no doubt have been done, because the government of India had been most willing to do what everybody had desired. Sir Henry Durand, as commander-in-chief, went to see if he could not settle troops in the hills, but everything had to be done at the beginning. It was a *terra incognita*. Roads had to be made, and only those who know what the climate really is could understand how long such a work took. The first European troops were located on a ridge of the hills. On the Himalayas there was a regular land and sea breeze; it blows all day from the plains, and all night from the snowy mountains, and that must be very salubrious. But they had to consider that the climate was of that peculiar nature that there were three months of extreme cold, three months of extreme drought, and three months of extreme wet, and all vegetation must undergo great transitions from wet to dry, and from heat to cold. He had seen all the fruits of England progressing favourably, then came the monsoon, and they never saw the sun again for three months, and so they remained unmatured. It seemed to him that the mistake made was in selecting the ridges for stations, and that it would be better to select hills with partial snow at the summit and plenty of water, so that they would have water from above, instead of bringing contaminated water from below. It was mentioned by Dr. Campbell that a colony could hardly remain as an English colony. In fact, an Englishman could not exist in India under a certain amount of annual income. If he kept a footman or butler the cost would be £60 or £70 per annum; and, unless English colonists could be employed in some way, they would only appear to the Indian population as a lot of broken-down Europeans. He recollected the German missionaries mentioned by Dr. Campbell; they appeared to have prospered very well, and a favourable opening seemed to have presented itself for them. The government formerly could not move many of the troops to the Himalayas, because a certain portion were required in the plains, especially when communications were difficult, but now that they were easier, and there were more European troops, the greatest blessing to the troops and to India was to locate them in the mountains. It would no doubt be very desirable if we could breed our own recruits for the army. If we did not breed Englishmen, they would be men almost as good; in some respects they would be better, for they would have the wind and limbs of mountaineers, and be able to climb well. He had no doubt that would eventually be done, but, to enable it to be done, he wished the word "barracks" were expunged from the English language; it had done more harm to the soldier than anything else. The noble Lord in the chair, Mr. Campbell and others, who had served in India, would recollect how picturesque were the cantonments of the Sepoy regiments, where each man was monarch of his little house, surrounded by his family and small garden. He believed that could be done at less expense than building large palatial barracks. Those built under Sir Charles Napier, he believed, cost from £150 to £180 per man, while they could build cantonments, of the kind he referred to, at about £30 or £40 per man.

Mr. C. H. Fielder said, on looking over the report presented by Mr. Ewart's Committee to the House of Commons, it struck him that the recommendations contained in that report were almost identical with the pith of the discussion which had taken place up to this time. He was sorry to find, from the remarks that had fallen from official gentlemen recently returned from India, that few if any steps had been taken by the government at home or in India to carry out those recommendations.

Mr. Samuel Ward was pleased to find that the question of railway communication between Calcutta and Darjeeling was receiving some attention. A great advantage would be gained, in a commercial point of view, if the produce could be conveyed from Darjeeling to Calcutta more readily than it was at present. A railway from Calcutta to Darjeeling was most desirable, independent of economical considerations, for all classes of European residents in Calcutta.

Sir Charles Trevelyan, K.C.B., said his first acquaintance with hill stations in India was in the year 1830, when he went with Lord William Bentinck to Simla; and, after more than a generation, he paid a second visit. It might be interesting to the noble Chairman and others to know what changes he observed there. The place remained substantially the same. Its character had been fixed for ever by "the everlasting hills." There were many more houses; there were more roads and better, and the old roads widened; and, above all, the beautiful carriage road from the plains had been made by Colonel Kennedy. Commercial development there was none; means for it did not exist. The country, no doubt, was suited to tea cultivation, but less suited than other parts. There was a tea plantation at Kotegurh, a few miles from Simla, but in the immediate neighbourhood there was no possibility, as far as he could see, of commercial development. Of colonisation, properly so called, also there was none. In fact, the merit of the place lay in its extreme beauty; and, if proper sanitary conditions were observed, its extreme healthiness. It was one of the most glorious places in the whole world. During the long interval of thirty-two years, he had seen all the places of greatest mark in Europe, but he had seen nothing that could be compared with this beautiful region of India. All of them fell far short of Simla. There was that magnificent chain of snow-clad mountains, the highest in the world, stretching from Cashmere to the sources of the Ganges and the Jumna, like a screen half-way to heaven. There was the beautiful rhododendron forest, and he begged to compliment the noble Chairman upon the great care taken of that forest, which he found, after thirty-two years, more flourishing and more primitive, so to speak, than when he left it on the first occasion. Then he would mention the extraordinary cloud scenery. He never saw anything like it. From his house, looking down the valley, he frequently saw a magnificent dark cloud stretched across the valley from hill to hill, with the rain falling from it into the valley, and the sun shining through this charming lace veil. At other times clouds formed a bridge over a gap in the hills, and, while all was dark and gloomy above, the sun was seen shining through this gap in the most delightful manner.

Then in the year 1859-60, in the course of an official tour, he visited the Neilgherries and the Pulneys, and stopped some time at each. The Neilgherries, though quite in a different way from the Simla hills, were very remarkable. The Neilgherry plateau was advanced, like a magnificent bastion, into the plains, with Dodabet, like a gigantic watch tower, dominating over the plains and table-land of Mysore itself. Then there was that remarkable Palghat gap in the Western Ghâts, through which the railway was carried, separating the Neilgherries from the Pulneys—an admirable natural arrangement which made a high road across the mountains to the western coast possible, and allowed the monsoon to spread over the plains of India, producing the climate which made the Madura and Tinnevelly cotton so famous. The Simla hills were all in ridges. It was, figuratively speaking, difficult to find a resting-place for the sole of one's foot upon them. One clung to the hill as to the roof of a house; but it was different in the Neilgherries. Here was a great undulating table land, quite open except in the hollows, filled by woods of extreme beauty, which never receded and never advanced, but remained just as they were probably thousands of years ago. The plateau was quite destitute of population, except those strange people, the Todas, a sort of barbarous Normans, who had lorded it over the inferior races occupying the side of the mountains. They were a shepherd race, who offer no obstacle to settlement. As we advanced they receded, and were thankful for the provision we made for them.

The health of the district was excellent. He (Sir Charles Trevelyan) did what he could to promote the removal of the great Military Orphan Asylum from Madras to the Neilgherry hills. This had since been accomplished, and he regarded it as a great measure of colonisation, and he hoped it would be followed by the removal of the Female Asylum to the same locality. Here there was a solid foundation for commercial and industrial prosperity, coffee cultivation being the great staple. The produce was of excellent quality, and might be grown with profit to any extent, the demand of Europe for this article being constantly on the increase, and the region suited for coffee cultivation in Coorg, Mysore, Wynad, and the Neilgherry and Travancore Hills being practically unlimited. European colonisation in the Neilgherries approached nearer to the Australian and American type than anywhere else in India. Europeans could live there out of doors all the year round. The climate was invigorating. The residents had abundant means of employment and subsistence, and the Madras Government had been liberal in their arrangements for giving security of tenure, at moderate quit-rents, in a manner acceptable to the planters. A considerable amount of colonisation had taken place, and it was still going on in a satisfactory manner, through coffee planters, through a large number of retired officers, and also through the schools, the latter being a very interesting feature.

The admirable climate of the district showed to great advantage in the younger portion of the population. He spent several hours on one occasion at a school established for educating young East Indians for the telegraph service. They were taken from the sultry plains of the Carnatic, and he was pleased to find that they acquired in the hills the robustness and heartiness of the English constitution, and the same appeared even among the natives. Those who followed us to that cold district were obliged to wear warm clothing, and to eat more animal food, and they became stouter and stronger than the natives who remained in the plains. The Todas themselves were also remarkable specimens of the excellence of the climate. Physically, they were almost like a race of giants, and the women were strong in proportion. As far, therefore, as the Neilgherries were concerned, everything appeared to be going on admirably. A separate commissionership had been established, to give the advantage of local administration; and, even if our Indian empire were to be rent asunder to-morrow, he believed an important self-sustaining fragment would be left there; but surviving, as he believed it would, for generations to come, and continuing to grow and develop, he looked to the Neilgherries as a source of solid strength, as a sort of bulwark of European power and Christian civilisation in the south of India.

Some remarks had been made about military colonisation, by which he understood to be meant organised systematic military colonisation; that was to say that entire military bodies should be assisted to colonise. He thought it was a mistake to take any body of men whatever, and to turn them into ready-made colonists. The work of colonisation was one which all were not capable of. It required special personal qualifications, and the manner in which our English soldiers were cared for and looked after was not favourable to the formation of the self-reliant habits which are so necessary for colonists. Of course, a considerable proportion of European soldiers were qualified to become useful and successful colonists, and they did become so. They percolated, as it were, into colonisation; but to encourage them to settle in a body, and to assist them with little outfits, was a mistake. It had been tried, and failed over and over again. During his experience at the Treasury, two remarkable instances had come under his observation—one in Canada, and the other in New Zealand. Both were dead failures, and he attributed it to the fallacy of supposing not merely that military, but that any body of men as a class, were fit to be colonists.

He also visited the Pulneys. Phulney (Phalni) meant "flowery," and anything equal to the flowers there he never saw. The roses and geraniums, originally planted in a few private gardens, had spread themselves on all sides, and had literally become brakes, like the furze brakes in England. The roses had become single, as they did without cultivation, like the dog-roses here, but they were very sweet-smelling. The feature alluded to by Sir A. Waugh existed here in a more decided manner than he ever saw it elsewhere. He zigzagged up the side of an almost perpendicular mountain, and, in two or three hours, passed from the sweltering heat of the plains into a delightfully temperate climate. The first decided symptom of having changed the climate was the bracken fern. He cut it across the root, and there was the old familiar oak tree. It struck him that it must be the work of Almighty Wisdom that had placed in the heart of India the identical plant which abounded in our parks in England. The tree fern also existed there in great perfection; and there was another remarkable phenomenon, viz., the natural bridges. The coarse grass and turf were exceedingly solid and tenacious; the streams burrowed beneath, and in course of time these natural bridges were formed. He had passed over several of them. These hills were as yet undeveloped. There had not been a road made in the interior of the hills, but now arrangements had been made for the extension of the Great Southern of India Railway by a loop-line into that district, so that probably, before many years, we might hear more of the Pulneys.

Mr. Edwin Chadwick—It appears to me that the free scope given by Sir Charles Trevelyan to the feelings of the pleasure of temperature and of the sense of sight, require correction from sanitary experience, and the warnings yielded, in urban districts at least, by the sense of smell. He has spoken in glowing terms of Simla. Now, in further justification of the mention I made of it in our previous discussion, I beg to cite a passage from a report of the Sanitary Commissioners for Bengal, which is in the following terms:—"In connection with the very unsatisfactory condition of Simla, the whole question of the proper means to be adopted for the conservancy of hill stations was considered and reported on. There can be little doubt that arrangements for securing the proper sanitary condition of such sanitaria have been hitherto much neglected, and it may be questioned whether the affections of the bowels, which have been considered as endemic in the Himalaya, may not in some measure be due to the contamination of the water supply. That the water was contaminated in the foulest manner possible was a fact admitting of proof only too clear. The dry beds of the mountain torrents were used as places of convenience, to have their contents swept down by the rain. In many places the spring from which drinking water was obtained lay beneath the brow of a hill, which was frequented for the purposes of nature by the servants of the neighbouring houses. It was shown, moreover, that sheep were allowed to feed on the hill sides, on food too disgusting to be mentioned. How these revolting practices could be put a stop to was pointed out by the Commission. The provision of latrines, both public and private, the guarding of the purity of the water supply, and the necessity for generally improved sanitary administration were insisted on. There was too much reason to believe that other hill-stations were in no respect better managed than Simla, and that a decided reform in the arrangements regarding the public health was urgently called for in them all." This is a very mild account of the results set forth in other reports as to the hill stations, yet it serves to contrast the impression now given of this one station as a specimen sanitarium, and it is a specimen of the corrections requisite to the like current statements. By neglect of the most rudimentary sanitary principles in administration, naturally good sites are made bad; whilst by proper applications of sanitary science, naturally bad sites may be made good and habitable even in inferior climates. In illustration of what I

stated in relation to the common causes of infantile mortality in India, I present the following statistics from the last report of the Madras Sanitary Commission, as to the sickness and death in hospital of 2,090 children of British soldiers at one station. The total number of these children taken to the hospital was 1,470, of whom 166 died there.

A Gentleman—That is in the plains?

Mr. Chadwick—Yes; it is a common specimen return of results that pass without notice, as if they were of course, but an examination of the causes of this immense sickness and heavy infantile mortality, denotes what is to be done in India. The statistics state that, "of the admissions, 1,101 are of the zymotic, *i.e.* the fermenting class, or more than half the total number admitted; 188 are of the constitutionaal class; 109 local, and 72 accidental affections. Of the zymotic affections, 1,075 are of the miasmic order, and 26 parasitic." Now, anyone with a competent knowledge of sanitary science will be aware that the great mass of this disease—the miasmatic disease—is certainly preventible; and that the authorities in charge ought really to be, and in time will be called to account for permitting it. The ignorance that assumes these ravages to be inevitable, and that children cannot be be maintained, or British soldiers or others labour or live anywhere but in the narrow hill-stations, is most deplorable. Stamp out all this foul air and filth-disease, as a proper executive would do, and the children of British parents may be brought up to the common sanitary condition and chances of life of at least the urban population at home, if no higher. Upon examination of the facts, I see no better real foundation for the common lazy dogma of the utter impossibility of rearing British children in India, than there has been for the doctrine some have held, of the essential unfitness of the British soldier, or of the artisan, to work even in the plains of India. I was glad to see it stated in the last report of the Madras Sanitary Commissioners, that the construction and the improvement of the roads in the Himalaya, between the stations of Murree and Abbotabad, have been continued by a party of the 79th Highlanders. From the 21st of May up to the 21st of October, upwards of 600 of the men of this regiment were employed in this work. After adverting to a question of the financial result, the commissioners state "a very considerable indirect cash saving may thus be said to have resulted from last year's operations, while the benefit to the regiment itself has been very great. From being sallow, weakly, and unhealthy, the men soon recovered the effects of the fever they had suffered from at Peshawur, and became ruddy and robust. Out of thirteen women who were with the working party, not a single case of sickness occurred." Now, why cannot such conditions be extended and maintained, for women and children as well as for men? In reference to what I said as to the extent of the prevalence of the miasmatic and foul-air diseases in India, and as to testing the local administration by the nose, I may mention that a lady, in her travels through India, states that, in night-travelling, she knew they were entering into a town by being awakened by a bad smell. In the advance of public administration, and the knowledge of sanitary science, and after due warning, when a Governor-General makes his progress, he may be guided with certainty by his sense of smell, and, when meeting with such causes of offence to it, may call upon the officer in charge, tell him justly and decidedly, "Children die away! there can be no succession here! you must go."

Sir Charles Trevelyan begged to say a word in explanation. The view expressed by Mr. Chadwick was present to his mind when he said Simla was very healthy, *subject to proper sanitary conditions.* He was aware of the neglect of those conditions which had taken place, and attention to sanitary arrangements was as necessary in the hills as in the plains—in one respect more necessary, because the crowding was greater in the Simla hills than in the plains. The space available for habitation was so contracted that it was almost as necessary to have proper drainage and ventilation as in the crowded cities of England. The first occasion when this evil became apparent was long ago, when the troops were first placed on the Simla hills. Long ranges of sheds were constructed for them at Dughshaie, and it was taken for granted that, because they were in the hills, they must be healthy; but, after a time, the men became more unhealthy than in the plains, and then it became evident that some sanitary regulations were necessary. He omitted one point in his previous remarks, viz., the experience of Southern India with regard to hill stations for the troops. The great military hill station there was at Wellington, in the Neilgherries. It was the only one, and a great deal of discussion had taken place as to the proper use to be made of that single hill-station in the south of India. He had no doubt himself as to what was the most advantageous use to which it could be turned. It was not to put a regiment there in its entirety, and to keep it there for a length of time, and then to send it back to the plains, and to send up another regiment. In the first place the change was severe, from heat to cold, and from cold to heat again. The men did not like the hills. They had no occupation. The full tide of human existence was wanting; and many instances had occurred of offences being committed, solely because they were dull, and wanted to be sent away. The true mode of using that hill-station was in the same way as it was used by the upper classes of civil and military officers, viz., by those who required it; and, in every regiment in the south of India, men who had been some time in the country, and wanted a change, were sent thither for as long a time as it was likely to be of service to them.

The Chairman said that they must all agree, whatever they might individually think of Mr. Clarke's able paper, in thanking him for the very interesting discussion it had given rise to. In that paper Mr. Clarke had endeavoured to enforce attention to the value of European settlements in India, and he proposed to accomplish this by having military and civil establishments permanently placed there, by instituting military colonies, and by the encouragement of trade with Central Asia, by which he thought merchants would be induced to settle in the Himalayas; and he went on to say he thought government was not alive to the importance of this matter, and, in evidence of that, mentioned that no military colonies had hitherto been established in the hills, though advocated by Indian authorities; that the subject of railways had been neglected; that no hill territories had recently been added to those available for European settlers—and mentioned Cashmere and Nepaul; and then went on to say, which was quite true, that not one-fifth of the troops were stationed on the hills, notwithstanding that it was recommended by the committee who investigated the matter. There was a general concurrence of opinion as to Europeans being settled throughout the hills; and it must have struck every person who had given attention to this subject when it was considered, that we have a country in India of the size of Europe, taking Russia out of it, and that it was held in subjection by a number of Europeans amounting, including the army, to not more than about 101,000. The last census showed that the troops amounted to 60,000, and that the other Europeans, settled all over India, did not number more than 39,516. Now, everyone must agree that our strength in India would be enormously augmented in proportion as European settlers were increased, not only materially augmented but morally, as Mr. Clarke said, by establishing centres of civilisation throughout the hills, wherever Europeans were located. This question of colonisation was attracting at this moment the attention not only of our own government, but those of the French and the Dutch. The former only lately issued regulations with a view of attracting Frenchmen to settle in Algiers, in preference to going to America, so important was it considered to increase the number of

settlers; and the Dutch were endeavouring to do the same with regard to the island of Java. Therefore, everyone would concur with Mr. Hyde Clarke in thinking it was a most important question, how best we could accomplish this object. But when we came to this point the difficulty arose. One speaker remarked how little had been done to utilise the hills, and proposed that the civil and military establishments should be placed there. Mr. George Campbell had pointed out that we had already gone as far as we could in this direction, and everyone who bore in mind the occurrences during the Orissa famine, and other circumstances in Bengal, would feel that it was possible to go too far in having civil establishments in the hills. With regard to the paucity of European soldiers located on the hills, he thought there was fair ground of complaint, because, though the expense of such establishments was great, and, no doubt, military considerations, the importance of which would be seen by looking at the map, stood in the way of having too many troops in the Himalayas, and also the observations of Mr. Campbell and Sir Charles Trevelyan, that the soldiers did not care too much to live in the hills, because it was extremely dull—in fact he could only compare a military station there to the picture of Noah's Ark on the top of Mount Ararat, and about as lively—he said, notwithstanding those considerations, he felt that Mr. Clarke had ground of complaint that so few of our troops were stationed in the hills. He made up an account at the India-office the other day, and, as well as he could make out, last year there were not more than 5,059 soldiers stationed in the sanitaria of India; therefore, instead of one-fifth, the number did not amount to more than one-twelfth of the total number of troops, and that was a thing they had a right to complain of. Then, with regard to military colonies, he was not sanguine about them. In the first place, there was very little land available for the purpose. Cashmere and Nepaul we could not get hold of; we had done everything to prevent their annexation. He (the Chairman) could not imagine a more fit way of employing soldiers than upon works which would increase their pay, and make their life in India more agreeable to them. But, on the other hand, he did not see clearly how we were to turn the European soldier into a settler. He doubted whether, once taken out of the regiment, he would submit to the sort of discipline which a military colony involved. It might suit the French; but the proper military colonisation of Algiers, so far from being a success, had been a failure, as far as he could make out. As long as the men in the regiment were employed he thought the greatest possible advantage would be derived from that mode of settling soldiers in India, indeed, he did not think we had gone far enough in that direction. He would like to see them employed on the railways, and the management of estates and coffee plantations, and those who were not qualified for those occupations might be employed in constructing roads, of which there was so much need in the Himalayas. In that way there was reason to hope much might be done. Then, with regard to ordinary settlers—civil colonists, in contradistinction to military—it was clear the government could not interfere so as to make tea and coffee planting renumerative, but they could do a great deal to prevent such undertakings becoming losses. They could remove many obstacles which stood in the way; they could improve the roads and do other things which he need not refer to. To show what progress had been made in reference to tea and coffee plantations, he would mention that, in 1858—ten years ago—there was £99,000 worth of coffee sent from India, whereas, in 1866, the quantity had increased to £785,000, or nearly £700,000 increase. In tea, in the same way, in 1858, the export was of the value of only about £53,000, whereas, in 1866, it amounted to £309,000. He had looked at a paper written by Mr. Clarke, ten years ago, on this subject, in which he pointed out the different obstacles which stood in the way of European enterprise in India. Of these, four were mentioned, and it would be interesting to see what had been done to remove them during the ten years. The first was the great expense of locomotive transit; secondly, the climate; thirdly, legislative prohibitions, on which he laid great stress; and fourthly, hostility and indifference on the part of the government. Now, with regard to the means of transit, he (the Chairman) would point out that, whilst in 1858 there were only 560 miles of railway open in India, last year there were 4,100 miles open. Although that was not so much as they hoped for, still that could hardly be called indifference on the part of the government. Then, with reference to legislative prohibitions, they had, he thought, been removed; indeed, a French merchant, who reported on India the other day, pointed out that legislation in India, in respect of the law of partnership and limited liability, was highly favourable to the introduction of foreign capital into India, much more so than in our own country. Then, again, with regard to hostility and indifference on the part of the government, he did not think they could be charged with anything like hostility in the present day, and, as for indifference, he did not think that could be said against them. Perhaps, in respect of roads, there was some colour for the charge. Mr. Ward pointed out the great advantages that would be gained by having a railway to Darjeeling. Whether the trade of that district warranted the construction of a railway at present he could not say; but this might be said, that the tea of the Himalayas and the coffee of the Neilgherries could be grown at greater profit than at present, if there were good roads connecting them with the railways. There was a road commenced, which went by the name of the Dalhousie-road, the object of which was to connect the plains of India with Thibet. It was made about half-way over the Himalayas and left in that condition. If, instead of one road half across the Himalayas, two roads had been carried across at different spots, no doubt the tea-planters of the Simla and Assam hills would have been in better plight than they are. There were other ways in which the government might assist, without committing any breach of the rules of political economy. Take the question of cotton. That was an article for which there was an enormous demand in this country, more especially since the American war. To develope that industry in India, only about £200,000 had been spent by the Government within the last fifty years. It was nothing considering the magnitude of the matter in hand; and, during that time, there had been only two cotton commissioners and four gardeners appointed to improve its cultivation. Mr. Ayrton had made a suggestion which he preferred to that of Mr. Clarke. The latter gentleman suggested we should have something in the shape of an English commissioner, while Mr. Ayrton advocated a member of the Council of India for agriculture and commerce. He thought the latter was preferable, inasmuch as it would establish a separate department, which would look after the interests of those who showed a disposition to settle themselves in the hills, and would give them valuable information. At present, he was sorry to say, there was scarcely any information to be got. He sought to ascertain at the India Office the amount of waste lands in the hills in India available for settlers. He could get some information with respect to the Himalayas, but none whatever—or it was extremely scanty—about the Madras Presidency. In the Himalayas, he ascertained, there were not more then 253,000 acres—he should have supposed it was much more; at Simla and Derra Dhoon, 44,982 acres, and he understood about 20,000 acres more had been taken within the last twelve months. However, comparing 1868 with 1850, he thought there was some ground for encouragement, and, if greater results were not shown, the answer must be—not that the government was hostile, though it might be a little indifferent, but the climate. He thought that was the great difficulty they had to contend with in India. It was true the government could, to a certain extent,

influence the effects of the climate by good sanitary regulations, by irrigation works, and the clearing of jungles; but, with all that could be done in that way, the climate would always be unsuited to European constitutions, and India would never be an agreeable place of residence for them. It was women and children who were most affected by the climate, and the mortality amongst them was as great as ever. Two years ago, the mortality amongst children was as high as 99 in the thousand. Again, the difficulty of education was greater than had been admitted. They could get children taught Greek and Latin, and they might obtain what was called a good education, but he was afraid one branch of education, the more important part, the forming of the child's mind—the moral part—could never be managed in a satisfactory manner in India. He therefore thought, on the whole, the climate was a bar to anything like extensive colonisation even in the hills. Mr. Chadwick had criticised the sanitary regulations with considerable severity, and he (the Chairman) admitted they were not perfect, but he apprehended that gentleman referred to reports some years old. [Mr. Chadwick said it was the report of 1866.] He was sorry to hear such a bad account of Simla; but it seemed to him, looking over the sanitary reports for the last two or three years, the danger was in going a little too much in the direction of sanitation. Sanitary science was in its infancy—all we knew positively was that pure water and pure air were essential to health, and yet how little had we done to give effect to this simple truth. We might try to give the people of India good water. As far as he knew, nothing had been done to improve their wells. He could not but think, with regard to sanitary regulations, we had overlooked what we could do, and attempted to do what it was impossible to accomplish in the present infancy of the science. He might be thought to have taken a rather gloomy view of the prospects of settlers in India, but he had no intention whatever of doing so. No man was more conscious than himself of the great importance of this question. He felt one chief danger in India arose from the little root we had taken there. Our position reminded him of those great cedar trees so common in the Himalayas, with vast spreading branches, but which, owing to the nature of the soil, threw out their roots laterally, and took little hold of the soil; consequently, when a wind of more than ordinary violence came, a great tree, which it woud be supposed would stand any amount of wind and storm, went over with hardly any resistance. That was something like our position in India. We were a caste separate from the rest of the country, and therefore the great object should be to throw our roots down deeper into the minds of the people of India; and anything that tended in that direction deserved every support on the part of this country; and whether they agreed or not with all that Mr. Clarke and other gentlemen had advanced in this room, he was sure they would concert in saying that any person who placed one stone upon the cairn of our knowledge of this subject deserved their warmest and most cordial thanks. When he said the climate of India was unfavourable, he included, to a certain extent, the hills, because, though it was agreeable to strong and healthy Europeans, it had a debilitating effect upon some constitutions.

After a few remarks had been made by Mr. Samuel Brown, on the rate of mortality in India, which he stated showed great improvement,

Mr. Hyde Clarke said, in reply, with regard to the objections made, either to his mode of opening the discussion, or those who had supported him, it was not his intention to enter into any detailed answer, because he considered the objections, to a great extent, really came in confirmation of his position. He was relieved, under those circumstances, from defending himself with regard to the general remarks he had made as to the conduct of the government of India. With regard to the objections generally, when considered, they would be found to arise, to a great extent, from misapprehension. In the first place, with regard to site, the remarks on that subject went to this extent, that in some cases the sanitaria already existing were in unsuitable places, and not adapted for all useful purposes. That was tantamount to saying that, because one part of England might be unsuitable for a particular cultivation, there was no capability of its development in any other part of the country. The subject was such a large one that it could not be studied in single details, but it must be grasped as a whole. So likewise with regard to military colonisation, anyone who had gone into the history of the subject must arrive at the conclusion which Sir Charles Trevelyan and the noble Chairman had come to, viz., that military colonisation, in its general sense, was a thing which must fail, and had always failed, even when they took into account apparent exceptions; but, nevertheless, military colonisation, as applied to the hills, was capable of doing a great deal. If regiments were sent out to India with permission to settle there, they would have persons suitable for colonisation, who would remain permanently in the country. Then there was considerable scope likewise for small stations on the hills, in the manner of the system adopted by the Austrian Government. With regard to a Minister of Agriculture for India being preferable to his own proposition of a land commissioner, he might say that both were indispensable for India, and a subdivision of labour must be carried out, so as to constitute separate departments for agriculture and land. Whatever might be the extent to which any objections had impugned details, or rather corrected them, it remained clear that the occupation of the hills by Europeans is practicable, and that the Government had not accomplished all that is required. Much remained to be done, to bring up the troops in the hills to the one-fifth. As to the civil establishments being sufficiently in the hills, or too much, the reform would not be complete till the capitals of government are placed in the hills. The allegation that the Orissa famine was aggravated by the Lieut.-Governor being at Darjeeling, was only another form of reflection on the government for not providing full communication with the hills. There was a telegraph to Darjeeling; it ought to be within twelve hours from Calcutta, and as accessible to Orissa as Calcutta was, and the establishments ought not to be divided between Darjeeling and Calcutta, but concentrated in Darjeeling. Much misconception had arisen in this discussion by Indians not understanding the variety of forms of colonisation; they regarded a colonist as an agricultural labourer, digging and tilling the ground in a cold, arable country. They forgot the various climates and shapes of colonisation; sheep-farming in Australia, semi-tropical cultivation in Queensland, the employment of Caffres in Natal. India, on its varied surface, would afford scope for European enterprise and intelligence, although the agricultural labourer, "the out-and-out emigrant," cannot plough the barrens of Simla or Dugshaie. The more the matter was understood, within and without India, the weaker would the objections appear, and the more assured the results. He was quite aware that Cashmere and Nepaul are under native rule, but it was desirable attention should be kept directed to them, as an interchange of territory might be possible with Cashmere, and the course of events might cause alterations in our relations with Nepaul.

Cantor Lectures.

The third lecture of the course "On Applied Mechanics," was delivered by John Anderson, Esq., C.E., Superintendent of Machinery to the War Department, on Monday evening, the 26th inst., the subject being "Applied Mechanics in

relation to Natural Laws in Processes." Colonel Murray, R.E., was in the chair.

This course of lectures will be published in the *Journal* during the vacation.

Twentieth Ordinary Meeting.

Wednesday, April 28th, 1869; Sir Digby Wyatt in the chair.

The following candidates were proposed for election as members of the Society:—

Barnard, Clement, 2, Staple-inn, Holborn, W.C.
Beadel, Frederick, 25, Gresham-street, E.C., and Gidea-hall, Romford, Essex.
Brogden, James, Tondu-house, Bridgend, Glamorganshire.
Bunbury, Sir Charles J. F., Bart., F.R.S., Burton-hall, Bury St. Edmunds, and 48, Eaton-place, S.W.
Burch, Sampson Kingsford, 239, Vauxhall-bridge-road, S.W.
Burke, William Henry, 17, Newman-street, Oxford-street, W.
Cather, Rev. Robert G., LL.D., 8, Old Jewry, E.C.
Chatto, W. J. P., 23, Carlton-house-terrace, S.W.
Church, Jabez, Hamlet-house, Chelmsford.
Clarke, Joseph, 2, Earl's-court-road, Kensington, W.
Clarke, Rev. C. Pickering, M.A., 3, Adelaide-street, Strand, W.C.
Clarke, Robert G., 3, St. Alban's-road, Highgate-road, N.W.
Clover, Joseph Thomas, 3, Cavendish-place, Cavendish-square, W.
Clow, Leonard, 9, Fitzroy-street, Fitzroy-square, W.
Corderoy, George, 17, King William-street, Strand, W.C.
Corrie, J. M., 42, Lancaster-gate, W.
Crespin, Edgar, 28, Torrington-square, W.C.
Firth, James, 27, Shepperton-cottages, Islington, N.
Hackforth, Henry, 9, Bentinck-street, Manchester-square, W.
Vivian, William, Roehampton-lodge, Roehampton, and 51, Bow-lane, E.C.

The following candidates were balloted for, and duly elected members of the Society:—

Arter, Andrew, 8, Walton-villas, S.W.
Ashton, Joseph, 59, Fleet-street, E.C.
Barnard, George William, St. Phillip's-vicarage, Kennington, S.E.
Beamish, Captain H. Hamilton, R.N., 45, St. George's-road, Eccleston-square, S.W.
Benwell, J. A., 5, Upper-gore, Kensington, W.
Berthon, P. H., 20, Margaret-street, Cavendish-square, W.
Birch, Charles Bell, 12, Alpha-road, N.W.
Biss, William H., 25, St. Stephen's-road, Westbourne-park, W.
Bisson, F. S. de Carteret, 24, Charles-street, St. James's, S.W.
Boekbinder, J. M., 49, Thornhill-road, Barnsbury, N.
Borrett, Thomas, 15, Bryanston-square, W.
Bowyer, James, 10, Tavistock-square, W.C.
Boyer, Joseph, 4, Codrington-terrace, Notting-hill, W.
Bradley, Charles Lawrence, 4, Belitha-villas-west, Barnsbury, N.
Breach, James G., 14, Prince of Wales-terrace, Kensington, W.
Brett, Edwin J., 311, Camden-road, N.
Brittain, Thomas, 22, Cleveland-road, Downham-road, N.
Brucciani, Dominico, 10, Onslow-gardens, S.W.
Buckingham, J. H., 35, Wood-street, E.C.
Burr, John, 8, Bolton-road, St. John's-wood, N.W.
Cochrane, Alexander Baillie, 26, Wilton-crescent, S.W.
Cockerell, William, 3, Pump-court, Temple, E.C., and Cambridge.
Durrant, George C., 20, New Bond-street, W.
Lacey, Charles J., 1, St. John's-villas, Haverstock-hill, W.
Todd, Arthur, jun., 30, Milk-street, E.C.

The Paper read was—

ON THE DUTIES OF AN ARCHITECT, WITH REFERENCE TO THE ARRANGEMENT AND CONSTRUCTION OF A BUILDING.

By T. Roger Smith, Esq.

The nature of an architect's duties with reference to the arrangement and construction of a building; in other words, the routine of his regular and most familiar professional work, is the subject which I have ventured to think it may be worth your while to consider this evening. There is much which becomes customary routine to the practitioner of any art, which it is yet well worth while that those should know who may have to criticise his works, or to avail themselves of his services, or who may think of his profession for their sons. In the case of many manufactures and arts, which are by no means of universal or even very general application, this sort of information has been eagerly sought and fully diffused; but, familiar as we all are with buildings, there exists good reason for supposing that by many the nature of an architect's work is less thoroughly understood than might have been expected: I have, consequently, thought that an endeavour to make quite clear what he can, and what he cannot do, would be of service. In this inquiry I propose to take a familiar example, that of a dwelling-house of good size, and to trace its history from its commencement to its completion, showing at each stage the share which the architect takes in the work; and I shall illustrate what has to be stated, by exhibiting the actual working and other drawings, &c., of a building of this sort, recently completed by myself.

Suppose, then, that an individual is possessed of a site, (probably recently bought), and of the needful funds, and is minded to build himself a house. We will further suppose, for the sake of simplicity, that this is a country site, and that some circumstance points out beyond question one particular situation on the estate as proper for the building, so that no trouble as to selection of the exact spot has to be encountered. The question immediately to be solved being what sort of house to build, and how to set about it, the first step, in all probability, will be to visit, or at least to think and talk over some houses already known or known about; and probably, according to the degree of constructive skill or draughtsmanship he possesses, the intending proprietor will make some sort of sketch, or model, or other design. This will not have been carried on far or long without the question of obtaining skilled assistance being thought over; and either from a general idea that it is the right thing to do, or from a real knowledge that trained special skill is indispensable to the success of such an undertaking, we will suppose that it has been decided to call in an architect.

It is foreign to my purpose to say anything about how the architect is selected, though it is fair to add that the selection is a matter of considerable importance. In the case of public buildings, competition is very frequently resorted to; this is rarely done in private practice; and, in order to trace the course of a design produced under the most favourable and natural circumstances, it will be best to suppose that the architect is consulted at the commencement of the undertaking, and entrusted with the work from the very beginning, not in consequence of his design having been chosen in a competition, but in consequence of his ability and integrity being known by the person intending to build.

The first step, after the architect has received some preliminary instructions as to the general nature of the building wanted, will be for him to visit the site. It is, perhaps, best that he should be able to form some very vague general idea of the size and sort of house intended,

before visiting the ground it is to be built upon, but no wise architect will put pencil to paper, without first seeing where his future work is to stand, and what will be near it, and studying the peculiarities of the site with some care, or (if that be quite impossible), without trying to form a good idea of it from maps and photographs. The points to be specially noticed on a site are the aspects obtainable for different rooms, and prospects from different windows; the peculiarities of shelter or exposure; the approaches, and space for gardens, grounds, &c.; the facilities for drainage and water supply; the dryness or dampness of the site, and its levels; the nature of the building materials within easy reach; and such local peculiarities of surrounding, or association, or character of scenery, or of neighbouring buildings, as influence style or design. It is now necessary to have sufficient instructions to shape a design upon, and here, as is natural, the custom varies with the peculiarities of each client. Many clients make a rough set of plans—usually defective. Others go even further, for I have had a model put into my hands as my instructions. Those who cannot draw, and some of those who can, wisely prepare only a list of what they require; availing themselves, probably, of some of the many published works on the subject. It requires much care to make such a list complete; when, however, it is complete, and a trustworthy series of sizes for principal rooms has been added, such a list forms a good basis for the architect.

In all probability the most satisfactory results are obtained by simply telling the architect what requirements it is wished to accommodate, and what special or unusual arrangements are required to be introduced, and giving him access to any model, either as to arrangement, size of rooms, or treatment which it is wished to follow; settling, in fact, the outlines of accommodation wanted in consultation with him, but leaving it very much to him to suggest how that accommodation shall be disposed. Thus, in a dwelling-house, the architect is best instructed by telling him how many members of the household, and how many guests are to be housed; what are the habits of the family; what existing rooms in known houses the new apartments ought to resemble in size, in shape, or style; and what house or houses (if there be such) the client looks upon as models in any special portion or throughout.

It is often the case that this part of the question is not easily disposed of. The architect's previous knowledge of the subject, the client's knowledge of what he requires, and the difficulties of site, frontage, and what not, under which he labours, are not the same in any two cases, and the trouble varies as they vary.

When, however, the subject is fairly grasped, the architect begins his design. Probably the mode of originating and elaborating an architectural design varies considerably, according to the habits and idiosyncrasy of each artist. I am inclined, however, to believe that, in most cases, a building is not first imagined as a building, but as a drawing—in fact, as a ground plan. Certainly the almost invariable custom is to commence upon the plan of the principal floor, and carry the arrangement of that on for some little way before touching any other part of the work. There will be ordinarily some simple germ, usually growing out of the arrangement of the communications between the best rooms, which will give the key-note, so to speak, of the whole. Such questions as the following are the ones which determine the lines of the skeleton of a plan:—Shall the building be symmetrical or irregular? Shall the rooms be entered from a hall or a corridor? In which direction will the offices, &c., lie best? From which side will the approach come? Where can the leading rooms be best placed for aspect, prospect, communications, and grouping? The chances are, that when these questions have been thought over for an hour, the true principle of arrangement, in order to combine them all, presents itself to the mind, and the key to the problem once found, the plan seems, in practised hands, almost to develop itself spontaneously.

From the first the designer ought to have present to his mind the possibility of forming a convenient series of upper rooms over those on his ground floor, the general nature of the roof which his ground plan will render necessary, and the leading masses externally and effects internally which his building will possess; and after he has gone some way with his ground plan he prepares plans of the upper floors, and elevations, or a prospective sketch of the exterior. This is all usually done to a small scale, and in many cases the drawings thus made have a very large amount of study devoted to them, and are altered and re-done very many times over, for in them lies the germ of the whole future work.

At length a series of fair sketches, embodying the main ideas of a design, has been prepared; and now, if not before, it usually becomes necessary to look into the question of cost.

In many cases the architect is furnished by his client, at the outset, with a statement of the sum to be laid out, as well as of the accommodation to be obtained, and it not unfrequently happens, by the bye, that the first is not adequate to secure the latter. It is, however, a more frequent case that, in the first instance, the accommodation desired is named, and the architect is requested in making his design to state its cost as nearly as he can. However this may be, it may be accepted as a general principle, that most of us when about to build, want more for our money than we can possibly get, and that, sooner or later, a conflict between cost and size has to be encountered. I, for one, always like to encounter it at the outset, and to endeavour to dispose of the question finally, although it is, undoubtedly, the most difficult part of our professional work to approximate, with anything like reliable accuracy, to the cost of a work for which nothing but the first sketches have been made, and perhaps hardly those completely.

The elements of this difficulty of estimating are twofold—first, the extremely wide range of costliness or cheapness possible to buildings of the same size and for the same purpose; secondly, the extraordinary discrepancies which the estimates for the same work will present, when a dozen men are all tendering for the execution of the building, and all of them men whose business it is to get their living by knowing what work will cost to execute.

It may be supposed that architects have, or ought to have, at their finger ends a series of trustworthy average prices; that it is familiarly known, for example, how much per bed a hospital ought to cost, how much per sitting a church, how much per room a dwelling-house, and how much per child a school. Again, it may be supposed that, bulk for bulk, one building will so closely resemble another that the price per cubic foot of bulk, or per superficial foot of area covered, can be guaged to a nicety; and it is quite true that such rough rules exist, and form the basis of our approximate estimates, but nothing short of very considerable tact, skill, experience, and adroitness in applying them to practice, will make them of any real value. It is a matter of simple counting to say how many rooms there are in a house, and of simple measuring to say what the cubic contents of a building, as shown on a set of plans, will be. It requires an amount of sagacity and experience not given to every one to say at what, of all the possible prices between eighty pounds and eight hundred, each room should be rated, or at what figure between fourpence and two shillings each cubic foot of contents should be priced. A simple illustration will show the truth of what I have been saying.

It is often urged that the difficulty of obtaining reliable preliminary information as to cost is greater than it ought to be, and perhaps it is so; but buildings are not the only articles of manufacture where prices range over a very wide margin. It appears to me that a house is a more complex thing than a black frock coat, or a wooden chest

of drawers four feet high; yet the price of a coat probably ranges from three pounds to ten guineas, and that of a chest of drawers from thirty shillings to twenty pounds; and no such extremes as are exhibited in these prices, or a hundred other familiar examples that I could name, are known in the building trade. In fact, it may be safely said that an approximate estimate of a building, prepared, with care and candour by an experienced estimator, is to the full as reliable a document as any of the ordinary bases upon which transactions are begun; while the building which is the subject of it is very widely open to variations in the course of its after-progress.

It is very important to the future success of the undertaking that the plans, made at this its early stage, should be understood by those who commission the building. To some a plan is an almost unintelligible document, and, in that case, some slight model ought to be constructed, to make arrangement, and even in some cases appearance, clear. With or without this aid, and with more or less trouble, the architect has now to see that his client fairly understands what he proposes, and fairly comprehends what he, the architect, judges will be the probable outlay. The amount of alteration which takes places at or about this stage of the work is often very great. In many cases the building has to be planned afresh, or re-arranged, or cut down, or enlarged, many times over, before a result considered satisfactory is obtained; in others, the design is accepted without modification. Sooner or later, however, the design is supposed to be in the main settled, and now commences the preparation of the definitive drawings.

In some rare cases, the drawings made to embody the idea of the design can be completed for the execution of the work. In the majority of instances this is impracticable, and an entirely new set of plans is prepared. These ordinarily go by the name of "contract drawings," as they form the basis of the agreement with the builder who executes the work. The favourite scale for these drawings is one-eighth of an inch to one foot, that is to say, the drawing is very nearly one-hundredth of the size of the actual work, and the drawings usually prepared to this scale are plans of the foundation, of each storey, and of the roof; geometrical elevations of each side of the work; and two or more sections, cut through the building from end to end and side to side, on arbitrary lines chosen so as to show those portions of the construction or arrangement which it is most important should be exhibited. These are followed by drawings on a larger scale; for the whole course of the development on paper of an architectural work consists in re-drawing again and again portions of it (or the whole), each time to a larger scale. Thus the contract or working plans, if to an "eighth" scale, as has been explained, are to a scale larger than (in fact the double of) the scale most frequently used for first sketches, and in their turn they are supplemented by drawings on a scale twice as large, namely, one quarter of an inch to a foot, showing in greater detail portions of the building; parts are again drawn out to scales of half an inch and one inch to the foot. Some details are then usually given to an eighth of full size, and the most important mouldings, enrichments, &c., are drawn full size. The set of contract drawings thus made by no means includes all the drawings necessary for the erection of the building, or even the larger number of them, but it contains all the most important general drawings, and sufficient details to enable a fair estimate to be formed of the work throughout.

The work to be gone through in the preparation of the set of contract drawings is arduous. They have often to be executed under pressure as to time, and yet they always ought to receive very full, careful attention, as in the preparation of them every point of importance, either in arrangement, construction, or treatment, ought to be anticipated and settled.

When the set of contract drawings is approaching completion, the architect has to prepare a document which accompanies them, and specifies the exact quality of material to be used, the precise mode of executing each portion of the work, and the thicknesses, weights, and other precise numerical definitions of every article open to doubt. This document is called a specification, and, in writing it the custom is to describe the materials and work under different trades, thus:—1. Excavator. 2. Bricklayer. 3. Mason. 4. Carpenter. 5. Slater. 6. Joiner. 7. Plasterer. 8. Plumber. 9. Smith and Ironmonger. 10. Painter. 11. Glazier. 12. Bellhanger. 13. Paperhanger.

The proper drawing of a specification is a work of labour amounting almost to drudgery, requiring great care, patience, precision, and acquaintance with work. The most essential points about it are, that nothing should be omitted, that nothing should be slurred over, or insufficiently described, and that the same amount of detail or compression should prevail throughout. It is of course a work in which system, amounting almost to routine, is essential, but, even with that assistance, the greatest vigilance is necessary to prevent omissions, however good the system may be. It is also customary to append to this specification a series of conditions, either those usual in building contracts, or such a modification of them as will suit the circumstances of the case. When these contract-plans and the specification are settled and near completion, it is not uncommon to make a second approximate estimate, and it is almost always worth while, for the basis of the estimate being in a much more complete state, it is possible to form a much more reliable calculation of the probable cost.

We have now reached the close of one complete phase of the architect's work, but one which has embraced really three distinct processes—the study of the subject, the general designing of the building, and the elaboration of the design in a practical shape. Let us for a moment review the nature of the work done thus far.

Of the architect's study of his subject, I said at the outset little, in fact, perhaps too little, as, in many cases, this is a severe labour, and if, in any individual instance, it is quite easy, the reason is because the architect has gone through the work of acquainting himself with the same subject on some previous occasion. In the example I have selected, that of a large dwelling-house, the habits of English families are so uniform, that an architect who has once mastered the subject may plan a house without much trouble, when he knows the size of the family and its customs. But in the case of each house-building architect there occurs a first good house, and, to prepare well for that, he requires to consider thoroughly the position and use of every room and every part of a room, from the drawing and dining-rooms to the oven, scullery, and brewhouse. There are, however, many architects, much engaged on public works, whose different buildings vary so much that each requires a separate investigation. For example, you can quite understand that there is little in common between a post-office, a hospital, a theatre, a palace, a court of law, a cathedral, a range of public offices, a fountain, a country house, a college, and a temporary exhibition building; yet in one architect's practice, with the work of which I am very familiar, the drawings for all these were going on within a space of about two years. It is manifest that each of these subjects must have required no small amount of special study, in order to produce a building thoroughly suited to the convenient discharge of the business to be carried on.

But, passing from the study of special subjects, a work which involves many visits to existing buildings of the same sort, I should like to return to a dwelling-house, and to touch upon a few of the points to be thought of in the planning of it and the working it out for execution. The relative position of each room in connection with all the others; the aspects of the windows; the communications, such as the hall, the corridors, and the stair-cases, require to be arranged for. Each room must be of the right size, shape, and disposition. In every main living-room the ordinary articles of furniture must be prepared for and places assigned them, and the same

in every bedroom, large or small. The position of window, door, and fireplace in each room, must be settled so as to avoid draughts, discomfort, and smoky chimneys. Light must be secured for every hole and corner all over the house, and so must ventilation. The service from the kitchen must be so provided as to bring the provisions into the dining-room readily, but to keep smells out. The duty of every servant, all over the house, must be understood, and all the endless appliances of a large house thought of. There must be a place found for the range and the hot-plate, and the jack, and the dresser, and the closets, and the shelves of the kitchen. The shelves, sinks and plate-racks, the coppers and washing-boards, the vegetable bins and the water supply of the scullery, must be all provided for. Care must be taken of the wine-cellar, the beer-cellar, the stores, the linen, the china, and the plate. Ovens, shelves, books, safes, plate closets, linen closets, housemaid's closets, baths, hot water, cold water, cupboards, lifts, and all manner of appliances are to be thought of; rooms for the family, and rooms for the guests; the nurseries, the upper-servants' rooms, the various services of butler, cook, housekeeper, footman, dairymaid, stillroom maid, must all be thought of, all planned for; all must be brought compactly together, and each must be kept out of the others' way. Whilst these matters are being disposed of, there are also many points in the structure that need attention in preparing working plans. Proper foundations must be provided for, and an equable distribution of the weights on the walls. The flues must be carried up into proper chimney stacks, the construction of bressummers, girders, floors, partitions, roofs, &c., must be devised. The arrangement of the roofing, so as to be easily freed from snow, the mode of bringing away rain-water, the drainage, the outfall or cesspool for the drains, the necessary precautions against damp, bad smells or tainted water, each and all of these must come under review, not one of them can be left to chance, any more than the putting together of the masonry or the brickwork, the thickness of walls, the quality of glass, or the weight of lead. All this time an entirely distinct set of considerations is also present to the architect's mind; his building is to please the eye, as well as accommodate the dwellers therein, and, whether there be the richest elaboration or the most rigid simplicity, he will not have fulfilled his duty to his employer, or been loyal to his art, if he has not striven to render the effect of his work, especially of the inside of his house, pleasing, harmonious, and appropriate.

I could go on further in this strain, reminding you that it is generally necessary to fix the nature of all the materials, the quarry—often the special bed for the stone—the quality of the bricks, and so on of every material throughout the structure; but I have said enough, I hope, to convince you that a vast amount of forethought and care is here wanted. I have only to repeat that all this has mostly to be done in a hurry, as few clients think of giving their instructions till that season of the year when the building ought to commence. Notwithstanding any hurry that may have existed, any error or oversight made at this period may probably—more probably than not—be a lasting injury and a cause of endless discontent, if not discovered in time for remedy in the course of the work; and even if it be so discovered and remedied in time, but at the expense of extra outlay, it will most likely be a source of grave complaint. I honestly confess that my wonder is not that oversights occur sometimes, but that they are so few and infrequent as they really are.

As the plans approach completion, the architect has to advise his client as to the means of executing the building. It is not very unusual for the proprietor to become, to some extent, his own builder, or at least brickmaker; time forbids our enlarging upon the work this entails on his professional adviser. The remaining courses are, either to agree with a contractor to execute the work at a schedule of prices, or to agree with a single contractor for a definite lump-sum, or else to invite several contractors to tender, and give the work to the lowest bidder. The plan of inviting contracts by public advertisement is, fortunately, seldom resorted to for private work; and the old plan of contracting with various tradesmen separately, though it still holds ground in the north, has been generally abandoned in the midland and southern counties. Whichever way is adopted, the architect has to negociate the business, and commonly, if there is a competition or a negociation with a single contractor, he has, from his knowledge of the trade, to nominate the contractor or contractors.

In any case where an estimate in a lump-sum has to be prepared, a more or less elaborate document, called a bill of quantities, is got out. This is sometimes prepared by the architect, but in and about London it is customary for a separate professional man, called a measuring surveyor, or quantities surveyor, to make it out. In either case, this bill is supposed to show with accuracy the whole amount of every description of labour, material, or article introduced into the building. In London these documents are prepared in the most extraordinarily elaborate detail, as their extreme length will abundantly show; in the country they are generally more condensed. A blank copy of this bill is furnished to the builder who estimates, or to each builder if there are more than one, and he puts his own price to the items, calculates the amounts, and bases the tender he sends in upon the result so obtained.

It sometimes happens that the estimate thus obtained is at once agreed to and accepted. At other times it is desired to reduce the amount of it, and in this latter case the architect has to arrange such variations or omissions as will admit of this being done.

Without further delay, however, we will suppose an agreement as to carrying on the work come to somehow, a contract signed, and a commencement about to be made. The architect has now, usually, to seek, and appoint, and engage for his employers a clerk of works, and to set out the building in its exact position on the site, and to fix some unmistakable level. This done, work is begun, and, from that time till the close of the operations, the architect has personally to visit the building, and has also to keep on continually preparing additional explanatory drawings, and, I might as well add, to furnish duplicates, sometimes triplicates of working drawings, for the use of the contractor and clerk of works.

The objects which the architect has to keep in view during the conduct of the works, and especially during his personal visits to them are, in the main, two—he has to satisfy himself, first, that the contractor and every man he employs are doing their duty; and, secondly, that the building will carry out his intentions and supply his client's wants.

To insure that the conduct of the work shall be satisfactory, it is necessary constantly to watch the materials and workmanship, either brought upon the ground, or introduced into the building, or in preparation at the workshops. I need hardly add, that to do this efficiently the architect must be a good judge of both work and material—an accomplishment requiring some amount of experience and attention. Where there is a disposition to evade the conditions of a contract, this part of the architect's work becomes both difficult and responsible, and at all times a certain amount of anxiety is involved in it. To a very large extent, however, the inspection of workmanship and materials can be facilitated by the clerk of works, if he be clever and honest. He is placed on the works on purpose to see, every day and every hour, that the contract is carefully and honestly executed, and I must say that I have, again and again, received the most valuable assistance in this branch of my duty from various clerks of works engaged under me.

In his other object, the architect has to bear in mind, during his superintendence of the work, that no one can be of much assistance to him. There is no part of his duty which he can less easily or less wisely delegate to

another, than that constant watchfulness which is imperatively needed to ensure the success of the building, both as a contrivance and a work of art.

Drawings, explanatory of the original plans and specifications, are continually in demand. The larger number of them, perhaps, relate to the artistic part of the work, and consist of full size profiles of mouldings and drawings of enrichments, or of details to a large scale, to show with precision and exactitude what is meant; but many structural drawings are wanted, and others are often called for to show modifications of the design; for there are few buildings in progress where some changes are not made. Sometimes a new want strikes the employer, or a new light dawns upon the architect. At other times an omission may be discovered, or an obvious improvement will suddenly present itself. At any rate, some alterations are usually called for, and require to be drawn out.

Constantly, also, during progress, specimens of moulded or enriched work, or full-sized models of features, are fixed in their intended place, and the architect has to visit the work, to satisfy himself that their effect will be as he wishes. In this way the superintendence of the work proceeds, and almost always involves some work for the pencil up to the very last, while the designing or the far less pleasant task of selecting chimney-pieces, stove-grates, fittings, paperhangings, and decorations, is as essential to the full success of the architect's work (and should be as fully left in his hands) as the design of masonry or joinery.

It may be asked whether the architect has any means of enforcing the execution of the contract, in conformity to his directions and wishes, and I reply that he has such means. The hold upon the contractor, which all building contracts give the architect, is the power of the purse. Buildings are always partially paid for as they go on, and always upon certificates from the architect. It becomes, therefore, part of the architect's duty to grant these certificates, and, in giving them, he has to see that the amount certified represents the proper proportion and no more of the contract price, and that the work is properly done; for it is his duty to withhold his certificate if his complaints remain unattended to, or his orders are not complied with. In cases of work by a schedule of prices, very careful measurements are made from time to time; and, when the work is done in other ways, suitable valuations are made; but, in some shape or other, the architect requires to be armed with the only power which will effectually enable him to protect his employer and secure attention—that of controlling the cash payments.

When, at last, the work is completed, it becomes the architect's duty to make up a statement of accounts. All claims for extra or additional works are checked and measured by him, or by the measuring surveyor for him, and the counter claims arising from the omission of work included in the contract, but not carried out, are valued. A balance is struck after every item has been scrupulously examined, and, if necessary, fought over. And the architect's last duty is the signing a final certificate that the balance, whatever it may be, is payable to the contractor.

I have now, I think, gone through the most salient points of an architect's ordinary duties, such as they exist when there are no accidents or bankruptcies, and no disputes, difficulties, obstacles, or other hindrances of any special magnitude; and, with the hint that such difficulties do not unfrequently arise, and impose on the architect different duties, sometimes as a negotiator, at other times as an advocate, or again as an arbitrator, I might, I think, leave the subject. Yet, if you will bear with me a moment or two longer, and not think my tale a fable because I try to point it with a moral, I have something to add.

Perhaps the most obvious sequel to all that I have said is the inquiry, "If all this is needed for the success of a building, who furnishes a sufficient amount of care when there is no architect?" The reply is, that most of it is not furnished, and the building suffers; and, as to the remainder, either some skilled or experienced assistance must be employed, or else other work properly designed is copied, and thus a portion of that thought, without which a building cannot be built, is secured; and, lastly, that much of the time of skilled artisans is spent, where there are no regular plans and no skilled direction, in furnishing, imperfectly and piecemeal, substitutes for that which ought to be clearly arranged and laid down for the workman by the architect.

If I have said enough to dissuade any person from becoming his own architect, this paper will not have been without service. Though there is no mystery in the planning and direction of work, yet this requires a very large amount of knowledge and familiarity with the subject; and, though an individual who desires to build, can, if he please, employ any number of men, and gain a good deal of experience in rectifying their mistakes, such experience is dearly bought, and comes too late for its purpose.

I have throughout studiously avoided giving prominence to the art side of this question; but here at least I must say that, however skilled a draughtsman or even a designer any private individual may be, he will be sure to be deficient in that technical knowledge which inspires the architectural treatment that a building receives from a good architect; here, at the best, defects are, to my mind, inevitable in the work of every man who has not measured and drawn much existing architecture.

Few persons readily understand that, because architecture deals with things quite familiar in one aspect of them to those who live in buildings, or buy or sell them, it is yet necessary to have long practice, in order to combine with economy and jndgment the different parts of a room, and the different rooms of a house; and to provide a place for all that has to be included within its four walls. Almost as few recognise the fact that if they can draw an architectural feature when they see it, that power is quite different from that of the architect who has to draw a whole building and its parts as he imagines them, and then to furnish for every portion the profiles of the mouldings, the sizes of the panels, the treatment of the carving to a large size. As a simple instance, it is easy for any person to draw a window with mullions, but no one who has not studied as well as sketched will be able to settle whether the width of the mullions should be a fourth, or fifth, or sixth, or what proportion of that of the adjacent light. The difference between a narrow and a wide mullion is equivalent to a total difference of style; a mullion of five inches would be out of place if one of seven inches was correct, and when it was done, the amateur would see that something was wrong, but would not know what; and it is to attain the power of regulating the half-inches in cases like this, that the student of architecture has to wander for months, or even years, through the districts where good buildings exist, making notes and drawings; and, let me add, there is nothing short of a perfect knowledge of these details, and incessant attention to them, which can give harmony, unity, and character to a building.

It may be natural, and I hope is not out of place to add, that the architect who does these services thoroughly has fully added the value of his fees to the value of the building. That he has quite work enough to do in earning them will be apparent to any one who turns over the plans and specifications of a large work, and forms some idea of the additional time spent in superintendence. I trust you may be willing to believe that the client has value received in the building for what he pays. The architect's remuneration, in ordinary cases, is, customarily and legally, a commission at the rate of five per cent. upon the cost of the works. This pays him very unequally, in some cases being sufficient, in others not so; but I believe it is a very fair way of payment as far as the employer is concerned, for it represents an increased standard of excellence throughout the building as com-

pared with what, under the most favourable circumstances, might have been reached without the architect, and this increased excellence is really an increased money value.

In concluding, I should like to say a word as to some peculiar demands made sometimes upon an architect's skill, and to point out what he ordinarily cannot and does not do. No architect can make a bad builder do good work. He can make all sorts of agreements and stipulations that the work shall be good, and can try very hard to enforce them, but there is a certain proverb about silk purses and the materials suited for their manufacture which will help to illustrate the impossibility of success. It is as well to add, that the architect can materially help to secure a good builder, and that he can generally prevent a good builder from doing bad work.

The architect cannot, from the very fact that he is human, ensure perfection in every part of the work, but if he is able and careful his services carry the building a great deal further towards excellence than is often imagined, and though no amount of care makes it quite certain that every flue shall draw, and every lock shall work, that the arrangement shall be all that can be desired, and the effect please everybody, yet a skilled architect, working for a good client, will go a very long way towards this result.

The architect is not ordinarily called, as the engineer is, to calculate accurately the endurance of his materials, because his walls ordinarily must be thicker than the weights on them demand to keep out the weather, and his joists must be stiffer than is needed to support the floor, in order to prevent the ceilings from cracking, and so throughout; but he has a great deal of that sort of calculation, in which tables and to perform experiments can but imperfectly guide him. He has to judge of foundations, and the balance of weights in his structure; of the sufficiency of windows and passages; of the probable effect on the eye of features not yet commenced; and of the suitability and durability of materials. Lastly, he has often greater difficulty in the management of men than of works, and the cross-purposes at which clients, builders, landowners, clerks of the works, foremen, and tradesmen are sometimes playing, often give him enough to do in his character of negotiator. Here, however, I do not propose to follow him. I have purposely kept out of sight much of what the architect has to do as an Artist. I shall certainly not be expected—if I say so little as to a side of his employment which ever demands his constant attention—to add anything as to other classes of duties or difficulties which are uncertain and irregular in their occurrence. I, therefore, here leave the subject, trusting that my paper may be judged to have furnished a fair account, and nothing beyond a fair account, of the nature of the ordinary and routine occupations of those professional men to whom you are in the habit of entrusting the design and superintendence of the buildings you erect.

DISCUSSION.

The Chairman said the paper was eminently practical in all its bearings, and, no doubt, would be well discussed by some of the gentlemen present, amongst whom he saw several who were especially acquainted with the matter treated, as, for instance, Professor Kerr, who had written what was quite the text-book on the subject which had been brought before them—"The English Gentleman's House." He could hardly do better than call upon this gentleman to open the discussion.

Professor Kerr said he had listened with great satisfaction to the paper which had been read by Mr. Roger Smith, who always discussed his subject, whatever it was, in both an agreeable and sensible manner. The impression left upon his mind was that it was a most unwise thing to be one's own architect; he did not know whether the main intention of the writer was to impress this upon the public mind, but he had certainly mentioned a list of dangers to be apprehended from the non-employment of an architect enough to frighten any one. The typical English gentleman, however, was usually determined to act as his own architect as far as he could, as he believed he knew his own requirements much better than any one else, and he (Professor Kerr) believed it to be the professional architect's duty to carry out his clients' wishes to the best of his ability. He looked upon the architect as a practical man, and not at all as a sentimental person; his sentimental days were gone long ago, and he hoped they would never return. The architect was the servant of the public, employed for the purpose of doing that which they were not able thoroughly to do for themselves, viz., to design and scientifically arrange a building, so that it should be perfect in all its parts, so that all the refinements of the age might be duly provided for. When this was properly done he considered that a great deal more than 5 per cent. additional value was conferred upon the building. If the architect were an unskilful man, which might sometimes happen, the case was different; but he was glad to say, for the credit of the profession in England at the present moment, that he knew of no profession in which there were fewer incompetent men, or where a man did more work for less money. Under these circumstances he fully appreciated the effort which Mr. Smith had made to impress upon his audience the importance of the architect's functions. With regard to the degree in which the owner of a house might be allowed to exercise his own fancy in the design, his (Professor Kerr's) opinion was that an intelligent client was entitled, within the limits which no English gentleman was likely to transgress, to dictate to his architect the conditions under which he chose to live; and a skilful architect would fulfil these conditions as perfectly as possible. He was bound to say that he had had clients whose assistance had been of the greatest possible service, and he knew of no greater gratification on the part of a professional man than to feel that he had honestly fulfilled the wishes of his client, and that by the exercise of his own skill he had accomplished that which a less careful man would have pooh-poohed as an impossibility. Mr. Roger Smith, he was glad to see, had not followed the general rule according to which architects were spoken of in England; their functions were generally divided into practical and artistic, the latter being considered by far the most important. This he considered a great mistake. He believed that it was, generally speaking, the truth that an architect, at any rate in his calmer moods, considered himself simply as the servant of the public, and it was a mistake to suppose that he wished to force his own principles of treatment on the public against their wish. That which had led architects to produce public buildings which had ultimately gone out of fashion, to say nothing more, was the pressure put upon them by *dilettanti* and others, who, with the best intentions, were not always possessed of that information which enabled them to give judicious advice. If architects, as a body, were more consulted on questions of public architectural art, architecture would not become more outrageous than it had been, but less so. Unless architects were encouraged in the other direction, he believed they would be induced to follow the dictates of common sense, and to remember that after all the English character was averse to any excess of display, either in ornament or anything else, and that the first condition of a good building should be that it fulfilled all its internal functions thoroughly and completely, and that any elaborate ornamentation was altogether a secondary consideration.

Mr. Benjamin Ferrey thought Mr. Roger Smith was deserving of the best thanks of the meeting for the very able and interesting paper which he had read. He quite agreed with all that had been said, both in the paper itself and by Professor Kerr, and would simply move a cordial vote of thanks to Mr. Roger Smith for his valuable paper.

Mr C. F. Hayward had much pleasure in seconding the vote of thanks, which was due to Mr. Smith not only from the public, but from his professional brethren, who were peculiarly interested in the subject brought before the meeting, and who, he believed, would generally be found ready to endorse everything which had been advanced. For his own part, although he quite saw the wisdom of the course which had been adopted, he could not help regretting that the artistic portion of the subject had not been more touched upon. He could not at all agree with Professor Kerr that the time was gone by for sentiment with regard to architecture, and he should much regret if sentiment were entirely to leave him when designing a building. When troubles came, as they would come—troubles connected with contracts, with workmen, with clients, or with other professional matters—he could not help feeling that it would be a most disagreeable task to go on with the building if there were no sentiment connected with it. He would put it to any gentleman present not connected with the profession, if it would be possible to build a granary or factory in the same spirit as such a building as had been brought under their notice in the paper, a gentleman's country house. He must say that, independently of any question of remuneration, it was a great pleasure to an architect to build a good house for a good client, and he believed that was one of the reasons why an English country gentleman was so anxious to interfere with the arrangements of his building; he felt the influence of sentiment, and desired for the time being to be himself an architect, and could scarcely refrain from interfering, although he might know that he would do so to his own cost. He (Mr. Hayward) had always felt the greatest pleasure in conferring with his clients upon points in which their own feelings were concerned, and where no questions were raised as to the builder's work or other matters of dry detail, which, albeit very necessary to be gone into, were very disagreeable both to the client and to the architect. It must have been a great pleasure to Mr. Roger Smith to carry out such a building as was represented in various details on the walls around them. It would be evident to anyone that, whatever an architect was, he was a working man; and that in the present day was a very honourable term. Even if his own hands took no part in the work, still his mind and brain must be constantly on the stretch until the building was finished. Mr. Roger Smith spoke of an architect designing or superintending the furnishing of a house as well as the house itself, and this he looked upon as a most important matter. Some clients would trust an architect with the carrying out of a building from the foundation to the chimney top, and yet would not take his opinion with regard to the design of a stove or a chimney-piece, and certainly not on the question of a paper hanging. This was a point which, in his opinion, ought to be more insisted upon as connected with the duties of an architect. As he understood it, an architect's duty was to carry out a building until it was externally and internally complete, and this could not be the case unless everything connected with it were under his immediate superintendence. He had great pleasure in seconding the vote of thanks.

Mr. Chatfield Clarke had also much pleasure in supporting the vote. He was sure there were several points which must at once impress the mind of any one who contemplated building. The first was, that he should employ an honest and capable architect; and the second, that, having done so, he should give him his full confidence; and this latter point was, in his opinion, one of the principal requisites to success in any building. The next point was to secure an honest and able contractor, for, as had been said, however desirous an architect might be of producing a good building, he could not do so if the builder were a determined rogue; and the result of his own experience was the same as that of Mr. Roger Smith, that, however careful they might be, they could not make a bad builder do good work. Another point, which he considered of some moment, was, that when once a building had been planned it should be altered as little as possible. A building was a conception as a whole, and, to a certain extent, might be considered as an inspiration, and therefore any subsequent piecemeal alteration very often interfered with the general effect of the structure. In conclusion, he would remark that building a house in the country was a very easy matter indeed compared with building in London. Very recently, in erecting quite a small building, which was not to cost more than £5,000, he had had eight or ten different negotiations on the subject of party walls, the rights of adjacent lights, difficulties connected with the Metropolitan Building Act, lines of frontage, and so on. Questions of lights and other matters were now refined upon to such an unnecessary and vexatious extent, that he believed it would be well if professional men were to take some means of calling public attention to the difficulties thus thrown in their way. He thought the manifest conclusion to be drawn from all that had been said was, that no wise man would enter on building operations of any extent without the assistance of a competent architect.

Mr. J. C. Wilson said there were a few questions which he should like to ask, not being a member of the profession. Did architects generally approve of deafening the floors of houses, as was frequently done in Scotland, by introducing a mixture of lime and ashes, which was found to keep the rooms warm in winter and cool in summer. Again, did they approve of making flues of a taper shape? he believed such a method would greatly tend to prevent chimneys from smoking. He should also like to know if architects approved of making a separate flue for ventilating purposes from each room to the roof the house. He was not sure whether or not it was the practice amongst architects, when serving their apprenticeship, to learn the various trades connected with building, such as joinery, masonry, and so on. This course was adopted by engineers, and he believed with very great advantage, as it gave them a knowledge of materials and construction which they could hardly obtain in any other way. He also begged leave to throw out the suggestion whether it would be possible to build houses according to certain classes, and have them classed much in the same way as ships were classed at Lloyds', having regard simply to the quality of materials employed and the workmanship, so that the purchaser of a house which had been built and certified, say by the Institute of Architects, as belonging to a certain class, would know that he was buying something of a certain marketable value. Of course no house would be classed at all which had not been built under the superintendence of a professional man. Whatever the public might think of the value of an architect's services, the members of the kindred profession were quite aware of the great ability and talent which were required to make a man a good architect, and he hoped the day was not far distant when the two professions would be found going more hand in hand than they had hitherto done, the architect doing that portion of an engineer's work which properly belonged to him, and the engineer, on the other hand, assisting the architect in all purely engineering matters.

Mr. Bishop said that last summer he had a house built, the bills of quantities being got out by a surveyor from the architect's specification, and upon these quantities builders were invited to tender. He went through some of the details himself, and he found, to his astonishment, that on the average the results were 33 per cent. in excess. The consequence was that he had to call upon the different parties who were tendering, and explain the matter to them, and one contractor, who had made out his estimate, was able to reduce it by £400, which was about 33 per cent. of the total.

Mr. Jones remarked that, having heard what was the amount of remuneration which architects received, he should be much obliged if Mr. Smith could inform him what amount of consideration would secure honesty in a

clerk of works. It was quite possible for him to have a commission on both sides, whereas, unless he were quite loyal to the person building, there was every probability of the structure being defective. It was one of the greatest evils in the present day that so few workmen could be trusted, so that a man, unless he could do a thing himself, never had any certainty that it would be done honestly and properly according to his expectations. Mr. Smith had spoken of being able to secure honest and able men as clerks of works, and perhaps his experience might be available to others.

Mr. Edwin Nash said all architects knew the difficulty of obtaining good clerks of works, and very often they were glad to have a building erected without such assistance, feeling that they could trust much better to the builder himself. A good clerk of the works was a most valuable man, but though there were some of that class, unfortunately there were a good many of the other; and being generally drawn from the ranks of workmen, it could not be expected that they would always be all that was desired. Some questions which had been asked could be answered far better by Mr. Roger Smith than by himself, but others were very simple. Architects did not object to deafening floors, which were very often treated in a similar manner to that described, nor did they object to taper chimnies, except as a question of expense, and some little arrangement being required in the management of the brickwork. The effect in the way of preventing smoky chimnies had not been much tried, but he believed it would be found beneficial, although of course there were objections; as for instance, such chimnies would be much more exposed to the weather than those of one calibre throughout. One matter which had not been touched upon he considered of great importance in connection with the architect's duties; he was too much harassed with practical office work of a dry technical character. This could not have been the case with Michael Angelo, Raffaelle, or the other great masters of former periods, or they never could have designed and carried out their magnificent works. He considered that architects ought to be far more of artists than they were, and unless a large amount of their dry business work were transferred to some one else, he thought English architects would never rise to the high standard of excellence which had been seen in former days.

Mr. Hyde Clarke said it had been hinted to him that the audience was to a great extent a professional one, and that the discussion had been principally carried on by architects, but as an old member of the Society of Arts he might remark that the subject came strictly within their domain as a technological one, and one of very great importance to the public. The point of view from which Mr. Roger Smith had treated it was eminently practical, for everyone was, in some degree, interested in the building of a house, which could not be said to the same extent with regard to building on a large scale, although on that also there was a bond of union between architects and an educated public, the community of enjoyment in works of art. Unfortunately architects were too often neglected in such matters as house building, and he regretted that a greater number of what might be called the employers of architects were not present, to see, from the drawings which surrounded the room, the great quantity of work which an architect had to perform. The interesting paper which had been read showed the relations between the architect and employer, and pointed out to the latter the real value of the services rendered by that profession. If this were more generally known, he believed there would be a much better understanding between architects and the public. In every business but that of building the value of ability and directing power seemed to be understood. Even in a tailor's shop this was the case, but people were much tender of having their houses from a "slop-shop" than their clothes; they were not always in the habit of having them made to fit, and yet every one knew that even in the matter of a coat, a considerable amount of ability was required in order to ensure a successful result. On the whole, he did not know that there was much cause for regret that there were so many professional men present, because the discussion had shown that Mr. Roger Smith had the concurrence and support of his professional brethren in what he had advanced.

Mr. Ladd, as a professional man, felt much obliged to Mr. Roger Smith for the manner in which he had presented his drawings to their notice. These plans showed the amount of work which had to be got through, and when it was done in so complete and detailed a manner, he did not consider that the five per cent. was at all an adequate remuneration; these drawings set a good example to any young architects or pupils who might be present, and showed them how their duty should be fulfilled in carrying out any work which was placed in their hands. Very often, he was afraid, not one-fourth of the drawings —in proportion to the extent of the work—were made which were here shown, and in those cases probably five per cent. was enough. First-class architects, of course, would do their work thoroughly and well, and in such cases they were not over but under paid. In his opinion there should be different scales of remuneration according to the amount of detail in the building, which involved extra work on the part of an architect.

Mr. Tracy asked if there were any intelligible rule known to architects by which they constructed a house, for, according to his experience, smoky chimneys were the rule in dwellings of all classes, both those on which unlimited expense was lavished, as well as those built in the cheapest possible manner.

Mr. Roger Smith, having thanked the meeting for the kind reception which his paper had received, said that notwithstanding the remarks of the last speaker, architects had a certain amount of knowledge with regard to the building of chimnies, and when they were carefully constructed on principles which were generally understood, they were not often complained of. It must be remembered, however, that it was a very delicate matter to arrange for a column of hot air to ascend, in all weathers and under all circumstances, so that it should never be liable to disturbance either by the opening or shutting of doors, by the starting of similar currents in other parts of the house, or by changes in the condition of the atmosphere inside or outside the building; still he was quite ready to admit that a good deal might yet be learned on the subject of flues. It was a very common practice to deafen the floors in good houses, but he knew nothing about taper chimnies, and should not like to take the responsibility of advising their introduction. Distinct ventilating flues were very desirable where expense was not an object, provided they were constructed upon an intelligible system. It was not usual for architects to go through any large series of workshops, but they not unfrequently spent some time in a joiner's shop, which was, no doubt, of considerable advantage. It would not be very easy to devise a classification for houses, and if it were done he did not think it would be of any practical value. One of the most important points in the discussion was that raised by Professor Kerr, as to the share which the proprietor himself might take in the erection of a building. What he had said in the paper referred rather to a man acting as his own architect, which he did not deem by any means desirable; but, for his own part, the greater share his client took in the building the better he was pleased, not that the result was always better, but that so much responsibility was taken from his shoulders. He perfectly agreed that a client had a right to dictate his conditions, and it was the business of the architect to carry them out in the best way possible. He believed the best results were attained where the client contented himself with stating his conditions, and left to the professional man the carrying of them out. The whole question was complicated to some extent by a house being so familiar

an object, and the furniture even more so. From this cause, probably, it was that an architect was so rarely allowed to give any opinion as to furniture, or even what were really parts of the house, such as chimney-pieces and wall papers. His own idea was that a man who wanted to make the most of his architect would use his skill and experience to the utmost, considering that he knew more than he himself did. Occasionally there were instances in which the client might detect matters which had escaped the attention of the architect, but, as a rule, it was the other way. Some of his brethren had rather complained of his not having said more of the artistic part of an architect's work, but the fact was he had been cautioned not to go into that matter, but to deal with the subject from a technological point of view, as being more specially fitted for discussion in that room. The truth was, considerations of artistic excellence and beauty never ought to be absent from the mind of an architect, whose loyalty to his profession should make him endeavour to make the plainest and simplest building conform to the true principles of art. He could not agree with what Mr. Chatfield Clarke had said about the alteration of plans when once made; but that was simply an instance of the different way in which different minds worked, and probably it would be found that no two men arrived at the same end by the same road. He could not go into the question raised by Mr. Bishop as to the quantities without having all the particulars, but the remarks of Mr. Jones as to clerks of works were most important. No sum of money would purchase honesty in such functionaries, but at the same time he had had many and had never had a thoroughly bad one. He always regarded it as one of the most important points to secure excellence in a clerk of works, and spared no pains, therefore, to ascertain what was his previous character. He begged to thank Mr. Hyde Clarke for his remarks; and though he did not think he was correct in saying that the audience was mainly a professional one, still there were architects enough present to secure the correction of any serious error he might have made in his paper. As to the point raised by Mr. Ladd, that an architect who did his work well was underpaid, he had stated something very similar in the paper, but, at the same time, the 5 per cent. commission was now well established, and, on the whole, did not cause dissatisfaction, although there might be individual cases of hardship.

The Chairman said he could not help feeling that the duties which an architect was called upon to render to his client had been, if anything, rather understated in the excellent paper of Mr. Roger Smith. One particular duty which had not been insisted on, but which was of great importance, was that of exercising patience. There were moments of difficulty in the progress of almost every great work, when an immense deal of tact and patience was necessary sometimes even to keep the peace between half-a-dozen people, and to make things go on smoothly, and this was worth at least one out of the 5 per cent. Another essential qualification was a combination of unselfishness and friendliness. An architect, in the early stages of his intercourse with his client, could very frequently be of the greatest possible service, sometimes by telling a man that he must spend more money, and sometimes that he should spend less. It was important early in the negotiations to see what was the tendency of the client. Sometimes he might be a man with a great taste for art, but with limited means or heavy family claims, and if in a moment of selfishness an architect took advantage of that enthusiasm, and went on glorifying himself at his client's expense, he did that which was improper and reprehensible. Again, the relations between the architect and his client being reciprocal, it was his bounden duty to act as a friend to his employer throughout, and from the moment that was clearly understood all mistrust would be removed, and the happiest relations would be established. Another quality which the architect should possess was that of justice. It was necessary for the protection of the employer that contracts should be in very strict terms; and where the former was of a grasping disposition, the builder was often so much at his mercy, that unless the architect held a very fair hand between the two, great injustice might be committed. He should, therefore, strive, above all things, to earn in all his transactions a character for uprightness, taking care, on the one hand, to protect his client, but never allowing injustice to be done to the builder. In conclusion, he begged, on behalf of the meeting, to tender to Mr. Smith a cordial vote of thanks for the very excellent paper he had read.

The paper was illustrated by a complete set of designs and working drawings for a country house, which nearly covered the walls of the room.

THE SITE FOR THE LAW COURTS.

In the House of Commons, on Tuesday last,

Mr. Gregory asked the First Commissioner of Works whether the Government had decided finally on the site for the new law courts suggested in his speech on Tuesday, the 20th, by the Chancellor of the Exchequer; and, if so, whether the proposed site could be acquired without delay; and in what manner, and how soon, would the subject be again brought before the House of Commons. Perhaps the right honourable gentleman would be able to state the precise spot mentioned by the Chancellor of the Exchequer as a desirable site for the new law courts.

Mr. Layard—In answer to the question of my hon. friend, I beg to state that the Government have finally decided to propose to the House a plan for the erection of the new law courts, on the site mentioned by my right friend the Chancellor of the Exchequer, on Tuesday last. As much apprehension appears to exist in the House and out of doors, as to the nature of the scheme suggested by my right hon. friend, I may take this opportunity of stating that the site proposed to be acquired by the Government is that comprised between Somerset-house and the Temple, bounded on the south by the Thames Embankment, and on the north by Howard-street, and several small alleys and passages connecting that street with the Temple and King's College. This site will furnish six acres of building ground. Mr. Street, who is now occupied in adapting the plans which he has already prepared for the Carey-street site to this new site, informs me that he will be able to erect all the law courts, and every office necessarily dependent thereon, upon these six acres. It is my intention to introduce very shortly—if possible, before Whitsuntide—a Bill which, should the House think fit to pass it, would enable the Government to proceed without delay to acquire the proposed site, and to commence the erection of the law courts upon it. I shall be prepared, on the introduction of that Bill, to give a full explanation to the House of the plan contemplated by the Government, and to point out its great advantages over all other plans hitherto suggested. At the same time I shall be able to give such assurances to the House as will, I hope, convince them that it may be carried out, including numerous and most convenient approaches, for the sum mentioned by my right hon. friend, viz., £1,600,000, or at a much less cost than any other scheme. Mr. Street is now preparing detailed plans, which I shall be able to submit to the House before the second reading of the Bill. Before sitting down, I may state to the House, what I had not the opportunity of stating the other evening, that I have received a communication from the Chief Baron of the Exchequer, Sir Fitzroy Kelly, stating that he and all the Judges with whom he has communicated, except one, are of opinion that, upon every ground, as regards the Bench, the Bar, the solicitors, the suitors, and the public—I quote his own words—the Thames Embankment should be preferred for the site of the law courts.

Mr. Hunt asked what was to be done with the Carey-

street site, and whether notice had been given to those persons whose property would be required for the new site.

Mr. Layard promised to explain this when introducing the Bill.

Lord. J. Manners hoped full opportunity would be given for discussing the Bill.

Mr. Layard said he had reason to believe it would be a public Bill, and therefore every opportunity would be given for discussing it.

Fine Arts.

DISTRIBUTION OF WORKS OF ART BELONGING TO THE STATE IN FRANCE.

A decree has just been issued relative to the distribution of such works of art as are not required for the Galleries of the Louvre, accompanied by reports from the Minister of the Beaux Arts, and the Superintendent of the Beaux Arts, Comte de Nieuwerkerke.

The number of pictures and other works of art laid up in the store-rooms of the Louvre, for want of hanging space, has always been a cause of complaint, and although the exhibition space has been greatly increased of late years, the acquisitions are so numerous, that the hidden stores are little if at all diminished, and the Government has felt it necessary to devise some additional means of making use of its surplus treasures.

It appears that during the last fifteen years the artistic collections of the Louvre have been increased by no less than forty-five thousand objects of art, pictures, sculptures, antiquities, &c. The question therefore arises whether all these treasures are to remain in the possession of the state, or whether a portion of them may be more profitably employed in cultivating the taste and aiding the artistic education of the people of France.

Now that the enlargement and restorations of the Louvre are all but completed, the exact capacity of that immense establishment is exactly ascertained, and consists of 142 galleries, or rooms; but large as is the space thus provided, it is not sufficient to contain, or at least to exhibit, the whole of the works in its possession. The imperial palaces are also well provided with works of art. There remains, according to the view of the Ministry, but one legitimate application for the superfluities of the Louvre, which is, to distribute them amongst the churches of the country, and the museums and galleries of those towns which have made laudable efforts either to establish new collections of works or to enrich those already in their possession, and have thus given a great stimulus to the love and study of art in their several localities. That this effect has been produced is proved by the great increase and improvement in the exhibitions which are now so numerous and important in provincial towns.

At present the Government has not the power to alienate any of the property of the state, and therefore a proposition will be laid before the Senate, authorising a certain number of items to be struck out of the inventories of the collections appertaining to the Crown, in order that they may be distributed in the departments as proposed.

The selection of the objects to be retained in the Louvre, or otherwise disposed of, is, of course, an operation of great trust and delicacy, and it has therefore been decided that lists shall be drawn up by the directors of the public galleries, and submitted to a special commission, consisting of the superintendent of the Beaux Arts, as president, and twelve members, six to be chosen from amongst the officers of the state and the rest from the Academy of the Beaux Arts.

In accordance with the recommendations of the minister a decree has been issued, the chief article of which is as follows:—"A statement shall be drawn up, by the authorities of the imperial museums, of the pictures and objects of art belonging to the crown which can be spared without inconvenience, and delivered over to the State." The works thus withdrawn from the imperial museums, and distributed in the provinces, will thus cease to be the property of the state, although, possibly, the recipients may be bound in certain conditions with respect to them, but nothing of this kind appears in the decree.

The Commission appointed by the same decree to carry out the object in view consists of the following members:—

Le Comte Nieuwerkerke, President; M. Chaix d'Est-Ange, Secretary of the Senate; M. Merimée, Senator, and Member of the French Academy; M. Alfred Le Roux, Vice-President of the Corps Legislatif; Le Comte Welles de la Vallette, Deputy; and Le Vicomte de Rouge, Councillor of State.

MM. Cabanel, Gérôme, Le Vicomte H. Delaborde, Gatteaux, Guillaume, and Cavelier—Members of the Academy of the Beaux Arts.

The Chartres Exhibition.—The town of Chartres has voted the sum of £200 for the purchase of pictures at the forthcoming exhibition, which opens there on the 1st May, at the same time as the regional agricultural exhibition. It is announced that the Empress, and probably also the Emperor, will pay the town a visit on the occasion of its combined exhibitions of industry, art, and archæology.

Notes.

Australian Meat.—The Lords of the Admiralty have accepted the tender of the Australian Meat Company (Limited), for whom Messrs. John M'Call and Co. are the London agents, for the supply of 200,000 lbs. of Australian preserved beef.

Exhibitions at Beauvais.—The coming exhibitions at Beauvais, which open on the 1st of June, are likely to attract a good many English visitors, from the nearness of the town to the British Channel, and other circumstances. The occasion is the agricultural show of the eight northern departments of France, which presents special interest to English farmers and others from the similarity of soil and products with our own country, the beet-root cultivation at the present moment, furnishing an interesting object of study. The additional exhibition comprises six groups—the fine arts and application of the liberal arts; furniture, tissues, clothing, &c.; products of extractive industry, raw and manufactured; machinery and processes of the useful arts; agricultural buildings and products; and horticulture. A large building has been erected for the purpose, with a spacious garden for out-door exhibition. In the centre of the building will be a large covered space for large hothouse plants; and a special gallery is set apart for fine and retrospective art. Steam and water power are provided for machinery in motion. One new feature deserves notice; the chief prizes will consist of works of art, one in each group, and the others of medals.

MEETINGS FOR THE ENSUING WEEK.

Mon.....Society of Arts, 8. Cantor Lecture. Mr. John Anderson, "On Applied Mechanics in relation to Natural Power."
Social Science Assoc., 8. Mr. S. H. Gael, "On Life Peerages."
Royal Inst., 2. General Monthly Meeting.
Society of Engineers, 7½. Mr. Wm. Sugg, "The Systems and Apparatus employed for Illumination by Coal Gas."
R. United Service Inst., 8½. Mr. Charles W. Eddy, "A Movable Steel Mantelet for the Protection of Field Artillery and Troops."
Entomological, 7.
British Architects, 8. Annual Meeting.
Medical, 8.
Asiatic, 3.
Victoria Inst., 8.

Tues ...Royal Inst., 3. Prof. Grant, "Stellar Astronomy."
Pathological, 8.
Civil Engineers, 8. Discussion "On the Outfall of the River Humber;" and (time permitting) Mr. J. Ellacott, "Description of the Low-water Basin at Birkenhead."
Anthropological, 8.
Syro-Egyptian, 7½. Rev. G. Sandie, "On the Peninsula of Sinai."
Wed ...Society of Arts, 8. Col. F. C. Maude, C.B., "On the Formation of Industrial Settlements in our Colonies."
R. Society of Literature, 4½.
Archæological Assoc., 8.
Thur ...Antiquaries, 8½.
Linnæan, 8.
Chemical, 8.
Artists and Amateurs, 8.
Royal Inst., 3. Prof. Tyndall, "On Light."
Society of Fine Arts, 8. Mr. S. C. Hall, "Memories of the Men and Women of the Age."
Fri .....Society of Arts. Piscicultural Committee. Mr. A. F. Pennell, "On Oyster Culture and Legislation."
Geologists' Assoc., 8.
Philological, 8½.
Royal Inst., 8. Captain Moncrieff, "Moncrieff System of Working Artillery."
R. United Service Inst., 3. Mr. Robert H. Scott, "Storms on the British Coasts, and Telegraph Weather Intelligence."
Archæological Inst., 4.
Sat .....R. Botanic, 3¾.
Royal Inst., 3. Prof. Seeley, "Roman History.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb.

Delivered on 21st April, 1869.

143. Post-office Savings Banks—Account.
148. Public Income and Expenditure—Account (year ended 31st March, 1869).
Public Petitions—Fourteenth Report.

Delivered on 22nd April, 1869.

75. Bill—County Coroners.
86. ,, Court of Common Pleas (County Palatine of Lancaster)—Amended.
124. Parishes—Return.
138. Patents for Inventions—Returns.
Judicature Commission—First Report of the Commissioners.

Delivered on 23rd April, 1869.

87. Bill—Local Officers Superannuation (Ireland).
88. ,, Naval Stores.
89. ,, Governor-General of India.
2. (6) Railways Abandonment—Warrant of the Board of Trade.
97. Poor-law Unions—Return.
118. Treasury Chest—Account (1867-68).
152. Hypothec (Scotland)—Return.
156. County Expenditure—Return.

Delivered on 24th April, 1869.

85. Bill—Municipal Franchise.
90. ,, Local Government Supplemental.
91. ,, Merchant Shipping (Colonial), 1869.
153. Post-office Savings Banks—Return.
158. Vagrancy (Cumberland and Westmoreland)—Correspondence.
Public Petitions—Fifteenth Report.

Delivered on 26th April, 1869.

92. Bill—Colonial Prisoners' Removal.
93. ,, Copyright (Periodicals).
94. ,, Railway Construction Facilities Act (1864) Amendment.
64. (v.) Committee of Selection—Sixth Report.
102. (ii.) Maynooth College—Supplementary Return.
123. Wine Duties—Correspondence.
46. Stannaries—Return.

Patents.

From Commissioners of Patents' Journal, April 23.

Grants of Provisional Protection.

Aërial navigation, apparatus for—1124—C. D. Abel.
Belt buckles—979—W. E. Gedge.
Boots, &c., apparatus for cleaning—1005—G. H. Ellis.
Boots, &c., fastenings for—1082—R. J. Colls and A. E. Bull.
Boring apparatus—1035—F. F. Villepigue.
Boxes, self-closing—407—G. Gros.
Chimney cowls—1130—C. Turner.
Cisterns, &c., apparatus for drawing and preventing waste of water from—1142—J. Chandler.
Cog-cutting, &c., machines—1080—J. Denis.
Compasses, &c.—1168—A. M. Clark.
Crinolines, &c.—1047—E. Collard.
Crucibles, &c., apparatus for manufacturing—1098—J. Hynam.
Door bolts and staples—869—M. Tildesley.
Felted fabrics—1122—A. d'Azambuja.
Fire-arms, apparatus for cleaning—1063—C. E. H. C. Healey.
Flax, &c., cleaning—1094—E. Brasier and J. E. Hodgkin.
Flour, manufacturing—1112—D. Johnson.
Fountain pens—1114—A. M. Clark.
Game, suitable for outdoor or indoor exercise—1053—B. McEvoy.
Gas meters—1102—D. B. Peebles.
Harmoniums, &c.—3765—W. Dawes and E. A. Ramsden.
Hydraulic machinery—971—H. Davey.
Hydrocarbons, apparatus for burning liquid—1152—J. H. Johnson.
Hydrocarbons, apparatus for burning liquid—1158—C. E. Brooman.
Ice-making machines—669—F. Windhausen.
Looms—955—J. Briggs and J. Almond.
Meat, &c., storing and preserving on board ship—935—E. H. Huch.
Nutcrackers, &c.—1154—T. White.
Organs—1064—J. W. Warman.
Pictures, &c., hanging—1084—C. J. F. Campbell.
Pipes and tubes, jointing—1144—A. H. Renton.
Railroad rails, joints for—1134—W. E. Newton.
Railway carriages, &c., propelling—1118—S. F. Shore.
Railway switches, indicators connected with—1126—T. F. Cashin.
Railway trucks and carriages—1156—C. T. Swanston.
Railways—1120—W. R. Lake.
Reaping and mowing machines—1078—T. Culpin.
Resinous bitumen—3893—W. E. Gedge.
Rotary engines, pumps, and meters—1088—A. V. Newton.
School desks, &c.—1170—W. J. Cowlman and A. Doe.
Sewing machines—1096—H. A. Bonneville.
Skins, removing hair from—1106—J. H. Johnson.
Slide valves—1128—W. Brock.
Steam engines—1140—J. Leechman.
Steam engines—1150—B. W. Farey.
Steam engines, &c.—1166—F. J. Bramwell.
Straw, braid, &c., stitch for sewing together—1108—E. T. Hughes.
Sunshades for hats, &c.—891—W. Harrison.
Telegraph wire, manufacturing—1136—J. H. Johnson.
Telegraphic cables, constructing and protecting—1076—J. Aspinall.
Valves—1110—L. J. Crossley and R. Hanson.
Vehicles, constructing and propelling—1086—W. W. & J. D. Hooper.
Vehicles, indicating the distance travelled by—1148—T. Akinson and R. Smith.
Velocipedes—949—H. G. Dixon.
Velocipedes—1092—H. W. Lobb.
Velocipedes—1146—G. Keighley.
Velocipedes—1162—W. H. Buck.
Water-closets—1164—R. Heyworth.
Wood, &c., preparing for combustion—947—C. Weekes.

Inventions with Complete Specifications Filed.

Hat rims, manufacturing—1194—H. A. Bonneville.
Hydrocarbon oils, manufacture of heavy—1178—G. T. Bousfield.
Sewing machines—1205—N. Wilson.
Steam engines, valves and valve gear for—1171—A. K. Rider.

Patents Sealed.

3044. G. Graveley.
3249. R. Ferguson and G. Lord.
3267. P. M. Crane.
3269. B. Nicoll.
3274. W. Boulton.
3276. T. Speight, sen., and W. H. France.
3277. T. Priestley & W. Deighton.
3279. F. Ransome.
3283. G. Zanni.
3289. J. Wallace.
3291. J. Johnson.
3312. J. and W. Adams.
3324. J. Brönner.
3539. C. D. Abel.
37. A. W. C. Williams.
559. J. Breeden.

From Commissioners of Patents' Journal, April 27.

Patents Sealed.

3296. M. A. Soul.
3305. M. Benson.
3308. F. A. Blanchon.
3318. W. Collins, jun.
3328. B. Dickinson.
3334. J. Dannatt and T. S. Turnbull.
3339. J. A. R. Main.
3347. E. Holden.
3353. S. Ward, W. Hurst, and J. Tuer.
3372. J. Parrott and W. Jones.
3376. W. Baker.
3389. A. M. Clark.
3435. T. B. Collingwood and W. Hardman.
3436. P. J. Livsey.
3451. C. Markham & W. Knighton.
3453. C. Markham & W. Knighton
3573. H. E. Newton.
3575. E. R. Wethered.
3745. W. Baines.
3829. J. Worrall and J. Kershaw.
3830. T. Aveling.
173. C. Baunscheidt.
339. J. Howard.
604. W. A. Herring.
660. T. Greenwood.
752. T. Greenwood.

Patents on which the Stamp Duty of £50 has been paid.

1106. D. Evans.
1116. J. Leigh.
1159. D. Bievez.
1170. T. Kirby.
1134. J. H. Wilson.
1162. A. Upward and A. A. Cochrane.
1136. G. E. Donisthorpe.
1278. W. Young and P. Brash.
1163. G. E. Noone.
1215. G. Davies.
158. A. A. L. P. Cochrane.
1196. T. A. Weston.
1305. C. Moseley.

Patents on which the Stamp Duty of £100 has been Paid.

1470. J. Stone.
1201. F. Dangerfield.
1199. J. F. Allen.
1214. J. Elder.
1221. W. Fisken.
1228. J. G. N. Alleyne.

Journal of the Society of Arts.

FRIDAY, MAY 7, 1869.

Announcements by the Council.

Ordinary Meetings.

Wednesday Evenings at eight o'clock :—

May 12.—"On the Ventilation of Drains." By James Lovegrove, Esq., Assoc. Inst. C.E. On this evening Earl Ducie will preside.

May 19.—"On the Progress of the Colonies." By John Robinson, Esq., of Natal.

May 26.—*Derby-day.*—No Meeting.

Committee on India.

Conferences are now in course of being held for the discussion of various subjects connected with India.

The following arrangements have been made for the remaining two conferences :—

Friday Evening, May 14.—"Waste Lands." By George Campbell, Esq.

Friday Evening, May 28.—"Trade with Central Asia, Thibet, and South-Western China."

At these Meetings the chair will be taken at 8 o'clock, and the discussion will be opened by a paper.

Members of the Society interested in Indian questions are invited to attend.

Piscicultural Committee.

This Evening (Friday), May 7th, a paper "On Oyster Culture and Legislation" by Arthur F. Pennell, Esq., will be read and discussed. The Chair will be taken at eight o'clock.

Members of the Society interested in this subject are invited to attend.

Designs for Channel Steamers.

The Council of the Society of Arts offer the Gold Medal of the Society, and the large Silver Medal of the Society, for the best and the second-best block model of a steamer, which shall afford the most convenient shelter and accommodation to passengers on the deck of the vessel crossing the Channel between France and England. The steamer is not to exceed in tonnage and draught the best vessels now in use between Folkestone and Boulogne, and the model must be on a scale of a quarter of an inch to a foot. The models, marked in cypher, are to be sent in to the Society of Arts' House, John-street, Adelphi, on or before the 1st November next, with a sealed envelope, giving the name and address of the designer.

The medals will not be awarded unless, in the opinion of the Council, the models possess sufficient merit.

Notice to Institutions.

A limited number of copies of the following works by Sir George Ramsay, Bart., has been kindly placed by the author at the disposal of the Society, for distribution to such Institutions as may apply for them :—

1. Analysis and Theory of the Emotions.
2. Introduction to Mental Philosophy.
3. Principles of Psychology.
4. Instinct and Reason.
5. Essay on the Distribution of Wealth.
6. Political Discourses.
7. A Disquisition on Government.

Applications for copies should be made to the Secretary of the Society of Arts.

Thames Embankment Committee.

The proceedings of this Committee, so far as they relate to the question of the site for the Law Courts, have been reprinted in the form of a pamphlet, which may be had of the Society's publishers, Messrs. Bell and Daldy, York-street, Covent-garden, price threepence.

Subscriptions.

The Lady-day subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Thames Embankment Committee.

The Council have authorised the presentation to Parliament, under the corporate seal of the Society, of the following petition, prepared at the recommendation of the Thames Embankment Committee :—

To the Honourable the Commons of the United Kingdom of Great Britain and Ireland in Parliament Assembled.

The Humble Petition of the Society for the Encouragement of Arts, Manufactures, and Commerce, incorporated by Royal Charter.

Sheweth—

That your petitioners have lately appointed a Committee to report on the best way of dealing with the Thames Embankment, so that the opportunity may not be lost of making this noble site conducive to the embellishment and improvement of the metropolis.

That such Committee consists of the following persons :—Lord Henry G. Lennox, M.P.; Lord De L'Isle and Dudley; Right Hon. W. Cowper, M.P.; Lord Elcho, M.P.; Baron Meyer de Rothschild; The Hon. Auberon Herbert; A. B. Beresford Hope, Esq., M.P.; William Boxall, Esq., R.A.; Sir William Bodkin, Assistant-Judge; Hyde Clarke, Esq.; A. Baillie Cochrane, Esq.; Henry Cole, Esq., C.B.; Lieut.-Col. E. F. Ducane; C. W. Dilke, Esq., M.P.; W. R. Drake, Esq., F.S.A.; Lieut.-Col. Ewart, R.E.; Edwin W. Field, Esq.; Alderman Sir T. Gabriel; W. H. Gregory, Esq., M.P.; Earl Grosvenor, M.P.; C. F. Hayward, Esq.; W. Haywood, Esq.; John Locke, Esq., M.P.;

Right Hon. Lord John Manners, M.P.; J. E. Millais, Esq., R.A.; S. Redgrave, Esq.; Lieut.-Col. Scott, R.E.; G. E. Street, Esq., A.R.A.; Seymour Teulon, Esq.; Sir Charles Trevelyan, K.C.B.; Richard Westmacott, Esq., R.A.; Rev. Henry White; Joseph Whitworth, Esq., LL.D.; Watkyn Williams, Esq., M.P.

That, during the course of the proceedings of this Committee, it became their duty to inquire whether any and what controlling power over public works in the metropolis of this country is vested in, or exercised by, any public department.

That it appears, from the proceedings of this Committee, that no such effective controlling power exists, and that the mode of dealing with the Thames Embankment, upon which the improvement of London essentially depends, has been left to the accident of the varying personal interests and tastes of the different owners of property on the Embankment.

That, so far as any control whatever exists over the works of the Thames Embankment, it is subject to the divided jurisdiction of the Corporation of the City on the east of the Temple, and the Metropolitan Board of Works on the west.

That such control is entirely confined to the conduct of works already authorized to be constructed, and is wholly ineffectual for securing the proper appropriation of public sites for the health, accommodation, and embellishment of the metropolis.

That such Committee is strongly of opinion that it should form part of the duty of a responsible Minister to exercise a controlling power, within necessary limits, over all operations bearing upon public works in which the convenience and embellishment of the metropolis are concerned.

That your petitioners entirely agree in the opinion of their Committee, and humbly pray your Honourable House to take such steps as may secure such responsible control as to your Honourable House may seem fit.

And your petitioners will ever pray, &c.

India Committee.

The fourth Conference on subjects relating to India was held on Friday evening, 30th April, George Campbell, Esq., in the chair. The paper read was—

ON INDIAN FIBRES.

By Leonard Wray, Esq.

The subject this evening is that of "Indian Fibres," a subject which has been frequently brought before this Society, and especially by those able and scientific men, the late Dr. Royle and Dr. Forbes Watson, to the latter of whom we are all greatly indebted for the exhaustive manner in which he has treated the subject.

I propose to occupy your time but very briefly, as I well know the valuable nature of the discussion which will follow the opening of this most interesting subject this evening.

We cannot avoid dividing our subject into the three great branches which it naturally assumes, viz.:—1st, those fine silken fibres so valuable for manufacturing into textile fabrics; 2ndly, those suitable for cordage, &c.; and 3rdly, those adapted only to paper-making. And I need not tell you that, to do anything like justice to them, would fill a good-sized pamphlet appropriated to each. Flax and hemp are so largely grown in Europe that we may well leave them out of the question for the present; and I think the same may be said of jute, and others of the same class.

The fibre which is now creating a great stir amongst our manufacturers is the "Rheea," so commonly although erroneously called China-grass, as we obtain our supplies almost wholly from China. It is there named "Tchu-mā," and is named in botany *Urtica nivea*, being of the nettle family.

In Assam, a cultivated and a wild variety is found; and in the Malayan peninsula, Penang and Singapore, another variety grows wild, the fibre of which is unusually strong. This has a Malay name, "Rāmee," and is in botany known as the *Urtica tenacissama*.

The partly prepared fibre of the rheea, such as this, is now worth in the market, £70 per ton, whilst the beautiful silken fibre, fully prepared, is worth 2s. 4d. per lb., as the fabrics made from it are of so strong and so lustrous a character as to be in universal demand. Pity, indeed, is it that this splendid fibre can be obtained only in such small quantities. No other supplies can be looked for, except from China, nor can we expect much from that country either. Its growth and preparation have been tried by most intelligent Englishmen in India, but they found, first, that the separation of the fibre from the plants was a most difficult and laborious operation; and, secondly, that the yield per acre per annum was exceedingly small. Indeed it is said by a gentleman now present to yield only one to one and a-half cwt. of fibre to the acre—a fact which forbids any European from entertaining hope of cultivating it at a profit, which is much to be regretted.

The authors I have alluded to made particular mention of the following plants as yielding fine, silken, and yet strong fibres, viz.:—the *Pederia fœtida*, the Jettee, the Moorva, and the pine-apple, each of which they fully describe; and no doubt almost all of them are known to many now present. I quite believe that they each and all of them hold out the promise of amply remunerating any European who will attempt, in a judicious manner, to utilize the beautiful fibres they contain.

The *Pederia fœtida* certainly has the most silky and lustrous fibre any one can desire, and its being only in lengths from joint to joint seems the sole objection to it. Still, these joints are often 12 inches apart, whilst the finest Sea Island cotton is not more than one inch to an inch and half in staple. Attention ought, therefore, to be directed to this lustrous fibre-yielding plant.

The Jettee, again, is jointed, but the joints are sometimes two feet apart, and the fibre proportionably long. It is a most excellent fibre, and will be sure to make its way.

The Pine-apple, with its beautiful fibre, exists in thousands of acres in the Straits of Malacca, and may be had at Singapore in any quantity for the trouble of gathering, yet no one seems to regard it. This indifference to so tempting an opportunity is really most astonishing, but I imagine it cannot last much longer.

Now, the plant which I desire most especially to draw your attention to, is that from which the surpassingly beautiful Manilla handkerchiefs are made. Who has not seen or heard of the long-celebrated "Pigna" cloth,—which can only be purchased at extreme fancy prices? This magnificent production is made from the fibre of Mindanao (Bromelia), in fact the *Bromelia penguin*, a kind of wild pine-apple, which is exceedingly abundant, in both east and west.

The late Mr. Temple, formerly Chief Justice of British Honduras, some years ago exhibited a quantity of the fibre to this Society, and he called it "silk grass;" and some present may remember how long, how strong, and how silken it was. We may search the world through, and not find another plant capable of yielding us so rich, so abundant a supply of a fibre which in quality cannot be excelled. That is a plant which we may look to, to provide us with a large amount of the very best quality of fibre. I believe this plant has hardly been spoken of; I doubt whether it has been named. It is more easily obtained, and the yield of fibre is very large, because each leaf is a mass of fibre, mixed with vegetable matter which is easily expressed in the green state. Dr. Forbes Watson told me that he looked upon the rheea as the fibre of the future; but if it be true that

it only yields 1 cwt. of fibre per acre, you will, I am sure, agree with me in thinking that it cannot be the fibre of the future, unless it can be grown cheaper and in greater quantity than we yet know of. But the fibre to which I allude can be grown exceedingly cheap, and the manufacture involves no difficulty. I do not know the exact mode by which Mr. Rutledge separated the fibre, but I believe it was on the principle of the thrashing machine, the plant being passed at a slow rate along a platform having a yielding surface, through rollers and beaters; and, when this was done with the plant in a green state, it came out at the other end of the machine very good fibre, which was improved by repeating the operation. A stream of water is used to wash the pulp away as it was expressed from the fibre. These are the principal textile fibres to which I have to draw your attention.

I come now to cordage fibres, and that is so vast a subject, that I feel I ought scarcely to introduce it on this occasion; but the point to which I will call your attention lastly, is that of fibres adapted to paper-making. With respect to paper-making, we can be satisfied with a very different character of material altogether; and almost anything of a fibrous nature would answer the purpose. I suppose almost all the plants of England have been tried, and some of the patents are very laughable. I have seen specifications of patents containing columns of names of almost every plant in England. Amongst others, there is the nettle; but with reference to Indian productions, there are plants which yield valuable productions besides fibre. But there is one plant I was particularly struck with, that is the common canna, one of which often grows as high as fourteen feet. The whole stalk and leaf are one mass of fibre, so much so that, on cutting down one of these plants in my conservatory, I found the leaves were full of beautiful fibre. The root furnishes that description of arrowroot which is called "Tous les Mois," and is described by chemists as the most nutritious of all the starches—more nutritious than the best arrowroot that comes into the market. That is the first product of the plant; the second product is the fibre resulting from the roots; and the third, the fibre from the stalks and leaves of the plant itself. If we get a double product from such a plant as this, *that* is getting really a great advantage, and at a cheap rate; and the cheaper you get fibrous matter to make your pulp, the better it will be for all parties. It may be interesting to you to know in what form this fibre for paper-making can be best sent to this country. It is said we cannot have paper-mills in India, because, as we see them in England, it costs a great deal of money to build and furnish the machinery. We must take into consideration the different kinds of paper made. If we go in only for that kind of paper which newspapers are printed on, that is a simple thing. I saw that kind of paper made 25 years ago, in the mills of Mr. Marshman, the proprietor of the *Friend of India*, and I was struck with the simplicity of the thing. In the factory, which was a very plain building, a number of women and children were seated, with blocks of wood before them, cutting up old gunny bags to pieces, and those were washed and made into pulp. The pulp was passed between cylinders heated by steam, and the paper was made from it. The paper is worth from 3d. to 4d. per lb., and is well adapted for newspapers. Only consider the quantity of paper that we send to India. Why should they not make their own paper? I recollect, on one occasion, Dr. Riddell exhibited in this room some fibre from the ochre plant, which he called a paper-making plant. That plant is fibrous from one end of it to the other; and Dr. Riddell showed me some paper which was made from it by the simplest process possible—merely pounding it in a wooden mortar, and turning out the paper at once. When we know this, we may well ask, why not make paper in India? I have here a specimen of a pulp made of Esparto grass, and converted into pulp in Spain. It is worth £20 per ton in the market. That is the form in which I should recommend those who would not make paper in India to send it here. If it is made in larger slabs than this, it is difficult to dry. If thoroughly dried it will keep for a thousand years uninjured, but, if not quite dry, it is liable to change colour, as this has done; but in this condition little more requires to be done with it to make it into paper.

DISCUSSION.

The Chairman said that Mr. Wray had laid before them some interesting matter, with regard to a number of different fibres which were as yet but little known in this country. So far, he thought he could do little more than invite discussion, but he would add to what Mr. Wray had said one observation, which was this—that he thought it was not desirable that they should exclude from the discussion those better-known fibres, jute, hemp, and flax, to which Mr. Wray alluded, but which were excluded from his paper as being well known in this country. He confessed, for his own part, he had a preference for the bird in the hand, rather than for those very desirable birds in the bush which Mr. Wray had introduced to them, and he had besides some selfish feeling in the matter. He was familiar with those ordinary fibres, whereas he did not know much about those with respect to which Mr. Wray had given them information. He would suggest that practical men who were acquainted with these great staples of jute, hemp, and flax, should give all the information they could upon this subject. Jute was not only a great commercial and industrial interest in this country, but was an example which gave great promise for the other fibres which Mr. Wray had introduced to their notice, inasmuch as he believed, a comparatively short period ago, jute was scarcely known as an article of manufacture in this country, whereas it had now become one of our most important manufactures. The supply of jute, he believed, came almost entirely from Eastern Bengal, but in the central provinces there was a large area of country in which the climate was very similar to that of Bengal, where he thought it was possible this cultivation might be extended, because it was a question whether, if the growth of jute was extended in Bengal, it might not unduly press upon the paid resources of that province, and, therefore, it was the more desirable to seek out new districts, where the cultivation of jute might be extended. Then, with regard to hemp, so far as he knew the common hemp of the plains was so little thought of as not to form an article of export to this country; but they had in India the plant which produced the Russian hemp, and, where cultivated, it was principally for the sake of the seed; in the hill districts and some other parts of India it was grown to a certain extent for the fibre. No doubt the production might be increased. At Nynee Tal this plant grew wild nearly all over the station; therefore, if the demand was great in this country, and if the price realised was such as to justify it, we might obtain considerable exports of the Russian hemp from India. With regard to flax, which was grown more widely—certainly as widely—as any plant in India, with small exception it was grown for the linseed and not for the fibre. One reason for that was, it was a plant which required a temperate climate, and when grown for fibre it required moisture. Cocoa-nut fibre had now grown to be an important product in manufactures, and he believed there were an enormous number of fibres in India applicable to the manufacture of paper, and he trusted those interested in the matter would give their attention to it.

Mr. Bainbridge said his experience of fibres was principally confined to the rheea, which was indigenous to the province of Assam, but owing to the difficulty, to which Mr. Wray had alluded, of extracting the fibre, combined with the very small yield, it had within the last few years become almost unknown in that part of India. The strength of fibre of the rheea was unequalled;

there was only one known which was stronger. Rheea fibre was chiefly used in Assam by the fishermen, in repairing their nets, but it was seldom that the nets were entirely made of it. The natives formerly grew it in small patches around their houses, where it got the benefit of every kind of refuse thrown from the huts, even to the cooking water. The rheea fibre was extracted from the bark, and was of a very silky character, something between silk and cotton, but the yield of it was out of all proportion to the bulk of the nettle in the green state. It was extremely difficult to extract the nettle fibre whilst the plant was in its green state, and though he believed machinery had been prepared for dealing with it in the green state, that which he applied was only applicable to the plant in a dried state; and the difficulty of drying it was so great, from the space required in the drying-house, and the great bulk of the nettle in the green state, that he was unable to do anything with it. The natives had always been found unwilling to grow this fibre, from the fact that the yield was so small compared with other crops; and it was so scarce in the native bazaars that it was readily saleable at four annas, or sixpence, per pound, which was equivalent to £56 per ton. The cost of preparing it made it unable to compete with the China-grass, with which it was very closely allied, and, he believed, almost identical. Five or six years ago he was requested by some friends to try the cultivation of the rheea in Assam. He had, however, great difficulty in getting roots in any quantity to grow from. To have grown from seed would have taken too long a time. It grew readily by cutting the root into three or four pieces. He commenced operations in the dry season, keeping the ground watered. The roots were planted in rows, two feet apart. As soon as the rain fell, the roots began to throw out shoots in all directions. The rheea was a most exhausting crop for the land, and required an immense deal of manuring, and he was under the disadvantage of being unable to procure the quantity or the quality of manure which the plant wanted, but he applied a much larger quantity of fertilising matter than any other plant would have required, and the result was, that he obtained three cuttings in that year, and the yield, as far as he could recollect, at each cutting was about 720 lbs. of green nettles, and from that amount of the plant he obtained only 45 lbs. of fibre. It was extracted by the hand-labour of the natives, who preferred to use the native knife for the purpose, to any mechanical means it was in his power to supply them with, though he had two machines for extracting the fibre in the dry state. The result was a yield of fibre of about 130 lbs. per acre from the three cuttings, but he had no hesitation in saying if he had been enabled to give a sufficient quantity of manure of good quality, he would have obtained five cuttings of the plant, and about 2 cwt. per acre of fibre; but he did not think, at that yield, it could be made commercially remunerative, or that it could compete with the China-grass, which was produced in the country, in small quantities, by a large number of peasant holders. The difficulty with respect to Assam was the almost entire absence of population, and to grow anything where labour was so scarce and expensive as it was in those days, particularly when the tea mania commenced, was impossible; and, in addition to that, land was selling readily at from £2 to £3 per acre, of good quality, and it was quite out of the question to grow rheea under such circumstances. He believed the so-called China-grass was not a grass but a nettle, and, commercially, this China-grass had quite superseded the rheea; and, as they were so closely allied to each other, it might be interesting to make a few remarks about that fibre. He had brought with him a number of samples of the China-grass, worked up in various marketable forms. As in the case of all new articles, it met with great difficulties in first starting, yet he believed it would be one of the principal fibres of the future. At present it was difficult to obtain it in any large quantity, but he had no doubt it would be with this article as with any other in China, as soon as there was a regular demand for it, China would furnish a regular supply. The country had an immense population, and they seemed able to supply anything we required in any quantity. In dealing with the fibre, the Chinese did not spin it as we did, but only twisted the ends together, and made a long thread of it. After the fibre was received in this country it was soaked in large tanks, to get rid of the gum, and afterwards bleached. It was then passed through rollers to extract the moisture, and from that it was passed to the teazing and dressing frames, and was turned out in the state in which it was now exhibited. The final process was passing it through the combing machine, and by that means it was produced in the beautiful silky state in which they now saw it. In that form it was readily marketable to any extent, and many of the manufacturers of the north were engaged in spinning this fibre into yarns.

Mr. Briggs believed that the spinning of this fibre to any large extent was confined to one establishment at Leeds, and they had a patent for manipulating China-grass.

Mr. Bainbridge said, to his knowledge, several manufacturers were engaged in spinning China-grass, but, being a comparatively new article, the supply was limited, and the market was consequently very sensitive, the great difficulty being, as Mr. Wray stated, to obtain the supply of the article. He believed almost every article of hosiery, from boot-laces up to shirtings and pocket-handkerchiefs, had been made of this material, and no doubt a great number of ladies were wearing it, quite unknown to themselves. He was sure, though this was alluded to as being an Indian fibre, it would not be from India that we should obtain the supply of it, but from some country like China, where there was a large population able and willing to grow it in small quantities individually, and consign it to brokers in the bulk, to be exported to this country.

Dr. Archibald Campbell said the fibre which he wished first of all to bring before the notice of the meeting, because it was the most important with which he was acquainted, was that which grew in the province of Nepaul, and was known as the pooah. He at first imagined it was the same plant as the rheea, and he wrote to Dr. Hooker to ask him if it was so, and he received a reply stating it was not the same, but it was very nearly allied to it. As far back as 1847, he brought the fibre before the attention of the Horticultural Society of Calcutta. It grew at an elevation of 1,000 to 2,000 feet. Its height was about five feet, and it bore a remarkable resemblance to the nettle, and was easily recognised by the silver tint of the leaf. He did not know whether the rheea had that. [Mr. Bainbridge replied that it had.] The fibre of the pooah was of the best possible description, and was used for fishing nets and game bags, for springes for catching pheasants, and for other things for which the best kind of fibre was required. He gave a sample of it to a military sergeant, who was a shoemaker by trade, and requested him to try it, and he pronounced it to be as good as Russian hemp. The cost of producing this fibre was about four rupees per maund, and the price it fetched at Calcutta was from 12 to 15 rupees per maund, or about £40 per ton. Experiments of a satisfactory character had been made with it by Captain Thompson, who had a rope factory at Calcutta. He would not detain the meeting by describing the process of manufacture of this fibre, but would hand over some notes he had prepared, giving particulars of the growth and nature of this fibre, for publication amongst the proceedings of this Conference.

Mr. Briggs said the subject of the merits of the different fibres of India was a very interesting one to him personally, and he would be the last to say anything derogatory to what had been brought forward by Mr. Wray, but it appeared to him they were "progressing backwards," for he had tested and manipulated the whole

of these fibres in 1859-60. During the Russian War the manufacturers racked their brains to find a substitute for hemp and flax, and out of that arose the search for fibres in India. With the exception of the Bombay and Madras hemp, he thought all the other things were simply things of fancy. The question resolved itself into this, that they had a plant in India, native to the soil and climate, which could be had in any quantity provided there was a proper system of agriculture in India, combined with irrigation works, and a network of railways, as in this country. We should then have India sending us cotton, for that, after all, was the fibre we most look for from India. That was the only fibre India could properly give us, except jute, of commercial advantage to us.

Mr. J. C. Wilson said, after alluding to some South American fibres, it was matter of surprise to him that flax was not grown more extensively in India. He had some Indian flax straw sent to him, which he manufactured, but the fibre was very short, whereas good flax straw was long. The seed was very fat and plump. The fibre was worth only about £40 per ton. In a loamy soil, with a clay sub-soil, flax could be grown with great advantage. The great secret of the manufacture of good flax consisted in using running water in the steeping of the straw, as was practised in Belgium, for fermenting and removing the gum. He had found by using a small stream of water running through the vats, to keep the water sweet and free from acid, the fermentation was prolonged, and a larger amount of fibre was obtained from the straw.

The Chairman inquired whether it was possible to grow good seed and fibre at the same time; and whether the specimen Mr. Wilson received was specially cultivated, or grown in the ordinary way?

Mr. Wilson could not answer the latter question. The seed was quite matured, and of very excellent quality, and at the same time the straw was fitted for fibre.

Mr. Horne said he had grown flax experimentally in India. The usual way of growing it was to sow the seed in a wide line, round fields of wheat. It was not in great favour with the natives, who regarded it as a "ne'er do weel," which might bring them in something or nothing. As far as his own experience went, he never saw flax grown in India for the fibre. The popular idea amongst the natives was that fibre and seed could not be grown together. His experience was, that the shorter the stalks were, the more seed-heads they threw out, and the finer and fatter the seed was. One reason why flax grew so badly in India was, he believed, because it was sown on the edges of the fields, where it got injured, and had to spring up again and make fresh shoots, and it did not get the same amount of irrigation as the rest of the crop. He had grown flax both for seed and fibre. With good seed and manure, he believed flax could be readily grown in the north-west provinces of India; whether it would be profitable as a commercial speculation was another matter. At one period he had the superintendence of a very large gaol in the north-west, where there were as many as 3,000 prisoners, and the difficulty was to find employment for them. One means adopted was to employ them in preparing aloe fibre, which could be done by the youngest and most ignorant of the prisoners, and was really hard labour when they were kept to it. The leaves having been cut off the plant as close as possible to the stem, were then beaten with billets of wood, and spread out to dry, and that was about the whole process. A little maceration would have been better. Of late he understood Dr. Tyler, who succeeded him in the charge of the gaol, had manufactured carpets suitable for the floors of billiard-rooms, &c., and he was informed that they possessed the valuable property of immunity from the attack of white ants. He believed the aloe fibre was not adopted for ropes, on account of its being very brittle. At the Agra Exhibition, Dr. Tyler showed some aloe fibre, between five and six feet in length, and it was beautifully clean and white. One other fibre he would mention, which was commonly called the Medar fibre. It was easy to cultivate. There was some difficulty in extracting the fibre, but when obtained it was of a most beautiful quality. The pith of the plant, converted into charcoal, was used in the manufacture of the finest quality of gunpowder, but this fibre he thought would never be of economical value. He had seen very good hemp grown in India, but the crop was soon exhausted. The natives made a rough description of rope with it, which they used for tethering cattle.

Mr. Cornelius Thorne said, with regard to China-grass, great difficulty would be experienced in obtaining it in this country in large quantity, so long as the price continued so low as £70 per ton, inasmuch as the natives used very large quantities of it, which they themselves purchased at 9 taels for green and 13 taels per pecul for white; the latter price being the last quotation from China for the best white. There were 16 peculs 18 catties to the ton, and the last rate of exchange was 6s. per tael. Now, if the grass was purchased and shipped shortly after it was collected, the average loss and weight would be from 8 to 10 per cent.; if purchased after lying some months in the warehouse, the loss was only from 3 to 5 per cent. As generally packed in China, one ton weight of this fibre would occupy the space of 2½ tons of measurement, so that freight formed a very important item.

Mr. Turnbull, calling attention to a sample of hemp on the table, remarked that it had been referred to as being exclusively a hill production. He saw the same article in Lower Bengal, and took an interest in it, but he found there was but little of it grown by the natives. As to jute, which now occupied a large share of public attention, his experience was that jute was not found in the delta of the Ganges, but was grown largely on the banks of the Brahmapootra. He was astonished that no reference had been made to the bark and leaves of the date, the cocoa-nut tree, and the plantain. He heard years ago of paper being made from the plantain, but nothing had been said about it that night. All the palms were, he said, more or less fibrous.

Mr. Hyde Clarke said he apprehended on the present evening they began to get some of the benefits of those conferences, because they were not only receiving Indian experiences as to the production of the raw materials, but the experience of gentlemen engaged in the practical application of those materials. He thought some comfort might be derived from the endeavours which were made to introduce new materials into our manufactures. With regard to jute and the fibre of the aloe, jute was at one time quite as much neglected as any of the other fibres of which they had heard; but, by means of machinery, it had now become a great manufacture. It was, in fact, only when they understood the details that they were able to overcome the difficulties. With regard to flax, there was a suggestion made as to the difficulty of growing the seed and the fibre together. Certainly, as Mr. Wilson had said, that difficulty was not experienced in the great flax-growing country of Belgium; but there might be some practical reason for what they would be disposed to consider the prejudices of the people of India. He was particularly inclined to think so, from the observations that had been made as to the way in which flax was grown in India. In the introduction of American cotton into Turkey, it was found that, if the plant were left to itself, it ran up so high and fast that it went to seed, and did not produce good fibre; but it was necessary to pinch off the tops of the plants, and then they got good cotton. It so happened that a plant which grew successfully in its ordinary shape in some countries, required to be adapted to the soil and habitat of the country into which it was introduced. He hoped, besides the benefit they derived individually from these conferences, they would have some effect upon the govern-

ment of India, for it was only by the co-operation of the government—and he did not speak of it merely in a corporate capacity, but in the persons of its intelligent officers—it was only by the co-operation of the government in the fullest sense, that they would be able effectually to advance improvements like those they were now considering. They were not stepping beyond the bounds of political economy in asking for that co-operation. They had heard how it could be given from what Mr. Horne had told them. There certainly was a necessity for a better organisation for the development of agriculture than that which now existed in India, so that the exertions of the officers of the government, and of the community generally, might be rightly directed. In the next place, a part which ought to fall to the government, and which had been undertaken by the government at different times, was that of experiment. If they considered the benefits that had resulted to India from the tea-gardens, there was sufficient encouragement to the government to continue in that course. The expense was very small in the first instance, and the profit to the government was generally very great in the end. They knew, from successful instances of the application of this co-operation, it was desirable that more should be given; and an undoubted means of doing good was by holding exhibitions of arts and manufactures in a country like India. He thought they were entitled to ask for hearty co-operation in this respect.

The Chairman inquired whether any gentleman connected with commerce would be good enough to give them information with regard to the course of trade in hemp and the other important fibres, from which they would be able to judge of the probability of an increased demand for them; and whether the increased supply of wheat from Russia was caused by a decreased area of hemp production?

Mr. Horne, in reference to what had just fallen from Mr. Hyde Clarke, said there was already a well-organised agency in India which the government could assist, viz., the horticultural societies which existed in Calcutta, Bombay, and Madras. The officers at the head of these institutions were all able men, who had the good of the country at heart, and there was every guarantee that any funds appropriated to them would be well expended.

Mr. Cornelius Thorne said there was one other fibre which was likely to be largely exported, which had not been mentioned, that was the *Phormium tenax*, or New Zealand flax. There was difficulty, in the first instance, in extracting the fibre, but that had been got over by machinery, and it was likely to be imported in large quantities. It was an exceedingly strong fibre, and was said to be worth £40 per ton.

Mr. Wilson said, a short time ago, he sent some of that fibre to the Secretary of the Society. It required to be steeped in a weak solution of caustic acid, to get rid of the gum, of which there was a large amount. A more beautiful fibre, soft and silky, he had never seen. At the present time there was great scarcity of flax at Dundee, and the spinners would be glad to get a supply from other sources. They were in the habit of drawing their largest supply from Russia, and this year the production was very small. Jute and flax were the great staples of Dundee. Very little hemp was used.

Mr. Botly remarked he had seen advanced agriculturists in England grow flax, but the reason for the limited cultivation of that plant was its great exhaustion of the soil, and that took place to the largest extent when the plants were seeded. If not grown to seed the soil was not so much impoverished.

The Chairman, in closing the discussion, said he could add little to the information they had received from the several gentlemen who had spoken. His own impression with regard to the rheea fibre, which had been so much discussed, was not very encouraging to that article as a great commercial staple to be exported from India to this country. The yield of fibre was very small, and the manufacture of it expensive; and those who took the most sanguine view of it were inclined to think that the Chinese fibre would beat it. Nevertheless it was desirable that the question should be kept in mind, and one failure ought not to discourage further attempts to utilise that remarkably beautiful fibre. Dr. Campbell alluded to a fibre of a nearly similar character which ran to waste in the Himalayas, where they knew there was a great quantity of waste land fitted for the growth of these coarser fibres, which might, perhaps, be produced with more profitable results than had hitherto attended the cultivation of the rheea. He could add his testimony to what had been stated, as to the great abundance of the pine-apple at Singapore and other islands under the equator, and it might turn out that the fibre was more valuable than the pine-apples themselves. He would not attempt to discuss the merits of the special fibres referred to. With respect to flax, its prospects in India, like those of the rheea, appeared to be somewhat discouraging. They had been told that the experiments in Bengal were not successful. He thought this was to be borne in mind, that flax was a competitor against cotton. In this country they knew that cotton had, to a considerable extent, driven back the flax manufacture, because sheetings and shirtings, formerly made of linen, were now made of cotton. The American war, which enhanced the price of cotton, gave a stimulus to the efforts of the merchants, who sought for flax in all parts of the world. The cessation of the American war caused a relaxation in that demand, but they knew the price of cotton was still very high, and it seemed probable that it would remain permanently so, and, in that respect, we had a greater stimulus to promote the production of flax in India and other countries, to a far greater extent than had hitherto been done. Therefore he was not yet without hope that it might turn out that we might produce flax in India. He believed Mr. Wray would tell them, what he was ashamed not to know himself, that in Central India there was a superior variety of this plant grown, viz., the white linseed. He did not know whether that was fitted for fibre, but, if it were so, there were vast tracts of waste land in the central provinces which could be appropriated to the development of that cultivation. In point of fact a great deal might already be claimed for the central provinces for which the credit was given to Bombay. One gentleman had told them that what was claimed for Bombay and Madras came in reality from Jubbulpore, the eastern portion of the central provinces, so that they might hope the production of flax would be in the future largely increased. They had not heard much with regard to the course of Russian hemp, and on that subject he would ask gentlemen to bear in mind the fact stated to-night, that the plant which produced the Russian hemp had grown largely in some parts of India, and was used for fibre in those parts; and, therefore, it was well to bear in mind, in case there was necessity for seeking further for that fibre known as Russian hemp, that there were in India the means of supplying a considerable quantity of that fibre. His own impression was, that the tone of the discussion that had taken place confirmed the idea with which he started, viz., that in looking for new fibres, it was desirable in no way to neglect the old ones. No doubt jute was a new discovery, but it was an indigenous plant, largely used by the natives. He thought the most promising plants were those in respect to the fibres of which the natives had already discovered the use. Mr. Clarke had made some observations regarding the action of the government in this most important matter—that they should encourage exhibitions of native manufactures and products, and that they should have an efficient department by which the agricultural industry of the country might be fostered and encouraged. With regard to exhibitions, he thought no one would say they had been wanting in India. They had been held without number in every province, and had been made prominent features in the

eyes of the natives and Europeans who had been brought together to see them. The central provinces had been foremost in that respect. With regard to the suggestion for the appointment of a special department in the interests of agriculture, it had his most hearty concurrence. He admitted the truth of what Mr. Horne had said, that there were, all over the country, a vast number of horticultural societies, small and great, which were doing very good work in every corner of India, but he had for years felt that a great deal of the zeal and energy of the members was thrown away for want of funds and centralisation. He had seen the same experiments repeated in hundreds of gardens, and the same thing done over and over again; it was a kind of treadmill, always in the same direction, and, therefore, he believed a department of agriculture in India would be productive of great good. In this respect he thought we might take France as an example. In this country there was a vast number of people who preferred to act for themselves. In France, and with Europeans in India, it was not so. They looked more to the government, and he thought it most desirable to urge the appointment by the government of a special department of agriculture in India, by which the efforts of officials and amateurs should be guided and assisted.

Mr. Leonard Wray, in reply, said Mr. Turnbull had justly stated that mention was made by him of the different variety of palms yielding fibres, such as the plantain and the banana, but their name was legion, and it would occupy them a month to go over the whole ground. The subject of plantains had been discussed over and over again. They knew that, on an average, the plantain yielded 3 lbs. of fibre per tree, and so many trees per acre were annually cut down, and they knew pretty nearly what quantity of fibre an acre of trees would yield. They also knew that the tree yielded an astringent juice, which was used in black dye, and that it also gave a fruit; and nobody ever thought anything of the matter afterwards. It was incidentally mentioned by a gentleman that a new description of fibre, that of the New Zealand flax, was likely to come into favour. In discussing that subject with a gentleman lately returned from New Zealand, it was said that was a country celebrated for its gums; almost every tree produced a gum of some sort, and even the soil of the country was impregnated with gum. That was the case with the plant alluded to, and the amount of gum it contained had hitherto been an obstacle to its treatment. The same gentleman suggested that there were parts of India where that plant would thrive well; and he (Mr. Wray) believed it would grow there as well as in its native habitat, especially in the Straits, and no doubt it could be cultivated there with great profit. With regard to jute, he remembered, in 1843-44, Mr. George Hodgkinson, of Calcutta, made some great efforts. It was a well-known plant, but its treatment and appreciation in this country were somewhat new, as were also the purposes to which it could be applied. It was true that until lately it had not received the attention that it deserved, but it was brought largely into notice 25 years ago. Then, again, with regard to hemp, they went over the ground again. Dr. Royle laid it down that stronger hemp was produced in India than in any other part of the world, and his experiments went to prove that, while Russian hemp broke at a strain of 160, Indian hemp was equal to a strain of 400, without breaking; and next to that in strength was the rheea grass. He would not allude to the comparative strength of the New Zealand flax. Looking to the fact that India produced the strongest hemp, and that it grew in a portion of the country which abounded with cheap labour, the surprise was that the cultivation of that plant had not been more attended to. The last subject to which he would refer was flax. He purposely abstained from entering upon that, because the time did not admit of his doing so, and he was glad it did not, because it gave him the opportunity of hearing the opinions of others. There could be no doubt as to the exceedingly exhaustive character of that plant. In all the old leases it was specified that flax should not be grown more than once in seven years, and the same restriction was imposed in some leases at present. If they grew the plant for both seed and fibre, it would not fail to be very exhaustive to the soil, therefore the cultivation of flax almost resolved itself into a question of manure. If the land was not well manured, they took off a very exhaustive crop. There was no doubt as to the fact that it paid better, in many districts, to grow flax both for seed and fibre than for fibre alone, but they must remember that these things were affected by the position in which the plant was grown. To take the case of India, the circumstances of cultivation must differ very much, owing to the vastness of the country. Take the season in which it was grown. He had seen hundreds and thousands of acres of flax grown in India, but it was in the cold season, and that was the driest season of any, and that circumstance affected the production very much. But there were other parts of India where they had more rain. Among them was the valley of the Nerbudda, and there was found, as an indigenous plant, the finest flax in the world, viz., the white linseed. The seed was far larger, rounder, and more plump than ordinary linseed. It did not contain so large a proportion of oil, but it contained more farina. A singular circumstance occurred in Calcutta when experiments were made there with this seed; after the oil was expressed, the cake was so good that the natives ate it. It was an exceedingly strong and good food. He had tried some of that seed in other parts of India, but it did not grow well; but in the Nerbudda valley it flourished greatly, though it was an unhealthy place to live in. They had the fact before them that, though they had a flax indigenous to India, he had never seen it cultivated out of the valley of the Nerbudda, where it was grown for the seed alone, although some flax had been made by the civil servants. Specimens of the stalks from which the seed had been taken were sent to the Horticultural Society.

Major-General Clarke writes:—It may interest the Committee to hear that, in 1855-56, the Punjab Government, then administered by Sir John (now Lord) Lawrence, sanctioned an advance to the district officer of Googranwala (myself) of 1,500 rupees, for the purpose of experimenting on the growth of flax. The plan I pursued was to offer to the cultivators of forty villages, having different characters of soil, the average profit they would expect on two acres of wheat if they would undertake to sow linseed, cut and deliver the same to the native revenue collector's office. The result was, that of the produce two tons were dispatched to England, of which nineteen bales, sold in Belfast, realised £63 6s. 4d., at prices varying from £35 to £45 per ton, and those sold at Dundee fetched £28 15s. 10d.; total £92 2s. 2d., at £45 per ton. My own opinion was, that the district in which these experiments were conducted was not by any means the one in which the natives would be likely to take up such cultivation, although the experiment was not unsatisfactory, even as to profitable results. I am of opinion that there are several tracts, chiefly alluvial, to the east of Ungurabad, in the Punjab, in which flax may be grown profitably; and, indeed, in parts of the Sealkote district the flax is grown for fibre as much as for seed. I know no other district in which this is the case. The twine is called "toolee." I think it was in 1857 that, in a brief visit to Dundee, one of the gentlemen—a partner, I believe—told me that the twine I showed him, which I had in my pocket, and which was a bit of string that I had bought in the bazaar and brought home, was worth 4½d. per lb. I believe that the government Punjab experiments led to the establishment of flax works, conducted by Belfast men, and I have heard that many difficulties beset the enterprise. I can only say as to this, that wherever an article requiring mechanical skill in its preparation grows indigenously in India, it may be profitably dealt with by European supervision. As to how far the cultivation of flax may be extended

I cannot state anything definite, but I think that there are several other fibre-yielding plants which will be much more grown than they have hitherto been. I suggest whether some of the vast, arid, sandy tracts in the Punjab might not be experimented on as to their fitness for growing "atscha" or esparto (the Spanish grass) for making paper. I believe that *Lloyd's Weekly News* is made from this fibre, of which the stock in Spain has declined, but of which Algeria yields a good supply."

The following is the correspondence alluded to by Dr. Archibald Campbell, regarding the pooah fibre of Nipal and Sikim (*Bhœmeria nivea*) and the oodal (*Sterculia villosa*):—

Extract from Letter from Dr. Campbell to the Agricultural Society of Calcutta.

I have the pleasure to bring a new sort of hemp to the notice of the Society, on behalf of Sergeant Crutcher, who is a professional worker in leather, and uses it in his craft. The sergeant considers it equal to Russian hemp for shoe and saddlery work, and purposes, if a demand should be made for it, to prepare and supply it to the Calcutta market. I shall shortly describe the plant, the method of preparing the hemp, with some other particulars, and will request of you to be so kind as to have it submitted to a comparative trial with the "sunn" and European hemps, and favour me with the result; also adding, if possible, the price it would fetch per maund in the Calcutta market.

Description of the Plant.—The plant from which the hemp is made is called "pooah" by the Parbuttias, "kienki" by the Lepchas, and "yenki" by the Limboos. It is like a nettle, and is one, probably, although I cannot determine the question. I have, however, the pleasure to submit herewith the leaves, seeds just formed, and a portion of the stem of the plant, from which the genus if not the species may be determined. It grows to the height of six to eight feet, and varies in the thickness of the stem from the size of a quill to that of the thumb. The leaf is serrated, of a dark-green colour above, silvery-white below, not hairy or stinging, and has a reddish pedicle of about three inches long. The seed forms in small currant-like clusters along the top of the plant and on alternate sides, about an inch apart; two small leaves spring from the stem at the centre of and above each cluster of seed.

Habitat.—The pooah is not cultivated, but grows wild and abundantly in the valleys throughout the mountains of Eastern Nipal and Sikim, at the foot of the hills skirting the Terai, to the elevation of 1,000 or 1,200 feet, and within the mountains up to 3,000 feet. It flourishes best in the hills at the same elevation at which the cotton is grown, but it does not, so far as I can learn, grow on the flat Terai, or open plain along the mountains. It is considered a hill plant, and not suited to the plains, or found in them. It does not grow in the forest, but is chiefly found in open clear places, and, in some situations, overruns the abandoned fields of the hill people, within the elevations which suit it. It is, I believe, a perennial, but of this I cannot speak positively, as I have not till now known the plant. It sheds its leaves in the winter, throws them out in April and May, and flowers and seeds in August and September, the exact period altering of necessity with the elevation.

When used.—It is cut down for use when the seed is formed. This is the case with the common flax in Europe. At this time the bark is most easily removed, and the produce is best. After the seed is ripe, it is not fit for use—at least it is deteriorated.

How prepared.—As soon as the plant is cut, the bark or skin is removed. This is very easily done. It is then dried in the sun for a few days. When quite dry, it is boiled with wood ashes for four or five hours; when cold, it is beaten with a mallet on a flat stone, until it becomes rather pulpy, and all the woody portion of the bark has disappeared; then it is well washed in pure spring-water and spread out to dry. After exposure for a day or two to the bright sun, it is ready for use. When the finest description of hemp is wanted, the stuff, after being boiled and beaten, is daubed over with wet clay, and spread out to dry. When thoroughly dry, the clay is rubbed and beaten out, when the hemp is ready for spinning into thread, which is done with the common distaff.

Uses.—The pooah is principally used for fishing-nets, for which it is admirably adapted, on account of its great strength of fibre, and its extraordinary power of long resisting the effects of water. It is also used for making game-bags, twine, and ropes. It is considered well adapted for making cloth, but is not much used in this way. I have the pleasure to forward the following specimens in elucidation of this note. 1. Leaves of the plant. 2. Seed clusters. 3. Portions of the stem. 4. The dried bark. 5. The prepared hemp. 6. Thread.

I am, &c., A. Campbell.

Darjeeling, September 24th, 1847.

P.S.—The gigantic stinging nettle of the Nipal and Sikim hills is made into hemp, and used in making the cloth called "bangra";* the preparation is the same as the pooah. The bangra is harder and stiffer than the pooah, and not adapted to making cordage and nets.

In compliance with your request, I have forwarded to your address a packet of the pooah hemp, which will, I hope, enable you to have the experiment instituted as to its comparative merits. I have also sent you a parcel of the dried bark of the pooah, with which you may desire to try some other mode of preparation than that in use here.

Enclosed is a note from Serjeant Crutcher, on the expense of preparing the hemp, which shows that the process, in his hands, has been very expensive. He tells me, however, that he thinks it may be prepared for about 4 rupees per maund, if done on a large scale; this, of course, is still conjectural. The point to be first ascertained is the quality of the article. On this I hope again to learn the opinion of the Society.

A. Campbell.

Darjeeling, October 30th, 1847.

Sir,—I beg to enclose an account of the expense incurred by me in manufacturing a small quantity of the pooah for the Society. I send, per bearer, the pooah manufactured, also a seer in the rough state, for them to try experiments on. The expense is, including the seer not manufactured, Rs. 4. 6. 6.

C. M. Crutcher, Sergeant.

October 29th, 1847.

	Rs.	ans.	pie.
Expense of manufacturing the pooah, 4½ seers only, cleaned from the stalk, cost 11 annas per seer	3	1	6
Expense of boiling the above, 2 men for two days, at 2 ans. 6 pie. each per diem; also finishing the process	0	10	0
Total	3	11	6

Quantity manufactured from the above is two seers, at a cost, as above detailed, of Rs. 1. 13. 9. per seer; the waste in manufacture is exactly five-ninths.

The reason this experiment is costly is this, the pooah was brought in by a coolie engaged on purpose, and not cultivated by myself; also the process should be conducted on a large scale, as the same expense, incurred as above, would be sufficient for a maund.

Extract of a Letter from Major Jenkins, dated Gowhatti, 24th November, 1847, on the Oodal (Sterculia villosa), a species of Nettle.

The oodal rope I sent you, not long ago, was a present from Capt. E. F. Smith, commanding at Sudiya.

* See "Notes on the agriculture of Nipal," vol. iv., p. 173, "Transactions of the Agricultural Society of Calcutta," by Dr. A. Campbell.

He thought it possible serviceable ropes might be made from this substance if better prepared. You may be aware it is the common rope used by all the elephant hunters when in the jungles. The tree is very common, and the rope is made most readily. The bark, or rather all the layers, can be stripped off from the bottom to the top of the tree with the greatest facility, and fine pliable ropes may be made from the inner layers of bark, whilst the outer yields coarse ropes. The rope is very strong, and very lasting, wet doing it very little injury.

Report on the above-mentioned Fibre and Rope, by Capt. A. Thompson.

An unexpected pressure of affairs has prevented me till now sending you the specimens of oodal rope and pooah hemp you sent me to experiment upon. I have now the pleasure of handing you the manufactured specimens, as also returning the communications of Dr. Campbell and Major Jenkins on the subject, together with some remarks on their value, and the uses to which I think them adapted.

First, the oodal. When well made, this rope is equal in strength to our best coir. But, in its present state, from having been made green, I suppose it is too stiff and inflexible for marine purposes. It resisted every attempt to separate the fibre or to dress it by hackling, and could only be useful, I think, for rafting timbers, bale lashings, stage ropes, and such like purposes, for which jute is now used, and the value of which is from 2½ to 3 rupees per maund. You will see by the specimen that has been re-manufactured, that the same rope when laid by machinery is three-quarters of an inch less in circumference than that sent by Major Jenkins; consequently, a rope of three inches made by machinery is equal to one of four inches made by hand. I would further observe that, could the fibre be brought here in such a state of flexibility as to allow of its being dressed by the hackle and properly spun, the value would be very much enhanced, and, I have no doubt, it could be made into good rope for ship use. The line made of the bark of the oodal, you will observe, is much more flexible, and better adapted for ship use, but not so strong. It is very elastic, having stretched 16 inches in six feet. It sustained 1½ cwt. for two hours before it broke. Of the pooah I have to report more favourably. The substance resembles cotton-wool more than hemp, and is consequently better adapted, in my opinion, for sail-cloth, twine, and thread, than for rope. I send a specimen of the cloth made of it, as also a piece of line. The pooah, when properly dressed, is, I think, quite equal to the best European flax, and will produce better sail-cloth than any other substance I have seen in India. I observe, from Dr. Campbell's communication on this fibre, that mud is used in the preparation, which clogs it too much, and not only renders it difficult to dress and spin, but spoils the colour, as is evident by the sample of cloth made of it.

My superintendent, Mr. William Rownee, who understands the nature of these substances, tells me that, if potash were used in the preparation (which is invariably done with Russian hemp and flax), instead of clay or mud, the colour would be improved, the substance rendered easy to dress, and not liable to so much waste in manufacturing. The value of the pooah fibre here may be estimated from the following data:—To make one yard of sail-cloth, it requires 1lb. 2oz. of fibre; and the expense of dressing, spinning, and weaving it (with the rude apparatus now used by the natives), is 2 annas 6 pie, and I estimate the value of the cloth, when made, at six to seven annas per yard; or, it might be easier understood thus:—

	Rs.
A maund of clean pooah will give 72 yards....	25
Less expense of manufacturing, say	10
Leaving as the value of the fibres.....	15

There are other incidental expenses that are not included here, but as near as I can at present estimate, I should say it is worth twelve rupees per maund. I would only further observe that, if properly prepared and dressed, I think the pooah capable of being converted into fibres much finer than either sail cloth or sewing twine.

Deputation to the Home Secretary on the Cab Question.

On Monday, the 3rd instant, at one o'clock, a deputation from the Society of Arts waited upon the Right Hon. Henry Austin Bruce, M.P., Secretary of State for the Home Department, in reference to the Cab Question. The deputation consisted of the following:—Lord Henry G. Lennox, M.P., Chairman of the Council; Lord de L'Isle and Dudley; Lord George G. Lennox, M.P.; Viscount Barrington, M.P.; Sir Daniel Cooper, Bart.; Sir Rainald Knightley, Bart., M.P.; Messrs. P. McLagan, M.P., Hyde Clarke, Wm. Wells, M.P., Henry Cole, C.B., Christopher Sykes, M.P., Seymour Teulon (Vice-Chairman of the Council), Roger Eykyn, M.P., the Hon. Wilbraham Egerton, M.P., with P. Le Neve Foster (Secretary), and Charles Critchett (Assistant-Secretary).

Lord Henry G. Lennox, M.P. (Chairman of the Council), said the attention of the Council had been specially drawn to the defective state of our cab system in London, on the occasion of the great International Exhibition of 1862, which, as the right hon. gentleman was doubtless aware, was set on foot by the Society. The Council felt a peculiar degree of responsibility in this matter, inasmuch as they had been mainly instrumental in bringing about these exhibitions, which brought so many thousands of foreigners to London, and placed them ready victims to the disgraceful cab system of this metropolis. Early in 1867, at one of the ordinary meetings of the Society (the late Sir Richard Mayne in the chair) the subject was fully discussed, and, at a subsequent meeting of the Council, the following resolution was passed:—"That a deputation from the Council, with members of the House of Commons who are interested, wait upon the Home Secretary, to urge upon him the necessity of bringing in a Bill to amend the Act for the regulation of Hackney Carriages in the Metropolis, with a view of introducing sounder principles of political economy, and more definite police regulations than are in force under the present law; also that the same deputation wait upon the Chancellor of the Exchequer, to urge that better principles of taxation be applied to hackney carriages and locomotion in general than are in force at the present time." The Chancellor of the Exchequer having, in his recent budget, proposed to remedy the grievance referred to in the last clause of the resolution, the Council felt that it was a fitting time to press upon the government the importance of attending also to the other department of the subject, being decidedly of opinion that, unless something were done in that direction, the proposed remission of taxes would benefit only the cab-proprietors, and not in any way the public. In this opinion they were borne out by the Commissioners of Inland Revenue, who said in their report that they did not consider that an improvement in the quality of the vehicles and horses would follow as a necessary consequence of the removal of the tax. The main point, however, which he wished to press upon the government was this, that the principles upon which the cab system in London was based were utterly unsound, and diametrically opposed to the first

truths of political economy. Indeed, it seemed almost the only instance in which the consumer dictated to the producer the price at which he should be supplied. The present rate of fares was found so low that last year it was raised, under certain circumstances, from 6d. to 1s., that is to say that, when the cab was hired from a stand, no fare less than 1s. was lawful. But even now the cab-proprietor was hardly used, for it appeared, from certain returns, that while there were about 6,000 cabs plying in London, there was only standing-room for 2,400, so that less than half could reckon upon their right to the shilling fare under all circumstances. At this moment the fact was, that a capitalist who wished to invest in cabs, thinking that, if he were to follow the example of foreign nations and start a better description of carriage, he would be supported by the public, was debarred from doing so by his inability to charge a higher fare for the superior accommodation. Upon this point the Commissioners of Inland Revenue said:—"There can be no doubt that this trade is, at present, in a condition almost peculiar to itself; that capital is repelled from embarking in it, and that the number of needy men who own a single cab, and drive it themselves, is increasing every year, while that of the large proprietors is decreasing."

The Home Secretary remarked that, if this arose from an inadequate return for the capital invested, it must be in some measure affected by the reduction of taxation.

Lord Henry G. Lennox said, doubtless it would be, more or less, but the general opinion was, that unless there was some alteration in the regulations the public would derive no benefit. The Council of the Society of Arts did not venture to suggest any specific plan in detail, but would propose, for the consideration of the right hon. gentleman, whether it might not be advisable to allow the cab-proprietor, on taking out his license, to state that he proposed to charge so much a mile, say 6d., 8d., or 1s., according to the quality of the article supplied, and that the fare would be prominently displayed, so that the public could not be deceived, and that the cabman should be compelled to do that which he rarely did now, deliver a ticket to each passenger. There were constant complaints of the difficulty or impossibility of getting really good cab accommodation, which many would be willing to pay well for. The fact was so well known that proof was unnecessary, but the Commissioners of Inland Revenue said—"It must be admitted that our four-wheeled cabs are a disgrace to the metropolis of a great empire," and Mr. Fitzroy, who was Under Secretary for the Home Department when the last Cab Bill was passed, said that, "in no country of Europe were the cabs so bad, and that the horses had been graphically described by a great novelist as only kept upon their legs by the wretched vehicles to which they were fastened." Moreover, abroad there were small open carriages known as "Victorias," which he had ascertained while in Paris were a most lucrative investment to the proprietors, but in London, the climate being very variable, it was evident that if such vehicles were introduced, such a price must be fixed for the use of them as would prove remunerative, for they could only be driven for a portion of the year. The next point for consideration was, what remedy could be applied to the existing state of things, and they naturally first looked to what had been done in other cities. It was stated by Mr. Frederick Hill, that nobody could pass through Manchester without being struck with the excellence of the cab system there. Both hansoms and four-wheelers were much superior to those in London, in consequence of there being a higher rate of fare.

The Home Secretary asked if the free-trade system existed at Manchester, or whether it was a fixed fare, but higher than in London.

Mr. Cole said the system was, that each proprietor might apply for a license, and state at what fare he proposed to run; practically it had resulted in a uniform 9d. fare.

The Home Secretary asked if this system had led to the establishment of more than one class of public vehicle in Manchester.

The Hon. Wilbraham Egerton, M.P., said he had never seen but one description of cab there which was much superior to the London vehicle.

The Home Secretary remarked that if only one price prevailed, it would seem to show that there was no objection to fixing the fare, provided the proper fare were fixed.

Mr. Seymour Teulon said that, on the other hand, if the owner fixed his own price, there was no excuse for grumbling.

Sir Daniel Cooper, Bart., said that in London there were many private broughams which could be hired at 2s. 6d. an hour, besides paying the driver, but they had always to be sent for; if these were allowed to run as public vehicles at a higher fare, they might stand at convenient places, where they could be got at more readily.

Lord Henry G. Lennox said with regard to the cab system in foreign countries, there were very good carriages at Munich, Brussels, and Dresden, but at Vienna they were especially superior. There were three classes there, the first being a *coupé*, or four-wheeled carriage, which was equal to many private carriages, and was much used even by the aristocracy of Vienna, the fares being by no means ruinous. It was to Paris, however, that he wished to call particular attention, and he begged to lay before his right hon. friend specimens of four classes of cab tickets in use there. He would not enter into minute details, which could easily be settled by the Commissioners of Police, if the Government should think right to take any action in the matter. He was confident that, if this matter were left to the guidance of principles more in accordance with those of free trade, the wishes of the public and the interest of the cab proprietors would be much better consulted than at present.

The Home Secretary said he presumed that in Paris the cab proprietor stated to which category his vehicle belonged, the fare for each being fixed by the authorities.

Lord Henry G. Lennox, in conclusion, said that the Council of the Society of Arts were quite content to leave all questions of detail to the Minister and his advisers, but what they particularly desired to press upon the attention of government was, that London required different classes of cabs, and particularly a better class of cab for those who were willing to pay for it.

The Home Secretary, in reply, said—I think the great object of the deputation is to get rid of the disgrace, which is truly said to exist, of having the worst description of cabs of any capital in Europe, to improve them, and also, not only to raise the general standard of cab accommodation, but to have some diversity of accommodation. All I can say is, that the subject is now under the consideration of the government. We hope to be able soon to bring forward a bill upon this subject, which, I trust, may pass this session. And by the important assistance rendered by the Chancellor of the Exchequer in his budget, if it should be approved, I do not despair of being able from this year to date a very marked improvement in these vehicles. I am not prepared at this moment to say more than that. I am extremely obliged to the deputation for having brought these facts before me, and I assure you that they will have my best consideration.

Lord Henry G. Lennox then thanked the right hon. Gentleman, on the part of the Council, and the deputation withdrew.

Cantor Lectures.

The fourth and concluding lecture of the course "On Applied Mechanics," was delivered on Monday evening last, the 3rd instant, by John Anderson, Esq., C.E., Superintendent of Machinery to the War Department, the subject

being "Applied Mechanics in relation to Natural Power."

This course of lectures will be published in the *Journal* during the vacation.

Twenty-first Ordinary Meeting.

Wednesday, 5th May, 1869; George Campbell, Esq., in the chair.

The following candidates were proposed for election as members of the Society:—

Anderson, T. H. W., 6, Stanley-crescent, Kensington-park-gardens, W.
Bartleet, George A., 1, East India-avenue, Leadenhall-street, E.C.
Bowring, Samuel, 1, Westbourne-park, W.
Cliffe, Thomas, 49, Cathcart-road, West Brompton, S.W.
Cooper, Henry, jun., Livermead-cottage, Torquay.
Cory, Richard, Commercial-road, Lambeth, S.E.
Cotton, Rev. Arthur B., Parsonage, Bow-common, E.
Cotton, Henry, Q.C., 10, Sussex-square, Hyde-park, W.
Stubbs, Thomas, Coombe-lodge, Lavender-hill, Wandsworth, S.W.

The following candidates were balloted for, and duly elected members of the Society:—

Addison, Colonel, 23, Argyll-street, W.
Ansten, Frederick G., 32, Alpha-road, N.W.
Bayley, Charles John, C.B., 51, Victoria-road, Kensington, W.
Blaikley, Alexander, 6, Courtland-ter., Kensington, W.
Bodmer, Louis Rudolph, 2, Lansdowne-road, Notting-hill, W.
Braid, Charles, 13, Westbourne-park-road, W.
Brandon, Thomas Cooke, 22, The Grove, Boltons, S.W.
Burstow, Charles, Saville-house, Lorrimore-square, S.E.
Bycott, Thomas, 7, Gloucester-place, Portman-square, W.
Calvo, Nicholas Antonio, 8, Devonport-street, Hyde-park, W.
De Marcoartu, Arturo, Langham-hotel, W.
Earnshaw, Edwin, 17, Fenchurch-street, E.C.
Gregson, Matthew, Liverpool.
Lock, Frederick, Epsom.
Pitcairn, Robert, 2, Old-square, W.C.
Thomson, E. H., 12, Buckingham-street, Strand, W.C.
Watt, Robert, Ashley-avenue, Belfast.
Wimshurst, Henry William, 22, Great St. Helen's, E.C.

The Paper read was—

ON THE FORMATION OF INDUSTRIAL SETTLEMENTS IN OUR COLONIES.

By Col. Francis C. Maude, C.B.

It will, doubtless, have occurred to many of my hearers that the title of this paper is, in one sense, but a synonym for emigration; hence the greater portion of my labour in preparing it has been devoted to the advocacy of emigration. And I hope and trust that I shall enlist the sympathies of some of those present in such a movement, on the ground of the benefit which may be expected to result from it to every class, and hence to every individual in this country.

In the first place, I suppose that every one will allow that independent emigration, which we all know has been going on steadily, to the extent of hundreds of thousands annually, from these realms, has, in so far as it has secured for us our colonies, on the whole, benefited the United Kingdom.

In the discussion upon the subject the other night in the House of Lords, Lord Overstone made use of, as some of us think, the fallacious argument that, because the glory of a prince is in the multitude of his people, and because our labourers are the source of our wealth, therefore we should not encourage or assist them to emigrate. It appears to me, and those who think with me, that the mistake his lordship made was, in not considering our colonies to be, as they are, or ought to be, "part and parcel of our empire." I hope to show that we should strain every nerve to keep this glorious Anglo-Saxon race (the envy and admiration of the world) upon the lands with which Providence has blessed us. There are many ways in which we can do much to bind and strengthen the ties of the colonies to the mother country; by kindly assistance to them when in sore need and distress; by courteous reception of those able men who come to us from them, laden with the wealth and intelligence which they have acquired in those lands; by friendly tariffs—and I believe there there is much brotherly love in this as regards nations; by careful legislation, and in many other ways; but I believe by no better means than an organised system of emigration.

Well do the Americans know the value of this stream, which we allow to flow to them unchecked; for I believe it is capable of clear proof, that for many years the cream of our labour market, the most self-reliant and courageous of our citizens, have been going to America.

Let us see what emigration has done for the United States of America, even since the war with the South, only two and a-half years. The Special Commissioner of the Revenue of the United States, Mr. David S. Wells, reports to his Senate, dating Treasury Department, Washington, January, 1869:—"*Immigration.*—From the 1st July, 1865, to the 1st of December, 1868, about 1,000,000 natives of foreign countries have sought a permanent home in the United States. Investigations made some years ago—since when the character of the emigration has greatly improved—showed that these immigrants bring with them specie, or its equivalent, to the average amount of 80 dollars per head; whilst their average value to the country as producers cannot be estimated at less than half the average value of an ordinary labourer in the south prior to the war, viz., 1,000 dollars. Immigration, thus, since the termination of the war, may be regarded as having added 80,000,000 dollars directly, and 500,000,000 indirectly, to the wealth and resources of the country." Now, these figures appear to me to be very much under the mark; possibly they are intentionally so. For instance, what Mr Wells euphemistically calls "the value of a labourer in the South," in other words, the price of a slave, should not be more than double the value of a freeman, or I am much mistaken. But, taking them at their lowest, they are sufficiently astounding. And it seems to me that, inasmuch as by far the majority of these immigrants were natives of these islands, the gain of America has been our positive loss. Lord Overstone is at least bound to support me in this position.

It may be asked why these men go to America. I believe there are many reasons for it, among which the principal are, the nearness of America to us, and the assistance rendered by the Irish Americans to their relatives at home; and I take the opportunity of saying that my affectionate and kind-hearted, though impulsive, countrymen are alone in this respect, not only in America, but in our other colonies. Englishmen and Scotchmen in the colonies scarcely ever—but Irishmen almost always—send home money to bring out their relations. But I believe the main attraction in America is the liberal land laws of the United States. By the "homestead law," as it is called, free grants of the richest land are given to anyone who will fence or cultivate a small per-centage in five years. This, of itself, when thoroughly known throughout the length and breadth of Europe, is sufficient to attract the cream of the agricultural population. And this brings us to the admirable organisation they have for spreading this information, or, as we may say, "touting" for emigrants. Every United States consul and consular agent is an emigration agent. Most of them are also directly interested in shipping emigrants. Information as to the advantages offered in the United States (I believe not

over-coloured) is largely distributed and judiciously circulated. In periods of distress, like the present and during the cotton famine, an especial system of "touting" is used. Agents call personally upon the best mill-hands and labourers, and public meetings are sometimes held in quiet districts, under the presidency of the innocent rector or leading magistrate, who is thus unconsciously used as a gratuitous advertising medium. But if a direct question is asked of a United States' official, he professes the utmost indifference to the subject. All this I have heard on undoubted authority, and, after the statistics I have just read to you, it is easily credible.

As regards our action, it is precisely the reverse. It is true that of late, owing to the enlightened policy of some of our colonial governments, offers, sufficiently liberal as far as they go, are being made to our surplus population in the matter of land, and I believe that we may daily expect to see a laudable emulation in this respect increase among them. But I hope to show that they ought to stretch a point, and go a great deal farther than they do, and that we ought to meet them more than half-way in the matter, and between us make a golden bridge over the Atlantic and Pacific Oceans, and thus indissolubly cement the existing bonds of union between us and our colonies, which loyalty, race, sentiment, patriotism, and friendly tariffs will, I fervently hope, ever continue to strengthen. I am aware that the subject of State emigration is beset with many difficulties, but none of them, as I think, are insuperable. Owing to universal suffrage, the influence of the wage-paid classes in some of our colonies has succeeded, to a great extent, in checking emigration from this country. Large sums of money, which ought legitimately to be applied to this purpose, are prevented from being so devoted. Private letters, and, in some instances, the colonial press, have represented the condition of the colony in gloomy colours, in order to discourage intending settlers. But, in spite of all this, there still exists sufficient liberality in the land laws and governments of some of our colonies to provide amply for a much larger number of persons than we are likely to send them, this year at all events.

I am quite prepared to admit that we have done our very best to inspire them with the prejudices which they hold. The principles of free-trade, which we at present profess, are not yet accepted or understood in all their breadth and entirety. I believe there is no description of professional or skilled labour in which there is what may be called free-trade, unless perhaps in the army. The church, the law, physic, the fine arts, the amalgamated carpenters and joiners, are all protected by exclusive regulations. And I believe that the operations of the poor-laws act as a check to emigration. At all events, until we are thorough free-traders at home, we cannot expect that the monopolists of labour in the colonies will surrender what they conceive to be their rights without a struggle.

Gentlemen may laugh at the idea of the army being an open profession, but I must say this, that I have never known an instance of an officer who rose from the ranks (and I have met numbers of such men) being otherwise than courteously treated and kindly received by his brothers-in-arms, and I believe the higher grades of my profession are more open to every class than those in any other trade. However, I also believe that when a noble, a patient, and an educated people are brought to understand the evil effects of a policy of protection, and to perceive how it reacts upon their class more than on any other, and more particularly upon their own children, then I believe this glorious and enlightened nation will throw off the last shackle of monopoly and protection, and place themselves at the head of the great movement of freedom throughout the nations of the earth. As to the operation of our poor-laws, I observe that when the question of State aid to emigration is proposed as a remedy for our distressed citizens, our statesmen for the most part shake their heads, and say that it is not the business of the government to assist emigration; they do not acknowledge the responsibility of the State towards distressed citizens in this manner. But does not the State, through its poor-laws, acknowledge a responsibility towards them? Whether it be right or wrong to do so, politic or impolitic, I will not now ask. But I believe the State says at least this much:—"If you will wait until you have parted with your last penny, and your last article of furniture, and then come to us, we will assist you, but only then, and only in the following manner:—The allowance of food, clothing, and shelter which we will give you shall be the least which experience proves will keep body and soul together. We will break the law of God and of nature, by separating you from your family. We will prevent your seeking for work elsewhere, by confining you in a house where employers are not likely to search for you, and whence you cannot go to seek it yourself. The nature of the work you shall perform shall not be that in which you are proficient, but shall be of the most uninteresting and useless kind. Owing to the small quantity of food we give you, you will not be able to exert your powers to their best advantage. By resorting to us for assistance, you will be lowered in the estimation of your fellow-workmen, and in all probability, as experience tells us, you will return to us again and again, until you become a confirmed and helpless pauper. As for your wife and children"—but I need not go on, these facts are familiar to all, or, at least, to all who take the trouble to learn them. And being so, this being, in fact, the "obligation" which the State acknowledges, do we violate any law of political economy when we propose to offer the use of a comfortable ship, good food, rich land, and, in many cases, good wages, to these very men whose condition is daily becoming more and more desperate and abject?

We are fond of pointing to Paris, and of showing how dearly the French pay for their system of providing work for the people; but if it be true, as I have lately heard, that there are one million of paupers at this moment in England, and, besides these, I am in a position to state that there cannot be less than one million persons who would be glad of permanent employment at reasonable wages, I do not think we have much to boast of. Besides, does any one doubt that, if the French Emperor were possessed of our illimitable colonies with their endless varieties of climate, he would very soon transfer his surplus population to them, and be very glad of the chance? And we ought to consider the cost of our paupers; let us take it at £10 a head per annum. As a matter of economy, it would pay very well to capitalise this tax, and, at two years' purchase, we could deport large numbers in great comfort, and thus save a good deal of money to the ratepayers, even supposing none of the money were ever refunded, but I hope to show how that amount would be more than repaid. But I suppose that some people will say, "Your system, then, is transportation?" My answer might be, "If you are not ashamed to impose the humiliating and unpleasant conditions which you at present force upon an applicant for relief, surely, when you have satisfied yourselves that his lot will be much happier and brighter in the new home which you offer him, all your compunctions should vanish." Besides which, from careful inquiries lately made among the wage-paid class, I know that there are an immense number, and I believe hundreds of thousands, who would be only too happy to be deported in this manner, provided the particulars of their future life were carefully explained to them. There is a great deal of ignorance upon the subject of our colonies, nor is it confined to any class. I own to a share of it myself, and I will mention two instances of it in other gentlemen, which came under my own observation within the last few weeks. Talking to an educated young gentleman about New Zealand, he asked me, in the most polite manner, "I beg your pardon, but where is New Zealand?" And a colonial official, who has lately been appointed to a post in one of our possessions, confessed that, when the

locality was first named to him, he shared my ignorance as to what part of the world it lay in. But when a little trouble is taken to explain the advantages which may fairly be expected, you would not find many of these poor fellows who would refuse a free passage to one or other of our colonies, and there is no reason why the necessary outlay should be lost to the donors or lenders. In some of our colonies there already exists a machinery for collecting it, and experience shows that, in nine cases out of ten, the whole is recovered. It is done by a system of promissory notes, nominally payable on demand, but actually collected by instalments spread over from one to two years. That able statesman, the Colonial Treasurer of New Zealand, the Hon. Wm. Fitzherbert, moved by the distress which he lately witnessed in this country, and at the same time keenly alive to the interests of his own, has left a written pledge with the government agent of that colony in London that he will collect these amounts free of charge, and, further, will undertake to provide employment, for the most part immediate and permanent, at good wages, for 500 such persons, as a preliminary step; and further, that while such employment is being sought for or offered to them, he will provide food and shelter for the emigrants for at least one month after their arrival in the colony; not in the north island, where the Maories are troublesome, but in the middle island, where they are in a complete minority. And I may add, that a fine new ship of 1,200 tons will leave the Thames on the 25th of this month, and has room for about 70 families. The cost of the passage of each statute adult is £15 15s. Poor as I am, if forty-nine other gentlemen will join me and do likewise, I will pay the passage of one such emigrant, and trust to his honesty to repay the sacrifice. This is one scheme of an industrial settlement in one colony. But supposing we do not recover any of the money we lay out in this manner, it will come back to us indirectly, in spite of them, for the last returns from the Board of Trade showed that each inhabitant of that colony takes from us just £10 per head of our manufactures. Think what a stimulus this is to our trade, and compare it with the amount the French consume per head of our exports, just 6s. 1¾d., and the Americans, 17s. 3¼d.

My friend Mr. Thomas Briggs has calculated, and will tell you the amount of benefit which a few dozen emigrant families can confer upon the Lancashire operatives, if they will only go to Queensland, and grow cotton there. And I do not think it possible to over-estimate the importance of securing a constant supply of that royal staple of our industry, and that too from a country where there is but little risk of a hostile tariff cutting us off from it.

Some people are fond of putting forward the offensive doctrine, that a man who is a "pauper," as they call him, has thereby become unfit ever again to exercise the self-reliance and independence, in any other country, necessary to procure him a living, the want of which qualities has brought him to the abject condition in which he now is. Like most sweeping generalities, this is both false and cruel. The condition of the wage-paid class is, in the nature of things, more dependent than that of any other; and, without for a moment depreciating the wisdom of frugality and thrift, I would ask some of those who are in the enjoyment of independent incomes, whether their position would not be almost as desperate, if their income were suddenly withdrawn? And this is constantly happening to large masses of our artisans, in many cases entirely without fault of their own. I have lately, in the company of an eminent philanthropic nobleman, been prosecuting inquiries in the hives and labour-yards of London, and we find that there is a very good proportion of intelligent, healthy, honest, well-conducted, able-bodied persons at present breaking stones or picking oakum, who might be fairly trusted, not only to earn a living in our colonies, but also to repay the amount of their passage-money, and who, when the details are explained to them, are only too thankful and grateful for the opportunity; and the best proof of the truth of this is, that the labour-master would be willing to go out with them.

The most irritating form of "snub" which an advocate of emigration gets is this—"If the colonies want our emigrants so much, why don't they pay for the privilege?" Surely, it is precisely those colonies which are least able to pay for it that are most in want of our population. Besides, it is not the colonists who want the emigrants, it is the glorious teeming earth, which is longing to give forth her increase. All the while, I do not mean to depreciate for one moment the efforts of those who are endeavouring to make the land of England bear three times her present population. All I say is, help people to cultivate our land in any part of the globe. "Waste labour to waste land."

I have not yet defined the particulars of a scheme of national emigration, and this for several reasons. One is, that no scheme of emigration, however complete in itself, is capable of being applied to all classes and all colonies. I know that the representative in London of one of our most important colonies has matured a very comprehensive scheme, which is, no doubt, adapted to the wants of those colonies.

With the assistance of some experienced gentlemen, I have matured one, and am engaged upon another, and I have already described a third, as applicable to the colony of New Zealand. But, before explaining the details of our schemes, I should like to be allowed to suggest what I, and those who think with me, consider should be the main points of any plan for national or State emigration. 1. The re-constitution of the present board of Emigration Commissioners. 2. The spread of information upon the subject throughout the country. 3. The cordial co-operation of the colonies. 4. An extension of the practice, if not of the privileges, of the guardians of the poor, in respect of money grants or loans to intending emigrants. 5. The co-operation of the wealthy, not only by liberal pecuniary assistance, but also by careful scrutiny of the applicants for relief. 6. The co-operation of the classes who would be directly benefited; they should be encouraged to apply for loans of passage-money before they have become absolutely penniless, and thus have lost half their chance of fighting the battle of life on arrival in the colony. And, above all, they should keep faith, and encourage the wealthy to further exertion, by repaying the money advanced to them, whether by government, the parish, or private charity.

The two schemes to which I particularly wish to call your attention to-night are both intended for New Zealand; the first as a military industrial settlement for the north island, where the Maories are and have been, to say the least, troublesome. The other is a co-operative settlement in the south or middle island. Both of these schemes have been sent to the proper authorities in that colony; the former has by this time received their consideration, favourably as I hope.

With your permission, I will read the details of the former, and afterwards reply to the objections which have been or may be urged to it.

In the then critical period of affairs in that colony (January, 1869), and in the state of depression in the labour market at home, it was considered that any well-conceived project for at once protecting the civilization and commerce of the colony, and, at the same time, affording a field for enterprise for a portion of our unemployed population would receive the attention and support of every patriotic Englishman. The information which we collected on this subject from former settlers in the colony, and the knowledge we have of the feelings and wishes of the more intelligent portion of the military and industrial community at home, warrant our belief that the following plan will be found the most ready and economical method of attaining these most desirable results.

The objects sought are the establishment of a small

colony, or, if the plan should work well, of small colonies on the frontiers of such portions of the north island as are most in danger of inroads from hostile natives; such colonies to contain within themselves all the necessary force requisite alike for their own defence, and therefore also for that of existing British settlements in their rear, the force to be under the orders of the local government, and capable of co-operating with other forces in the event of any serious outbreak in their neighbourhood. Such a system of colonisation has always been found to be productive of the most beneficial results.

The proposed conditions of service are those which have already been found to work well, and are as follows:—

1. Men, married or single, the preference being given to the former, to be enlisted for a term of five years. Preference also to be given to those who have healthy sons over 15 years of age.

2. Arrangements to be made with the Colonial Government to apportion grants of land in the following proportions:—

	Acres.
To first-class men	60
,, second-class men	40
,, non-commissioned officers	80
,, staff-sergeants	100
,, officers (according to rank) from	300 to 600

3. First-class men to consist of soldiers of five years' service and upwards, of good character, and in good health, and of artisans and agriculturists with testimonials as to character, and certified to be medically fit to encounter the attendant hardships of their new life. Second-class men to consist of able-bodied youths of from 17 to 21 years of age, the preference being given to those who can produce testimonials as to their respectability.

4. The transport and equipment of the force to be provided by the Imperial Government. Three ships of the size of the *Helvetia* would amply suffice to convey 2,000 men and their families, with the proper complement of officers, to the colony.

5. The pay of the force to be, for the first year, as follows:—

	Per diem. £	s.	d.
Brigadier-Colonel at	1	0	0
Brigade-Major	0	15	0
Lieutenant-Colonels	0	15	0
Captains (including Adjutants, Quartermasters, Paymasters, and Surgeons)	0	10	0
Subalterns	0	7	0
Sergeants (additional)	0	1	0
Staff-sergeants	0	3	0
First-class men	0	0	4
Second-class men	0	0	3

In addition to complete rations for each man and his family. Officers to receive two rations daily; lieutenant-colonels and brigade-major, three; and brigadier-colonel, four. For the second year, rations only to be issued, except for such periods as the men may actually be under arms, when the same pay as for the first year should be issued.

6. Should their military services be required during the three succeeding years, the officers and men should be paid and rationed as above, but otherwise no pay or rations should be continued after the end of the second year.

7. The term of service to be for five years, at the expiration of which time each man will be a freeholder of the land allotted to him, according to the class to which he belongs, provided also that each man shall, within that time, have brought a portion of such land into cultivation, unless any protracted military service, unfavourable seasons, &c., should render it advisable to lengthen the period for such improvement.

8. The same rules to apply to the officers and non-commissioned officers.

9. Facilities to be afforded to each officer, non-commissioned officer, and man, as in other colonies, to enable him to bring his land into cultivation, by an advance of money on the security of the land, and at so much per acre of the grant, to be repaid by easy instalments, extended over a number of years.

10. The appointment of officers for this service should be made from those whose capacity has been shown, either in the regular army or in the local militia, and should be confined to those whose private means and natural inclinations would fit them for the position of leaders in such an enterprise, and at the same time enable them to become active and useful colonists.

11. The non-commissioned officers should all have at least five years' service in the regular army, and one-half of the men should be drawn from the same source, from which it is believed there will be no difficulty in inducing men to volunteer. An opportunity will thus be afforded, by taking a small number of men from each regiment, of reducing the regular army in the simplest and most convenient manner. The remainder to consist in equal proportions of a selection from the artisan and agricultural classes, and of youths of good character and promise, of from 17 to 21 years of age.

The whole to be enlisted as for the regular army for a term of five years.

12. Each corps of 2,000 to be under a brigadier-colonel, and to be divided as follows:—

Three battalions of 666 or 667 men, each under the command of one lieutenant-colonel; each battalion to be sub-divided into six companies of 111 men each, under the command of one captain and one subaltern; one adjutant, one surgeon, and one paymaster and quartermaster (combined appointment) to be attached to each battalion. One brigade major, one chaplain, and one storekeeper to be attached to the entire force. The paymaster and quartermaster to be charged with the entire payment and rationing of his own battalion, under the direction of the storekeeper. Each battalion should further have 24 sergeants (four per company) and four staff-sergeants (these non-commissioned officers being included in the 666 men composing each battalion), and one armourer sergeant and two storekeepers' clerks should be attached to the entire force.

13. The land which would be required for such a settlement would be for—

	Acres.
1,500 first-class men, at 60 acres	90,000
72 Sergeants, with 20 additional	1,440
12 Staff ,, 40 ,,	480
500 second-class men, at 40 acres each	20,000
1 Brigadier-Colonel	600
3 Lieut-Colonels and 1 Brigade-Major at 600	2,400
28 officers, with rank of Captain, at 400	11,200
1 Chaplain, at 400	400
18 Subalterns, at 300	5,400
2 Storekeeper's clerks, at 200	400
1 Armourer-serjeant, at 100	100
Being a total of	132,420

or something more than 200 square miles.

14. The expenses of the undertaking for the first year are estimated as follows:—

	£	s.	d.
Pay for 1,500 first-class men at 4d., and rations at 9d. per day	29,656	5	0
Pay for 500 second-class men and rations	9,125	0	0
Rations for 1,000 families, at 3 full rations per family	41,062	0	0
105 rations for officers	1,437	3	9
Extra pay for 72 non-commissioned officers at 1s. per head	1,314	0	0
Extra pay for 12 Staff-Serjeants, at 3s.	657	0	0
1 Brigadier-Colonel, at 20s.	365	0	0
3 Lieut.-Colonels and 1 Brigade-Major, at 15s.	1,095	0	0
18 Captains, 3 Quartermasters, 3 Sur-			

geons, 3 Adjutants, and 1 Chaplain, at 10s.	5,110	0	0
1 Storekeeper, at 10s.	182	10	0
18 Subalterns, at 7s.	2,299	10	0
1 Armourer-Serjeant, at 2s.	36	10	0
2 Clerks, at 3s.	109	10	0
	92,449	8	9

This, allowing a margin of £20,000 for unforeseen expenses, gives £112,000 as the cost of the colony for the first year, besides transport and equipment.

15. Allowing that there is no active service, the second year's expenses would be about £70,000, or, allowing a wide margin for contingencies, £75,000; and the third and succeeding years *nil*.

16. Supposing it were found desirable to establish as many as three such settlements in the north island, the necessary outlay would be less than £600,000. Comparing this with the results of the late campaign in Abyssinia, and taking into consideration the increased prosperity which would eventually accrue to the mother country from the increased demand for its manufactures (estimated to average £10 per head, which, at the end of two years, would be at least at the rate of £180,000 per annum), we do not think that the amount required will be grudged by an economical government.

17. In any case, it is hoped that the home government would provide the transport and equipment.

I may add that several noblemen and gentlemen possessing the largest experience in colonial matters approve of this scheme, and among them Mr. Fitzherbert, who is, I hope, at this moment, urging it upon the attention of his ministry.

With regard to the other scheme, time will not at present allow me to enter upon the details of it, but I may say that the proposal did not originate from myself, but from the colony; and the manner in which it is proposed to carry out the emigration scheme is by taking out another 2,000 operatives, artisans, clerks, engineers, and labourers, with their families, and settling them upon part of the land which is to be given, in consideration of their making a railway of nearly 200 miles, through a district which is enormously rich in mineral wealth, particularly gold, coal, and copper, the coal being superior to that of the north of England. And it is proposed to make every *employé* a shareholder in the enterprise, thus enlisting his sympathies in the economy of the work. Besides which the cultivable land will be allotted on the "chequer principle," in which the alternate portions of land, which are the property of the shareholders of the company, derive their value principally from the settlement upon the other alternate portions. And thus, as we may say, we make the land itself join in the co-operative principle. I shall be very happy, at a future time, to give further explanation upon this latter subject to anyone who cares to inquire into it. I beg to express an apology for having trespassed so long upon your time.

DISCUSSION.

The Chairman said the subject of the paper was a very important one, and it had been laid before them in a most interesting manner. He thought it was one of the most difficult questions of the day, whether or not this country should assist pecuniarily in emigration as a part of national policy, and he would rather not commit himself to any definite opinion upon it until he had heard the result of the discussion. The latter part of the paper, referring to military colonisation, was similar in its intention to a proposal recently made by Mr. Hyde Clarke with reference to India, which had his hearty concurrence, and he hoped that both with regard to that country and New Zealand, and anywhere else where it seemed desirable, it would meet with the approval of the meeting. At the same time, he would confine such operations to cases in which the interests of the mother country were directly concerned, because in other cases he believed the more advanced colonies, which would receive the benefit, were quite able to look after their own interests.

Mr. Hyde Clarke, being called upon to open the discussion, said he should have preferred that some one better acquainted with the colonies should have preceded him, but he had one or two desultory remarks to offer upon the valuable paper which they had heard. Reference had been made to the fact that on an average each emigrant to the United States took with him about eighty dollars in cash, which rule, however, did not apply to English colonies. The great proportion of emigrants to the United States were Irish, and, although it seemed somewhat of an anomaly, it was the fact that the more backward a country was in civilisation or in industry, the more prone were the inhabitants to hoarding, and this habit was accordingly much more prevalent in Ireland than in England. On the other hand, although many of the emigrants did not take so large an amount of specie to our other colonies, partly on account of the greater expense of the journey, there were many wealthier emigrants who took much larger sums with them, even in some cases affecting the amount of exports from the mother country, and forming quite a disturbing element in the balance of trade. He believed, however, that this was no disadvantage, as it came back in another shape. This observation was quite by the way, but it showed that they must not be too hasty in drawing general conclusions from partial data. With regard to the preference shown for emigration to the United States, not only from this country, but from Germany, one cause, no doubt, was the better organisation for transport to that country. Of course there was a vast difference in the distance from Europe to America, and from Europe to Australia or South Africa, but still it would be found that, relatively, emigration was much cheaper to America than to any portion of what might be called our colonial system. This matter had a considerable influence on the numbers of German emigrants, who would be of great value to any colony, not only from their industrious and frugal habits, but because of their consanguinity and ready amalgamation with the English. In any well-devised system of emigration to the colonies, therefore, such as had been laid before them in the paper, they must not only look for support from Great Britain, but from Europe in general. They must not be so hasty in drawing the inference that English emigrants were less disposed than Irish to assist their relations in coming out to join them; and must recollect that there was a vast deal of difference in sending home the amount of passage-money to the United States and to Australia or New Zealand. He felt great interest in this subject, because he had at one time taken an active part in agitating the question of a poll-tax, for the purpose of repaying the passage-money, which had been taken up in New Zealand to a considerable extent. Such a principle he believed to be thoroughly practical, and, where properly applied, would, in the course of a few years, give a large emigration fund. There was no reason why, if an emigrant were assisted to the extent of £10 or £11, they should not take £2 or £3 more as an insurance or profit on the transaction, which in the course of time would form a permanent emigration fund. He had also taken an active part in the promotion of emigration amongst educated women, and could not but think that such measures would be of great advantage. When they considered the great exertions which were made by educated women, not only in this country, but in India and elsewhere, to provide for themselves and their families, it was evident that they would be most valuable members of society under circumstances where they were relieved from the artificial condition in which they were often placed in England. He regretted that Mr. Chadwick was not present, because he had taken such interest in emigration in connection with the poor-law, and it was, no doubt, much to be re-

gretted that one of the advantages of what was called the new poor law had been allowed to fall into abeyance. That system had, no doubt, many defects, though he did not think it was chargeable with all that was brought against it, but certainly if the provisions originally made for the emigration of paupers had been carried into effect, England would now be in very different circumstances. He could not himself see how it could be doubted that, as a nation, we ought to promote emigration. From the earliest period we had been an emigrating people; we had used great efforts to establish colonies, and the results had certainly tended to encourage us to pursue the same system, particularly with the advantage of the experience which we had attained. It was very unfair to compare the pauperism of England with that of France, for while in England the principle of each man having a right to relief had been acknowledged, it had only been established in France very lately. In that respect France had been one of the most backward countries in Europe, and at this moment it was very difficult to say what was the amount of pauperism there. However impractical the propositions put forward by Colonel Maude might seem to some persons, there was not one which had not been fully proved by experience, either in the United States or elsewhere. He agreed with the Chairman that military colonisation could hardly be pushed too far, but the practical limitations which Colonel Maude had put forward were thoroughly in accordance with experience, and the system ought, in his opinion, to be introduced wherever it was possible. He believed, in conclusion, that if they wished to arrive at a practical result, it was necessary to place the emigration department of the Government on a different footing; it had been treated as a kind of a casual pauper department from the very beginning, never being admitted as a regular part of the administration. It was impossible, of course, to put a cabinet minister everywhere, but, at any rate, the emigration department was of such importance that it ought to be put under competent guidance, with a parliamentary chief, and a permanent staff. Many of the plans which Col. Maude had brought before them were not new; they had been tried and had failed over and over again, but this was because the subject was too large for individuals, or even benevolent societies to deal with. He hoped, however, that the question being now brought forward under better auspices, more favourable results might be obtained.

Mr. Briggs said his experience in this matter began during the cotton famine in Lancashire, when he was interested in sending off many people who were thrown into forced idleness, and in danger of becoming paupers. In 1862 the Queensland Government ordered 1,000 operatives to be sent there at their expense, and Mr. Jordan, the commissioner, authorised him to send out families. He advertised in two papers in Manchester, and the result was such a crowd of applicants that half-a-dozen policemen were required to prevent a riot. Himself and three clerks filled up about 700 forms, which were sent to London, but only about twenty-five of them were considered eligible from their previous occupation, and, consequently, the advertisement had to be repeated with the same results, and thus the number was filled up. When the parties went up to London, however, although it had been intimated that their passage would be entirely free, it was announced that no one could go who had not £2 17s. 6d. to pay for his outfit, and the consequence was that he (Mr. Briggs) had to put his hand into his pocket to the extent of £140 in order to keep faith with those whom he had been in communication with. This showed the impediments placed in the way of emigration to the colonies compared with the United States, for, at the same time, American emigration agents had offices in almost every street, and were sending off people from Liverpool at the rate of 10,000 a week. Some time ago he had noticed in the *Journal of the Society of Arts* a paragraph copied from a Brisbane paper, to the effect that the growing of cotton in Queensland had become a most profitable occupation, as a family of six persons could cultivate and harvest from twenty to thirty acres. Taking the yield at only 20lbs. an acre, that gave a result of 400lbs. of cotton per family. During the American war the number of persons who emigrated to the States was about 613,000, or, at a low estimate, 100,000 families of six each, and if these had all gone to Queensland and cultivated cotton, they would not only have maintained themselves but have made £200 each, reckoning the cotton at only 6d. per pound, which was just half the present price, or £20,000,000. This showed the value of emigration to America, and what it ought to be to our own colonies. The next question to be considered was, why they could not get these independent, thrifty people, who could pay their own passage, to go to the colonies, and, in his opinion, the man who would solve that problem would deserve the thanks of the nation. He knew a young man in Staffordshire who borrowed £10 from his father and went to America; in the course of three months he sent home £300, and asked for his brother to come out to him, and before the end of the year he sent home £1,000 to invest in property in Staffordshire. This showed that fraternal affection was not confined to the Irish. The Emperor of the French was pursuing, he believed, a very wise course in this matter. At the very time when Australia was threatening to send back every ship which brought convicts from England, although at the same time Western Australia, 2,000 miles off, would have been glad of them, France was sending her convicts to New Caledonia, an island not more than 600 miles distant, where they were treated better than honest, independent, thrifty people were in any English colony.

Dr. Mann (of Natal) said he had had some little experience in the question before the meeting, and many years of anxious thought upon it also, and he must say that the result was entirely confirmatory of the view which Col. Maude had laid before them—that the effect of emigration was to benefit both the colonies and the mother country. He had no doubt that both England and the colonies were benefited by sending out people of a right class, but he must say that in order to make emigration as beneficial as possible, and as little injurious—for in every movement they must expect to take a little evil with a great deal of good—they required a very careful and deliberate organisation. The reason why they met with such difficulties with regard to the colonies, and why America took hundreds of thousands where the colonies took only tens, was all comprised in that one thing—organisation. He believed England wanted to send away just those whom the colonies did not want, and the colonies wanted those that England could not spare; and yet these were just the men who went to America. His own experience had been drawn from Natal. At one time it was the practice to give anyone who wished to emigrate there 6,000 acres of land, and the Dutch emigrants actually represented to the Government that this was not enough, and many of them got grants of 2,000 acres more, to enable them to bring up their families. When that system was found not to answer exactly, the colonial government gave any one in the colony who asked for it 3,000 acres of land, and he himself had had that quantity offered him, which he declined, because he did not consider it worth having. The result was, that the land got into the hands of men who continually sold what was given them for £20 or £30, and a great deal of it accumulated in the hands of men who made no use of it, but bought it at a nominal price, intending to hold it until they could dispose of it at an advantage. In consequence of this, through the Imperial interference, they were prevented for some years from giving land to anyone under any circumstances, and then three years ago, after consultation with the Imperial Commissioners, the present system was adopted, under which small grants of land were made to persons who had

capital enough to work it; for instance, a man with £500 would have 200 acres of land, with the opportunity of purchasing more on easy terms, while a man with £100 would get about 50 acres. That answered very well; those who availed themselves of it having been eminently successful, but, on the other hand, they were very few. Indeed, it almost required personal influence to induce people of that class to emigrate; as a general rule, if a man had £100 he would not leave England until he had spent it, and the great thing required was to induce the man with £100 to take it somewhere where he could turn it into thousands before it was wasted. They wanted some means by which to find out men who were in such a position, that money might be advanced to them, with a good prospect of its being returned. The Natal Government had tried this plan, and had not succeeded in getting back more than half the money they advanced, but he was quite convinced that the fault was not so much in the system, as in the mode of administering it. A man and his wife and three children could be transplanted to Natal and sustained for 12 months for £100, and they would be in a genial climate, where at the end of the year they would at least find themselves secure of bread and cheese, and where, if they were steady and industrious, there was a good future before them. They must, however, have the £100 provided to start with, and that must be provided in such a way that they would regard it as a mere business transaction, in which they gave the colony the full value of that which they received, agreeing to pay back, with interest, the money advanced. This could only be done by having a capital, which the colony must possess—a fixed emigration capital, which could be turned over and over again, with sufficient margin allowed in the repayments to make up for a small percentage, which would always be wasted. They must make such an insurance upon the amount lent as would cover the loss, and then it might be lent over and over again *ad infinitum*, and any amount of superior emigrants could be taken to the colonies. With a capital of £100,000, Natal would certainly be able to send out 500 families, and by the time they were firmly planted on the soil the money would be available again for the same purpose. His conviction was that if they took the greatest rubbish from the London streets, and pitchforked them into the colonies, in the majority of cases they would do well in the end, but in the process there would be such an amount of distress and discomfort, that no man with philanthropic feelings would like to engage in such a work. What they wanted was to avoid as much as possible all the evil, and secure all the good possible.

Mr. Walker (British Guiana) said he agreed entirely with the scope of the paper, as far as his experience enabled him to form an opinion, though British Guiana was scarcely in a position at present to enter into any scheme for emigration.

Mr. James Marr said there was an old proverb that there was a silver lining to every cloud, and he could not but think that the paper they had heard, and the subject which it treated, must be regarded in that light in relation to the dark, heavy, dismal cloud which for some time had been overhanging the working classes of this country. He was not a colonist, and knew nothing about those dependencies but what he had heard and read, but, as a Londoner, connected with the building and other trades, he could not but notice that at the present moment there were thousands of hard-working men who were reduced almost to beggary. Day after day he had applications for work (particularly in the neighbourhood of Greenwich, Woolwich, and Deptford, where so many had been discharged almost without notice) from men who were ready to do anything to earn an honest penny. At the same time they read that in the colonies there were thousands of acres of fertile land only waiting the labour of the husbandman to be made productive, and they also read that thousands of sheep were annually boiled down for the sake of their tallow. Some alteration ought to be made in this state of things, especially when they considered the enormous expense to which this country was annually put for the support of paupers and criminals, while, at the same time, the honest labourer out of work could not participate in this fund unless he went to the workhouse and became a pauper, or else committed a crime. The paper which had been read, and the plans suggested in it, were very valuable, but he feared they would take too long to carry into execution. The disease was at our doors, and something ought to be done immediately to reduce it as much as possible. If we could afford to pay enormous sums for the support of pauperism and crime, surely we could give something to do what private benevolence had recently been doing—assist the distressed labourers to emigrate. Perhaps an influential body like the Society of Arts might be able to induce the Government to take the matter in hand, and see if they could not devise some plan for helping our distressed workmen. One day they heard that thousands had been turned out of employment, and in the next few days that they were most anxious to emigrate—that the subject had been brought before the Government, who were not disposed to bring in any measure to assist emigration, yet in the coolest possible manner they spent £800,000 in finding a building site in the Strand for the New Law Courts, which now they did not want. £100,000 would go a long way in assisting emigration. He hoped every effort would be used to induce Government to take the matter up, and he was quite sure that no foolish ideas about being "transported" would prevent Englishmen from seizing any opportunity offered them of bettering their condition by leaving their native country when it could no longer support them.

Sir George Grey (late Governor-General of New Zealand) said he came there simply as a listener, hardly knowing what the precise purport of Colonel Maude's paper was to be, but when he found that such valuable suggestions were given, he was unwilling to appear disinclined to aid the objects in view. After having lived for many years in the colonies, he was really unable to understand many of the arguments which were urged in England against emigration. Some persons were continually lamenting the increase of population, and recommended that restraints of some kind should be placed upon marriage, in order that the increase of the human race might if possible be prevented as a great calamity. On the other hand, he found that men had for many thousand years been endeavouring to fill the world, and yet had inhabited but a very small part of it, the most fertile portions remaining to this day almost or quite destitute of inhabitants. At the same time he found that the human race had had explorers in every country, who had given them a knowledge of the world, such as had never before been possessed, and the means of transport and of communication had enormously increased, and the wisdom of mankind with regard to the management of their own affairs had also greatly augmented. Yet there seemed an increasing unwillingness to turn this wisdom to advantage in providing for the poor, and to use the means of transport which they possessed, and to avail themselves of the geographical knowledge which had been given them. It was manifest, however, that every addition to the settlements of man upon the globe had added enormously to all the comforts of life. Looking back only to the time of Elizabeth, they found that since then sugar, coffee, tea, silk, and almost every article which contributed to comfort and health, had been introduced into England through the occupation of foreign countries. It really seemed marvellous that men should hesitate to avail themselves of the advantages which God had so liberally bestowed upon them. The amount of poverty which existed in England was appalling, though it was not perhaps so apparent to those who lived always in the midst of it, as to those who had spent many years in the colonies. Mr. Torrens, an acute observer, and one

who had devoted a great deal of attention to the subject, declared that in his opinion the position of the poor in England was worse than that of the barbarous races with which he was acquainted, and really his own experience was to the same effect. In no country in the world was one so struck with the mixture of wealth and poverty. He was particularly struck with this one night in the dead of winter, when passing by Buckingham-palace, he saw three or four wretched looking little girls, not more than ten years of age, cowering down against the wall, their heads wrapped in little cotton shawls and buried in their knees, having to sleep the whole of the night, in that cold weather, against the wall of the richest palace in the world. Such a thing would be impossible in any colony; some one would have taken them in and given them shelter. Whilst this was the state of our population it did seem terrible that no great statesman should arise and do something to get these people transported to other parts of the earth. The appellation of paupers, which was given to those who were unfortunate, was also a great drawback to men in a colony. Many deserving men, such as those recently discharged from the dockyards and arsenals, had saved money, which they had invested in furniture; having lost their employment they gradually pawned the whole of their furniture, and then had to receive public relief, after which they were stamped with the name of paupers, which rendered them odious when they arrived in a colony, and even attached a stigma to their children which was not easily got rid of. He was hardly prepared to say that England should be at the expense of emigration, but his own opinion was that some such plan as that suggested by Dr. Mann would be of the greatest advantage both to England and to the colonies. England would be enabled to relieve herself of what he saw, with great pain the other day, described in the *Times* as "human refuse;" a sad term to use, in a country where Christianity had prevailed for so many years, when speaking of people who, in many cases, were not responsible for their own misfortunes. He believed, however, that even "human refuse," if planted in the colonies under proper supervision, such as Colonel Maude had alluded to, would become most valuable citizens. He, therefore, should always raise his voice in favour of emigration, when conducted on proper principles, as a thing which would benefit not only England, but the whole human race.

Mr. Briggs said the remarks of Sir George Grey had reminded him of a fact which he had forgotten to mention before, that to his own knowledge emigrants who had been rejected by the Commissioners as unsuitable for Queensland, had gone there assisted by a Co-operative Society, and in their second year of settling were able to export £200 worth of produce to this country.

Captain Henderson having remarked that he was not able to say much on the theoretical part of the question, said he would give the practical results of his experience in New Zealand, from whence he had only lately come. He believed the principal reasons why emigrants of a superior class did not go to the colonies more, was because they were not informed of the true state of affairs there. Publications and free lectures might do much to remedy this, but his own experience was that comparatively few had any idea of the happy position in which they would find themselves in New Zealand, where he was an employer of labour. He could not speak quite so favourably of Queensland. In the former country, men who had had no practical experience of the duties they had to perform found themselves, soon after their arrival, in receipt of from £30 to £50 a-year, with a good house to live in, and rations, and, not unfrequently, a horse to ride. That was what he was paying at the present time, and to a married couple £70. He knew a man who had gone out as an assisted emigrant, who was now worth £20,000, and who had brought out his father, mother, brothers, and sisters, the latter all being married and doing well. Those who went out without any money, or but very little, soon found the means of getting on, earning a little money first, and then purchasing a small quantity of land, which was £1 an acre in Otago and Nelson; in Canterbury, with many superior advantages, it was £2, and in Auckland 10s., but it was often to be purchased for less than these prices. In the Australian colonies also, although he could not speak quite so favourably of them, he knew men who had got on wonderfully. The prospects were not so good in Queensland, where there had been a severe drought last year; where the climate was not so pleasant; where at present there was a great competition in the labour-market, arising from the importation—some said the kidnapping—of a great number of South Sea Islanders. In New South Wales the climate was better; and he knew a man there, originally an assisted emigrant, who was now worth £2,000 a-year from his sheep stations. When he (Capt. Henderson) visited him, he told him that the best shepherd he had was a London pickpocket, whilst several others were ticket-of-leave men, who had been thieves and burglars. He would conclude with an anecdote of a servant girl of his own at Dunedin, in New Zealand. Servants would never engage for longer than a week's notice, as they were always expecting to get married, and one fine day the girl, who was about seventeen, came and gave him notice that she was going to leave at the end of the week. On asking the reason, she said that her two brothers, who had come out a year or two before her, and had been employed as shepherds, had now got a comfortable home of their own up the country, and wanted her to come and keep house for them. Accordingly, the next Sunday, up rode two fine fellows, each on a good horse, leading another with a side-saddle, on which the damsel mounted and was soon out of sight.

Mr. Campin suggested that in order to the thorough and efficient working of any general scheme of emigration, the whole colonial system would require remodelling, possibly in the direction of having a council of representatives from the various colonies gathered together, and acting in concert with the Colonial Office.

The Chairman said he must repeat what he had said at the beginning, that on emigration, regarded from a national point of view, he must reserve his opinion. He fully admitted that there were great advantages in emigration to individuals who had a call that way, as was evidenced by the facts stated by Captain Henderson and others; but looking at it nationally, and excluding the very difficult and complicated question with regard to Ireland, he still doubted whether, as a matter of national policy, it would be wise for England to put her hand in her pocket and exert her energies in order to send away from her shores the most able and energetic of her working men. The colonies wanted to take the best of our workmen and to reject the bad, which was hardly satisfactory; and we must not be too precipitate in supposing that because temporary and local causes produced a temporary and local lack of employment, therefore the country was over populated. Sir George Grey had alluded to those who wished to put restraints upon marriage, but he was not aware that the Legislature had taken any step in that direction, or contemplated doing so. He was inclined to believe that eventually we should have to promote emigration, and no one could be more sensible of the appalling contrast in this country between the rich and the poor, to which Sir George Grey had so forcibly alluded. On the other hand he was not prepared to admit that every other remedy had yet been tried; he was radical enough to think that there might still be some reforms in our social and fiscal system, under which the poorer classes, or a large number of them, might not find it necessary or desirable to emigrate. Colonel Maude had said that by promoting emigration we should bring about an indissoluble connection

between ourselves and the colonies, but from that conclusion he must take leave respectfully to differ. On the contrary, he was one of those who thought that, in the natural progress of events, the colonies would become self-dependent and independent. This had already happened in the case of America, and would probably not be very far distant in Canada. Australia would probable require another generation or two, but each colony had the most complete self-government possible, and as they increased in strength and importance, he did not think it probable they would retain their connection with the mother country. This being so, the question of emigration must be considered, first with reference to ourselves, and next with reference to the colonies. As regarded ourselves, if it were necessary, which he did not admit, to promote the emigration of able-bodied workmen, it would be as advantageous for them to go to America as to the colonies, because under free trade principles trade went on as freely with America as with the colonies. As to the colonies, they expressed a most decided disinclination to receive what was called pauper labour. True able-bodied men temporarily thrown out of work ought not to be termed paupers, but there were a large number who, from various permanent causes, could not earn their livelihood, and they could not expect the colonies to take charge of them. In his opinion, therefore, direct pecuniary, or other assistance, to emigration ought to be confined to what might be called special cases. The experience of Captain Henderson would tend to show that there was a kind of middle-class pauper, between the able-bodied workman out of employment and the regular confirmed pauper, who in favourable circumstances would become useful members of society, and to that class aid might be judiciously given. He concurred heartily in what Dr. Mann had said as to the land question, as he thoroughly disapproved of the principle of giving large tracts to jobbers, the true system being that described, of giving small portions to men who would settle down and cultivate it. If Dr. Mann meant, however, that the advance of the £100 should come from England, he did not agree with him, as he thought it ought to be provided by the colony, which would get the benefit of the settler's presence. The whole power of disposing of the land lay with the colonies themselves, and they ought to find means to bring customers for it. Notwithstanding that Cape Town had proved an expensive and unprofitable colony, it was his opinion that Africa would be the great field for future colonization, particularly by educated and persevering men. They now knew that in the interior of that vast continent there were large tracts of land lying so high as to possess a temperate climate, and well fitted for the cultivation of tea, coffee, and other products, which would well repay the capitalist. There was an almost indefinite field there; and if the frontiers were occupied by such military colonies as Colonel Maude proposed, there would be an abundant protection for ordinary emigrants in the interior, who would thus be protected from any predatory violence on the part of the natives. In conclusion, he proposed a most cordial vote of thanks to Colonel Maude for his valuable paper.

Dr. Mann remarked that the Chairman had not understood him. Natal was already freely giving £5,000 a-year to promote emigration; but this was not sufficient to develop its resources rapidly. They thoroughly recognised the principle, however, which the Chairman had laid down.

The vote of thanks having been unanimously passed,

Col. Maude replied very briefly to the remarks which had been made, remarking that every one seemed to agree with him, with the exception of the Chairman. He was not at all sure that that gentleman's views could be borne out by facts. The system proposed by Dr. Mann was very similar to that which he had had the honour of suggesting, namely, a system of loans, only Dr. Mann proposed that the colonies should find the capital, whilst he was of opinion that the mother country should meet them, if possible, half-way. The Chairman objected to the emigration of the pick of their working classes, and so did he, and he came there for the purpose of doing what he could to prevent their deserting England for America; and he appealed to the meeting whether it was not the fact that a protective system was in force in the States for the purpose of excluding, if possible, English manufactures. If thorough free trade were established there would not be such strong objection to English citizens settling there; but he hoped that, at all events, some would agree with him that there would still remain a political reason. He did not believe American institutions and English would ever harmonise; they were republican to the backbone, whereas he trusted that Englishmen were thoroughly loyal and monarchical. The Chairman said he would limit emigration to the special case of industrious citizens out of employment; he accepted that proposition, and would venture to assert, that at the present moment there were a million such persons in England who would be glad to avail themselves of a system of assisted emigration.

COPYRIGHT IN WORKS OF FINE ART.

The second reading of the Bill, prepared under the sanction of the Council of the Society of Arts, "for Consolidating and Amending the Law of Copyright in Works of Fine Art," was moved in the House of Lords, on Friday last, the 30th April, by Lord Westbury.

Lord Westbury said—Before I explain to your Lordships the provisions of this bill, and the necessity for introducing it, I desire to say a word upon the origin of the bill itself, which, I fear, has been the subject of some misapprehension. Your Lordships will remember my introduction of the bill in 1861 which became law in 1862, and which, for the first time, gave protection to pictures, drawings, and photographs, being a large class of works of fine art. The Act contained many provisions against frauds which, up to that time, had been commonly practised. Unfortunately these provisions have been ineffectual to repress the multiform varieties of fraud, and accordingly, in the year 1866, a large body of artists and publishers of works of art presented a memorial to the Council of the Society of Arts, praying that a comprehensive measure might be prepared for the consideration of Parliament. A bill was accordingly prepared, which was submitted to me in the last year, and, with some alterations, was laid by me on the table of this House during the session of 1868. Your Lordships gave a first reading to it, and the bill was extensively circulated with the view of eliciting criticism and suggestions. The measure has received general approval, and a petition in its favour has been intrusted to me for presentation, signed by 30 Royal Academicians, 22 associates, and 120 other artists and persons interested in the subject. The necessity for this bill arises from the confused and defective state of the existing law, the imperfect protection it affords to the authors of works of fine art, and from conventions having been entered into by Her Majesty, under the International Copyright Act, with most of the Continental Powers, engaging to give to artists in those countries a protection corresponding to that which British artists enjoy therein, and thereby incurring a moral obligation which, in the present state of the law, cannot be discharged. My Lords, you will agree with me that there is no better criterion of the progress of a nation in civilisation and intellectual culture than the respect and protection afforded by its laws to works of literature and art—works which are the noblest possible addition to the wealth of a country, but which greatly depend on the legislative encouragement given to men of genius; such works, moreover, as possessing in the highest degree the attributes of property, ought surely to enjoy the protection extended

to other species of property. But I am sorry to say that, if laws are taken as a proof, these creations of the mind are more valued and respected in other countries than in England; for whereas, in this country, works of art of a particular class enjoy protection for 28 years, and others are protected for the author's life and seven years afterwards, that protection extends in France to 50, in Germany to 30, in Belgium to 20, and in Spain to 25 years in excess of the author's life, while in Italy it lasts 40 years, with a contingent benefit for 40 years longer. No attempt was made in England to give, or rather create, copyright until 1714, in works of literature, nor as regarded works of art until 1735. In 1714, literary copyright for 14 years was established; this was afterwards extended to 28 years; and, in 1842, thanks to Mr. Justice Talfourd, and a noble earl present (Stanhope), to 42 years, or to seven years after the author's life, whichever happens to be the longer period. In 1735, copyright for fifteen years was given to engravings, but the Act, which is commonly known as Hogarth's Act (the passing of it being entirely due to his exertions), was unfortunately so worded as to protect only engravings in which there was an original design. This was probably attributable to Hogarth being in the habit of composing as he engraved. This restriction was afterwards removed, and the term was extended to twenty-eight years, but no attempt was made to give protection to sculpture till 1798. Sculpture and engravings were commonly supposed to stand on the same footing, but the former enjoyed a copyright for only fourteen years, with a further term of fourteen years contingent on the artist's life. The benefit of these statutes was not extended to Ireland until the year 1836. In 1862, protection was given to paintings, pictures, and photographs for the author's life, and a period of seven years afterwards. The difference between English and Continental law was by no means creditable to us, and, although the conventions professed to be based on the principle of reciprocity, we only gave a French painter protection for his life and seven years afterwards, whereas France offered the British artist protection for fifty years after his death. The Engraving Acts, moreover, extended only to the United Kingdom, so that piratical copies might be imported with impunity from abroad, or even from the Channel Islands. By the convention with France, Her Majesty engaged that laws should, if possible, be passed, conferring on French artists advantages corresponding to those which France conferred on British artists, and one of the articles promises the seizure and destruction of piratical works—a stipulation which our existing laws do not permit to be carried into effect. The honour of the country requires the removal of these anomalies. The nine or ten existing statutes contain many conflicting provisions, and my object, therefore, is to consolidate, amend, and extend the present law. Dealing with a subject full of difficulty, and which the common law does not touch, I do not pretend that my bill is perfect, and I am quite willing to have it referred to a select committee, that it may be thoroughly sifted, and its language carefully weighed. After giving some requisite definitions, the bill proposes that authors of original works of fine art hereafter made or sold shall have a copyright for the term of their natural lives and for 30 years subsequently. This period is not so long as that existing in France, but it is the duration assigned in Germany, and rather longer than the Belgian term. Then there are provisions as to the transfer of copyright, and forms are given for facilitating transfers. If a work of fine art is executed under a commission, as soon as the purchase-money is paid, the work and the copyright become the absolute property of the person giving the commission; if the work is sold by the author, the copyright is the property of the purchaser, unless the copyright, or some portion thereof be reserved by a memorandum in writing to the author, who may reserve the right of engraving the work, or the right of photographing it, or the right to repeat or make replicas of it, or the right to the design. But, in all cases, the transfer and the reservation must be in writing, and no contract shall authorise the author to make any repetition of the work unless such should have been expressly reserved. The bill also allows an artist to retain his property in unfinished sketches and studies made for and previously to the execution of his registered work, without prejudice to his copyright, and it provides that sketches, studies, and unfinished works to the value of £15 shall not be subject to seizure in the event of the artist's bankruptcy, or of his suffering distraint for debt. The 5th clause confirms a decision which has been deemed of questionable authority, exempting engravings published as part of a book from the provisions of the Engravings Acts. Of engravings published separately, a proof must be deposited at the British Museum. The sixth clause defines how copyright may be assigned, the schedule containing some short forms of instruments for that purpose; and the seventh provides that, in any contract disposing of a copyright, it shall be implied that the work was the original design of the author, and that the copyright has not previously been infringed or prejudiced. The eighth section lays down that no action shall be maintainable by the proprietor of a copyright until after registration, the registered proprietor under any licence being nevertheless able to sue or be sued in his own name in any matter arising out of such contract, and the omission to register not otherwise affecting the copyright or licence. Next come the penalties, which, except one or two additions, are taken from the Act of 1862, and then follow provisions directed against the common fraud of affixing names, initials, or monograms purporting to be those of persons who did not really execute the work, as also against the disposal of works of art under false representations. There is also a provision against a very ingenious mode of fraud which is sometimes resorted to—that of altering any work of art, and then offering it for sale as an unaltered work of the author. Of this an amusing instance is given in the evidence of an eminent artist, Mr. Charles Landseer. He had painted an historical picture, in which were introduced the figures of two large dogs. These dogs were retouched by his brother, Sir Edwin, and, of course, greatly improved. The picture was sold to a dealer, who cut out the figures of the dogs, supplying their place by copies made by an inferior artist, and the piece of canvas, with the dogs so cut out, was transferred to another piece of canvas, on which a suitable background had been painted for the purpose, and the picture thus manufactured was sold as a new and original work of Sir Edwin Landseer. It is hardly possible to guard against the infinite varieties of fraud. The next provision of the bill is directed at the fraudulent practice of publishing an engraving with a stipulation that the number of copies shall be limited, and then printing a much larger number; and the following provisions prohibit the sale of impressions from a plate retouched or wrought afresh, as proof impressions or copies. The 11th clause prohibits the importation of piratical copies of copyright works, and the 12th extends to works of art the protection already given at the Custom-house to works of literature. I can see no reason why a provision which has been so beneficial in the one case should not be applied to the other. Inferior artists abroad are systematically employed in making copies of valuable works for the English market, and, to check this, the 13th clause applies to the importers of these pirated copies the machinery of the Mercantile Marks Act, obliging them to reveal the names of the persons from whom they were obtained. The succeeding clauses empower justices to grant search warrants for piratical copies, and also empower the seizure of piratical copies in the possession of hawkers. The necessity for these provisions has been shown by the recent statement of an eminent London publisher that, by the aid of a powerful glass, he saw, from an adjoining building, persons employed in making copies of his most valuable engrav-

ings, which were afterwards hawked about at a few shillings per copy. Then there are provisions as to registration, and as to legal proceedings instituted under the act, with the view of giving a cheap and easy remedy. The bill is by no means one-sided, for it not only gives protection to artists, but to the public against artists. A practice has prevailed among some artists of selling a picture to a purchaser, and afterwards making a replica four or five times over of the same picture, each succeeding purchaser not being aware that it had been already the subject of sale. This will be checked by the third clause, and various frauds to which the public have been subjected will be repressed, while dealings between artists and purchasers will be facilitated, and proper protection will be given to the authors of original works. Copyright is given, after registration, throughout the British dominions, to all works of art, which as to pictures, drawings, and photographs, is already given by the Act of 1862, and which, by one of the articles of the foreign convention, is to be given to all foreign works of art after registration in this country. I believe that the bill, after consideration by a select committee, will succeed in gathering up the loose and uncertain enactments already in existence, and in combining them into one harmonious measure.—The noble and learned lord concluded by moving the second reading.

Earl Stanhope was glad the subject had been taken up by the noble and learned lord, whose legal eminence and taste for it peculiarly fitted him for the task. An assimilation of fine art to literary copyright would be a great improvement, and it was gratifying to learn that the bill had received support and encouragement from artists generally. The propriety, however, of referring it to a Select Committee was apparent, from the fact that the noble and learned lord had found it expedient to withdraw the first bill on the subject which he had introduced early in the present session. While agreeing that we should reciprocate the advantages given to British artists on the Continent, it was open to question whether we should offer great advantages to artists living in countries which gave us nothing in return. International copyright was more important in the case of works of art than of books, for differences of language limited the appreciation of literary productions, whereas works of art encountered no such impediments. While, therefore, he should rejoice in the extension of copyright to American artists, he doubted the fairness of such an extension in the absence of reciprocity. Their lordships would remember that Mr. Motley, who had lately been appointed United States' Ambassador to this country, had derived great advantage from obtaining copyright for his works in England, and he could not refrain from mentioning the high honour in which that gentleman was held by literary men in England, and their sincere desire that he would display a fairness and justice in diplomatic negotiations equal to his great ability as an historian. He would suggest that, both as regards literary and fine art copyright, power should be reserved to her Majesty in Council to grant privileges of copyright to natives of any country which was willing to concede similar privileges in return. The noble and learned lord had defined an author to be "he who has designed, or made any original work of design;" but, where the merit of an engraving of a celebrated work was very great, and a large sum had been expended on it, it was not fair that it should be reproduced by photographs. There might be no copyright in the original picture, but protection should be given to a valuable engraving of it in the same way as if it were an original design. [Lord Westbury thought the Bill as it stood would provide for such a case.] It did not seem to him that this was clearly provided for. He anticipated great benefit from a comprehensive Act on this subject, which was especially opportune now that the spread of photography threatened a decline in the best class of engravings, and from the noble and learned lord's readiness to accept any amendments, he felt confident that the bill would be brought to a satisfactory issue.

The Earl of Kimberley also thanked his noble and learned friend for taking up so difficult and complicated a subject, concurring with him in the propriety of referring the bill to a select committee. He could scarcely take so decided a view of the rights of property in works of fine art as his noble and learned friend had done, for, whereas the property of an ordinary article rested in the possessor for the time being, the peculiar privilege of preventing the possessors of works of art from making the use of them which they otherwise might be disposed to do was not so much an inherent right attaching to property as a special right created for the purpose of encouraging such productions. Within certain limits, it was desirable that encouragement should be given to works of literature and art, and it was also desirable that the present law should be consolidated and amended; but the House, while securing to really fine productions their due pecuniary encouragement, should beware of passing indiscriminate enactments, such as would confer rights on undeserving works, and lead to much litigation and embarrassment. Great difficulty attached to definitions. The noble and learned lord, for example, had defined sculpture in these terms:—"Every original work, either in the round, in relief, or intaglio, made in any material, and by any process." Such a definition would include a variety of designs, which would more properly come under the Designs Act, giving a protection of four or five years. In the case of painting and drawing, the bill proposed to give a protection for the life of the author and thirty years after; but, as by an Act brought in by the noble and learned lord, photographs were put on the same footing as paintings and drawings, he thought it was worthy of consideration whether it was desirable to give so long a protection to photographs. There never was a time when better prices were given for works of art in this country, and he doubted whether any considerable extension of the period during which copyright was now enjoyed was essentially necessary. By the bill copyright was extended to the whole of the dominions of the Queen, and he wished to point out that, in respect to a great many of the colonies, there really existed no power on the part of this country to enforce such a bill as the present. The bill, therefore, would remain a dead-letter as far as many of the colonies were concerned. The bill seemed to be conceived in the interest of engravers to a great extent, rather than in the interest of authors or of the public. By a previous Act of Parliament, it was provided that whenever no precise stipulation was made between the author and the buyer of a work of art, then the copyright should exist in the work. He preferred such a provision to the enactment in the present bill, which declared that in every case there should be a copyright in works of fine art. It was not for the public interest that these copyrights should be created, and he thought it better to leave the law as it stood. There were details in the bill of a severe nature, introduced from an anxiety to protect the works to which it related, and there was one extraordinary clause in the bill, to the effect that in all cases where any person should sell a work of fine art, there should be a distinctly implied contract on the part of the person selling that it was an original work. Considering how difficult it was to decide what were and what were not original works, he thought such a clause would operate harshly on sellers. He believed that the bill required careful consideration, and he trusted that it would be referred to a select committee.

The bill was then read a second time.

The select committee on the bill was appointed on Monday, the 3rd inst., as follows:—The Lord Privy Seal, Earl Stanhope, the Earl of Carnarvon, Earl Somers, Viscount Hardinge, the Bishop of Oxford, Lord Portman, Lord Overstone, Lord Lyveden, Lord Westbury, Lord Houghton, and Lord Romilly, and the

names of the Duke of St. Alban's, Viscount Stratford De Redcliffe, and Lord De L'Isle and Dudley, have been subsequently added.

THE NEW LAW COURTS.

In the House of Commons, on Monday evening last,

Mr. Pemberton asked the First Commissioner of Works whether the particular attention of the Lord Chancellor had been called to the new site for the law courts selected by the government, and whether his lordship approved the selection.

Mr. Layard observed that the bill relating to this matter was a Government Bill, and the hon. member would, perhaps, excuse him from answering an inquiry as to the opinion of an individual member of the government in such a case.

Lord Henry Lennox asked whether the right hon. gentleman would insure that members were supplied with plans before the bill came on for discussion, and whether he would place a model of the new building in the library for the information of members.

Mr. Layard said he hoped to have lithographic plans in the hands of members, perhaps before Whitsuntide; they were now being prepared by Mr. Street. As a model entailed an elevation it would be a longer affair, but nothing would be settled until the House and the public had full opportunity of criticising the whole plan.

Correspondence.

Smoky Chimnies.—Sir, — In the discussion which followed, on the 28th of April, the paper "On the duties of an Architect," the subject of smoky chimnies was mooted by several of the speakers. I felt I had neglected a duty in not stating a case in point, which is briefly this:—A friend of mine (Mr. J. Reeves, of Downton, Wilts) added an additional and elegant drawing-room to his house, but the intolerable smoking of which neither builders nor architects could cure. In considering it over again and again, an idea crossed him that possibly that part just above the grate might be contracted with advantage. The grate, &c., was taken out, and this arrangement made—with some improvement. Then the upper part of the chimney was taken down, and his idea of a taper one constructed, of a funnel shape, the wide part at the top. It was done without difficulty, and, much to his satisfaction, effectually cured the unbearable nuisance.—I am, &c., W. Botly.

Scientific Instruction. — Sir, — My attention has only to-day been directed to a paper read before the Society, by Mr. H. H. Sales, "On the Adaptation and Extension of Present Means for Scientific Instruction," (printed in the *Journal* of March 5th). With his general opinion on the present state of primary education I cordially agree, as also with his desire to utilize existing training colleges for the purpose of secondary instruction. I thank him for bringing both these questions before the Society, but his case is sufficiently strong without the introduction of erroneous statements in deterioration of the training colleges, which I am sure he has unwittingly made, and which he would be sorry should remain uncontradicted. I therefore venture to claim a hearing on their behalf. 1. As to the expenditure for the years 1857 and 1867 (p. 266). He gives correctly the certified expenditure of 17 colleges for 1867 at £44,832 18s. 4d., and the grants of the Committee of Council in aid of that expenditure nearly correct, £32,469 19s. 1d., from which he draws the conclusion that "these colleges are almost entirely supported by grants from the Committee of Council." Here he has fallen into an error, to which a mere reference to Blue Books would lead anyone. "The certified expenditure" is an arbitrary proportion of the "total expenditure," on which the calculation of the grant payable is made. No college can ever receive in any one year more than three-fourths of the expenditure of the previous year, but the Privy Council do not allow three-fourths of the "total expenditure" of the previous year, but only of that part which they themselves consider has a just claim to State aid; *e.g.*, the expenditure caused by training any student who, before he commenced training, did not pass the Council "admission examination" is struck out, even to his fractional share of tuition and establishment charges. Thus the certified expenditure frequently falls short of the total expenditure. The authorities of these colleges have always been at issue with the Council office on this point, and in the interest of education have been ready to admit youths seeking the benefits of the institution, although from lack of preparation, from sickness, or other causes, they have been unable to present themselves for the "admission examination" on that one day in the year when alone they are admissible. Such pupils have to be maintained entirely at the cost of themselves, their patrons, or the subscribers to the colleges. Here we have done this work extensively, and sent out good educators to serve in schools under government inspection; but the Council office has starved us out—we can do it no longer. The total cost of training the 838 teachers (for the number trained in 1867 should be taken, not those in 1868) was £47,846 19s. 11d., or rather (for the net cost of the practising schools and extraordinary expenditure, being part of the necessary cost, should be added) £48,062 16s. 3d., *i.e.*, an average of £56 per head. This leaves a balance of £15,592 17s. 2d. to be supplied by "students, diocesan boards, private subscriptions, and investments." Thus the Committee of Council has provided only 67 per cent. of the cost. Mr. Sales (following the Blue Book) has credited "parents and students" with £3,533 15s. 2d. of the remaining 33 per cent., but we who make those returns to the Council office, know that neither students nor their parents contribute £5 each towards the expenses; so long as the money is handed to us by the pupil himself, we have no right to ask from whence he got it, but it comes, in at least 90 cases out of 100, from the pocket of the clergyman or squire of his parish. It is a "private subscription" to the college. I do not think I should be wrong in stating that £15,000 out of £15,592 was provided by "charitable bodies or private subscriptions." Another error into which Mr. Sales has fallen, is that of including in his item of "certified expenditure" the whole of that debited to "Westminster College." That institution is "mixed," having 127 male and female students; the certified expenditure of the whole is £6,475 14s. 11d., but Mr. Sales has taken it, if I mistake not, as the cost of 62 male students. Leaving it out of account, the average cost of the male students in 1867 (excluding Chester) is correctly given in the Blue Book as £57 0s. 10d. 2. Contrasting the cost of tuition in 1857 and 1867 respectively, Mr. Sales says, "The gross amount is greater in 1867 than in 1857." In the latter year three-fourths of the tutors in training colleges, being certificated masters, received an "augumentation grant" on their certificates, paid to them by the Privy Council as to any other certificated masters. This part of their salary did not appear in the accounts of the training colleges (because paid direct to the tutors), but when the revised code swept those payments away, the college authorities had to make good the loss to their tutors. 3. It is quite true that the cost per head has increased in proportion to the decrease in the number of students. Our buildings for 100 students must be kept in efficient repair; our tutorial staff, our servants, must remain the same if we have only 40, and these charges are now eating us up. We have applied in every possible form for permission to fill our empty rooms with other students, but we have received every discouragement from the Council office. Again, we have advertised the establishment of a district science school, but, though circulated for many weeks through all the centres of industry, we have not had any *bonâ fide* applicants. 4. I must reluctantly join issue with Mr. Sales on his statement that the "course

of study would not qualify the student to pass the honours examination for juniors in either of the universities' local examinations." I have before me the questions set by the Oxford examiners in 1867, and those set to our students in the same year, and I am certain that the latter would laugh at the easiness of the questions set to the seniors of the former in Rudiments of Faith, History, Geography, English Grammar, Political Economy, Euclid, Algebra, and Arithmetic. They would pass in honours with ease in those subjects. Were it not for their ignorance of languages, I believe that our first-year students would also pass. I will instance one or two questions. Oxford examination—"What is a pronoun? Into what classes are pronouns divided? Explain the distinction between *my, mine, my own.*" Council examination, first year—"Give a list of English pronouns. Classify them, and give a clear explanation of the word which describes each class." Council examinations, second year—"Write out all the tenses of the words *must, may, can, will,* and indicate the variations in meaning which these words may have under certain conditions." Oxford—"What were the Exclusion Bill, Septennial Bill, Act of Uniformity, Triennial Bill, Habeas Corpus Act? When were they passed respectively?" Council examination—"The increase of royal authority in the time of the Tudors, and the indications of the coming power of the House of Commons. Give instances of both, and show that the struggle which took place under the Stuarts was already indicated." "The Habeas Corpus Act—its general provisions." "The different acts for the settlement of the royal succession from 1660 to 1789." 5. Mr. Sales, looking only at the "syllabus" of the Committee of Council, speaks of the "standard of knowledge" as "miserably low." I have shown that a comparison of the examination questions will establish the fact that it is as high in subjects common to both as that of the Oxford seniors. The examiners of the latter candidates report, for instance, on English grammar, "the failures" (two-thirds of the whole) "are due, not so much to inadequate answers, as to the total absence of answers to the more important questions." In the case of my own college I can speak more certainly, as it is annually examined by Oxford examiners, who are frequently examining the local candidates about the same time and after the same style. They are appointed by our Diocesan Board of Education, and almost invariably award higher marks to our students in July than are awarded to them in the same subjects by the Council of five examiners in the following December. The "syllabus" is not a fair criterion, *e.g.*, "Political Economy" requires a fair knowledge of Professor Fawcett's book; "Mechanics," an accurate knowledge of powers, forces, laws of gravitation, &c., and of the make and working of all ordinary machines in use, both in agriculture and manufactures. That the standard of knowledge is lower than it was, I allow and deplore, but it is due to two causes. 1. The low standard of education required by the revised code in elementary schools. 2. The annihilation of a third year's training in colleges, during which the higher instruction in vogue in 1857 was imparted. We have pressed for its resumption, are ready to resume it without any increase of staff or apparatus, but are told the country has prohibited it by the revised code. We clamour incessantly, "We've got no work to do." Lastly, the materials on which we have to work, whom Mr. Sales describes as "men, who for the most part have spent five years as pupil teachers, having received, in addition to daily employment in an elementary school, five hours' instruction per week from a certificated teacher." This was the case in 1857, but I am sorry to say was not in 1868, when not more than one-half the pupils of this college had ever been pupil teachers, while only two-thirds of those who passed the "admission examination" last December had been so prepared. The standard of these men on admission is miserably low, and it is unfair to compare them with the candidates for the "local examinations," who have spent their lives under instruction, and not in earning their bread; but it is greatly to the credit of the training colleges if their pupils can, as I maintain, stand competition with their more-favoured fellow citizens. I venture to speak somewhat more confidently on this point, because I have had the teaching of both kinds of pupils (eight years of the one, and six of the other). But no one not in the thick of the fight can tell accurately how the revised code is subtly sapping the foundations of true education in this country; and I am ashamed of my position when I visit the schools of continental nations. It is hopeless to dream of scientific instruction until a higher standard is raised in our elementary schools. We have to thank Mr. Sales, then, as I do from the bottom of my heart, for having so thoroughly exposed the complete unsoundness of our educational system.—I am, &c., James Ridgway, Principal of the Diocesan Training College, Culham, Oxon.

March 20th, 1869.

MEETINGS FOR THE ENSUING WEEK.

Mon.....R. Geographical, 8½. 1. Admiral Irminger, "The Gulf Stream in High Latitudes." 2. Mr. Nicholas Whitley, "Surface Temperature of the North Atlantic." 3. Capt. R. V. Hamilton, "On Open Water in the Polar Basin."
R. United Service Inst., 8½. Col. A. Cunningham Robertson, "The Constitution of our Military Forces, and Conditions of Military Service."
Social Science Assoc., 8. Mr. Arthur Hobhouse, "Whether the present tendency of Opinion on the Authority due to Founders of Endowments operates to give them too much power."

Tues ...Royal Inst., 3. Prof. Grant, "Astronomy."
R. Medical and Chirurgical, 8½.
Civil Engineers, 8. Mr. John Ellacott, "Description of the Low-water Basin at Birkenhead."
Photographic, 8.
Ethnological, 8½. Special Meeting. 1. Opening Address by Prof. Huxley. 2. Sir George Grey, "On the Social Life of the Ancient Inhabitants of New Zealand, and the National Character it was likely to create." 3. The Bishop of Wellington, "Observations on the New Zealanders and some of the Melanesians;" and (time permitting) 4. Mr. J. L. Palmer, "On some Explorations in Easter Isle."

Wed ...Society of Arts, 8. Mr. Lovegrove, "On the Ventilation of Drains."
Geological, 8. 1. Mr. G. W. Ormerod, "On some of the Results arising from the Bedding, Joints, and Spheroidal Structure of the Granite on the Eastern Side of Dartmoor." 2. Mr. D. Mackintosh, "On apparent Lithodomous Perforations in the Hills of North-west Lancashire." 3. Mr. James Nicol, "On the Parallel Roads of Glenroy." 4. Mr. J. Clifton Ward, "On supposed 'Rothliegende' Beds near Knaresborough."
Microscopical. Mr. B. T. Lowne, "On the Structure and Functions of the *Rectal papillæ* of the Blow-fly."
R. Literary Fund, 3.
Archæological Assoc., 4. Annual Meeting.

Thur ...Royal, 8½.
Society of Fine Arts, 8½. Conversazione at the Suffolk street Gallery.
Antiquaries, 8½.
Zoological, 8½.
Royal Society Club, 6.
Mathematical, 8.
Royal Inst., 3. Prof. Tyndall, "On Light.'
London Inst., 6.
Social Science Assoc., 8. Dr. W. B. Hodgson, "On Population.' (At the House of the Society of Arts.)

Fri .....Society of Arts, 8. Indian Conference "On Waste Lands." Opened by Mr. G. Campbell.
R. United Service Inst., 3. Capt. Majendie, "The Martini Henry Rifle."
Royal Inst., 8. Paper on "Newest Artificial Colouring Matters."

Sat .....Royal Inst., 3. Prof. Seeley, "Roman History.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Delivered on 27th April, 1869.

Par. Numb.
95. Bill—Customs and Inland Revenue Duties.
159. Penal Servitude—Return.
164. Exchequer Balances—Statement.
Public General Acts—Chap. 1 to 7.

Delivered on 28th April, 1869.

155. Fisheries—Return.
157. Coinage—Account.

167. Trade Accounts (Foreign Countries)—Belgium, Holland, and United States.
America (Penny Postage)—Letter from the Hon. Reverdy Johnson.
Public Petitions—Sixteenth Report.

Delivered on 29th April, 1869.

162. Reformatories (Ireland)—Return.
165. Chelsea New Bridge—Returns.
168. Park-lane and Hamilton-place—Correspondence.

Delivered on 30th April, 1869.

46. (II.) Trade and Navigation Accounts (31st March, 1869).
161. Assessed Taxes—Account.

Session 1868.

453. Factories—Returns.

Patents.

From Commissioners of Patents' Journal, April 30.

Grants of Provisional Protection.

Agricultural drills—1161—G. Black.
Air or gas, apparatus for carburetting—1242—G. G. Tandy.
Apparel, designing the forms of certain parts of articles of—1067—H. Parslow.
Articles from materials formed by tension, compression, or extension, machinery for manufacturing—471—G. W. R. Pigott.
Boilers—1155—W. Gradwell.
Boilers, &c.—1079—J. A. Miller.
Boots and shoes—1131—B. J. B. Mills.
Boots and shoes—1223—T. C. Bull.
Bottles and jars for preserving fruit, &c.—1165—A. W. C. Williams.
Bottles, &c.—1220—E. O. Catrin.
Bottles, &c., making air and liquid tight—1187—H. W. Dee.
Brewing—1121—E. Beanes.
Buildings—1153—J. G. Jennings.
Cabs, &c.—1117—J. Kirk.
Cards, &c., cutting pasteboard or other sheets to form—1179—A. F. Craig.
Carpets, &c., apparatus for sweeping—1204—F. W. Follows & J. Bate.
Carriages—1172—F. Mulliner.
Centrifugal pumps, &c.—1091—P. Jensen.
Cocoa nibs, &c., manufacturing beverages from—1217—W. Holloway.
Cotton, machinery for combing—1099—J. M. Hetherington.
Cotton, &c., presses for compressing, &c.—1081—R. J. Morison.
Dentistry—1101—P. Headridge.
Deodorising, materials for—1103—E. C. C. Stanford.
Draw plates or fire hasteners—1129—J. Roberts.
Drop drills—1119—J. Easton.
Eggs, &c., indicating when sufficiently cooked—996—G. H. Smith.
Engines, pumps, &c., to be used in mining—1167—J. Vivian.
Fabrics, finishing—1230—C. E. Brooman.
Fan blowers—1135—A. V. Newton.
Feeding bottles—1157—A. M. Clark.
Feed-water apparatus—1201—S. Shaw.
Fences, &c.—1210—K. S. Mackenzie.
Fire-arms—1180—J. H. Johnson.
Fire-arms, cases to be employed with breech-loading—1127—T. B. Burns.
Fire-arms, &c.—1184—E. T. Hughes.
Fire bars—1137—F. Erskine.
Fires, lighting—1111—J. Wadsworth.
Food, &c., treating certain substances for—1083—J. Dewar.
Forgings—3913—W. Clay.
Fret-cutting or sawing machines—1176—W. H. Thick.
Fumigating matter, apparatus for distributing—1132—R. E. and C. Marshall.
Furnace bars—1133—W. Gillespie.
Gas burners, safety attachment for—1181—W. E. Newton.
Gas, regulating and purifying—1071—D. and G. Hallas.
Grain, mashing—1174—F. F. Whitehurst.
Greenhouses, &c., heating water for warming—1188—T. Amies.
Hats, bonnets, &c., ornamenting—1191—A. Smith.
Hats, &c.—1198—J. E. Ward.
Hydraulic barometrical apparatus for raising beer, &c.—1195—P. Bourchani.
Ice—368—H. A. Dufrené.
Iron ore, producing pure iron direct from—1203—A. Brady.
Iron ores, treating—1197—H. Aitken.
Lamps—1215—W. R. Lake.
Lamps, lighting—1077—W. A. Hunter.
Lifting apparatus—1160—H. J. Worssam.
Locomotives—1190—T. Page.
Looms—1095—W. Smith.
Looms—1113—J. H. Dales and J. F. Maygrove.
Looms—1211—H. Lee.
Looms—1234—J. Holding.
Matches and match boxes—1199—A. V. Newton.
Metals, producing moulds and cores to be used in casting—1149—J. Whitley and S. J. Peet.
Motive-power—1087—W. E. Newton.
Mural paintings—1227—C. D. Abel.
Oil feeders—1226—M. Pletts.
Ores, treating—1151—W. Wright.
Ores, &c., apparatus for separating—1212—G. Green.
Paint—1244—A. Borgnet.
Pianoforte actions—1141—E. Dowling.
Pottery ovens, &c.—1200—H. Y. D. Scott.
Printing—1186—F. J. Knewstub.
Pyrophosphate of lime, obtaining—1224—M. Henry.
Railway fish plates—1192—R. Chapman.
Railway signals—1116—E. D. Temple.
Railway trains, communication in—1229—W. Johnson.
Railway trains, communication in—1246—W. R. Lake.
Retorts—1147—J. McLauchlan.
Safety valves—1075—G. D. Hughes and A. H. Sellers.
Sash frames, hanging—1236—H. T. Lewis and W. White.
Sewers and drains, ventilating, &c.—1177—S. Harrison.
Ships—1109—W. Martin.
Ships of war—1173—L. Eggert and O. E. Pohl.
Smoke, consuming—1104—G. Haworth, H. Haughton & R. Gibbons.
Steam engines—1097—W. Ashton and J. H. Storey.
Steam engines, condensers for—1222—J. W. McCarter.
Steam generators—1228—C. M. Barker.
Steel, &c., manufacturing thin sheets of—1231—W. Robinson.
Sugar, apparatus used in producing—1073—A. Fryer.
Tapes, &c.—813—J. Heywood, F. Murphy, and J. Wild.
Tell-tales for public vehicles, &c.—1115—W. Crombleholme.
Tin ores, &c., washing—1206—F. Bartle.
Tools, cutting, &c.—970—J. H. Lloyd.
Tubes, &c., cleaning—1085—C. Lungley.
Velocipedes—1065—J. I. Stassen.
Velocipedes—1123—H. Browne.
Velocipedes—1182—J. Ives.
Velocipedes—1225—H. C. Mayer.
Velocipedes, &c.—1125—S. Holman.
Vessels for containing oil, &c.—1214—M. Andrew.
Votes at elections, apparatus for receiving and registering—1089—T. H. Blamires.
Watches, &c., escapements for—1105—O. Vivier.
Water meters—1209—W. E. Gedge.
Waterproof coats, &c.—1163—E. Cooper.
Whist markers, &c.—1069—R. W. Munro.
Wool, &c., cleansing—1202—L. Goetz.

Inventions with Complete Specifications Filed.

Furnaces—1290—S. Oakman.
Locks—1245—W. R. Lake.
Rails, tyres, &c., utilising waste—1240—J. C. Ridley.

Patents Sealed.

3325. W. E. Bates and T. Dodd.
3350. I., W., and J. Holt and J. Maude.
3358. R. Needham.
3361. A. Reid.
3370. J. Samuel.
3375. T. Harrison.
3389. A. M. Clark.
3390. A. M. Clark.
3394. N. Wilson.
3416. O. G. Abbott.
3430. A. M. Clark.
3448. R. A. Dalton and G. S. Barton.
3456. A. J. Deblon.
3579. R. Lakin & W. H. Rhodes.
3789. J. Hine.
143. J. Bourne.
486. F. H. Collins.
640. W. Clark.

From Commissioners of Patents' Journal, May 4.

Patents Sealed.

3355. H. Jewitt.
3360. J. Clark.
3369. T. and T. P. Lucas.
3381. J. C. Haddan.
3383. J. Lewthwaite.
3386. J. Macneill.
3397. R. McHardy.
3419. H. Bessemer.
3426. G. Wilson, sen., and J. Wilson, jun.
3446. B. P. Walker.
3479. P. J. Ravel.
3492. — Gérard.
3562. T. Smith and J. V. N. Bazalgette.
3581. G. Bernhardt.
3596. W. R. Lake.
3600. F. Holt.
3648. W. E. Newton.
3751. J. Parkins.
3928. A. V. Newton.
38. J. Stevens.
327. J. Macintosh.
455. B. Hunt.
625. W. R. Lake.
630. B. C. Crawford.
718. W. R. Lake.
722. G. H. T. Finzel.
736. C., W., and J. Drake.
794. W. R. Lake.

Patents on which the Stamp Duty of £50 has been paid.

1197. E. Bray & J. C. Hargreaves.
1306. B. Wright.
1200. D. Thomson.
1219. C. D. Fox.
1225. J. Spencer and D. McCorkindale.
1251. H. A. Manfield.
1327. J. A. Jones.
1221. W. Deakin and J. B. Johnson.
1397. G. Macdonald.
1230. J. Lewis.
1318. G. T. Bousfield.
1190. R. Maynard and R. Maynard, jun.
1257. S. Bourne.
1297. A. Pocheron.
1333. W. E. Newton.
1345. W. Botwood.
1404. W. E. Newton.

Patents on which the Stamp Duty of £100 has been Paid.

1461. A. Nicole.
1275. J. Oxley.
1301. M. Paul.
1473. C. Attwood.
1318. J. Fowler.

Journal of the Society of Arts.

FRIDAY, MAY 14, 1869.

Announcements by the Council.

Ordinary Meetings.

Wednesday Evenings at eight o'clock :—

May 19.—"On the Progress of the Colonies." By John Robinson, Esq., of Natal. On this evening Sir George Grey, K.C.B., late Governor-General of New Zealand, will preside.

May 26.—*Derby-day.*—No Meeting.

Committee on India.

Conferences are now in course of being held for the discussion of various subjects connected with India.

The following arrangements have been made for the remaining two conferences :—

This Evening (Friday), May 14.—"Waste Lands." By George Campbell, Esq.

Friday Evening, May 28.—"Trade with Central Asia, Thibet, and South-Western China."

At these Meetings the chair will be taken at 8 o'clock, and the discussion will be opened by a paper.

Members of the Society interested in Indian questions are invited to attend.

Postal Reform Committee.

The Council have appointed a Committee for the purpose of "promoting the adoption of reduced rates of postage, particularly in reference to printed matter and parcels," and that Committee is now engaged in the consideration of the question, with a view to secure newspapers and printed matter being carried at rates not higher than those which are found practicable in France, Belgium, and the United States of America.

The Committee met on the 3rd inst., and in accordance with its recommendations, communications are being sent to the proprietors of the principal London newspapers, to the Religious and Charitable Societies, and to the Chambers of Commerce, inviting their co-operation.

Communications are also being sent to Foreign Governments, asking for information as to the postal regulations in their respective countries, especially relating to newspapers, printed matter, and small parcels.

Cab Reform.

The Council will appoint a day after the Whitsuntide holidays for discussing any practical measures for improving the cab system in the metropolis.

Any persons who may desire to submit proposals for discussion are requested to communicate them in writing to the Secretary on or before Saturday, the 29th inst.

Designs for Channel Steamers.

The Council of the Society of Arts offer the Gold Medal of the Society, and the large Silver Medal of the Society, for the best and the second-best block model of a steamer, which shall afford the most convenient shelter and accommodation to passengers on the deck of the vessel crossing the Channel between France and England. The steamer is not to exceed in tonnage and draught the best vessels now in use between Folkestone and Boulogne, and the model must be on a scale of a quarter of an inch to a foot. The models, marked in cypher, are to be sent in to the Society of Arts' House, John-street, Adelphi, on or before the 1st November next, with a sealed envelope, giving the name and address of the designer.

The Council reserve the right of withholding either or both medals, in case, in their opinion, the models sent in do not possess sufficient merit.

The following particulars of the South-Eastern Channel steamers, *Victoria, Albert Edward,* and *Alexandra,* are given for the convenience of competitors, but it is not intended to confine the designs to them, except as to tonnage and draught :—

Length between perpendiculars, 200 ft.
Breadth of beam, 24 ft.
Depth underside of deck amidships, 12 ft. 6 in.
Draught of water, 7 ft.
Bow, clipper.
Stern, elliptic.
Rig, polacca with two masts, lug foresail, gaff mainsail, staysail, and flying jib.
Engines, oscillating.
Paddle wheels, 17 ft. 6 in. diameter.
Tonnage, 568 tons.
Speed, 17 miles an hour.

Notice to Institutions.

A limited number of copies of the following works by Sir George Ramsay, Bart., has been kindly placed by the author at the disposal of the Society, for distribution to such Institutions as may apply for them :—

1. Analysis and Theory of the Emotions.
2. Introduction to Mental Philosophy.
3. Principles of Psychology.
4. Instinct and Reason.
5. Essay on the Distribution of Wealth.
6. Political Discourses.
7. A Disquisition on Government.

Applications for copies should be made to the Secretary of the Society of Arts.

Thames Embankment Committee.

The proceedings of this Committee, so far as they relate to the question of the site for the Law Courts, have been reprinted in the form of a pamphlet, which may be had of the Society's publishers, Messrs. Bell and Daldy, York-street, Covent-garden, price threepence.

Subscriptions.

The Lady-day subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Food Committee.

A meeting of this Committee was held on Wednesday afternoon, 21st April, at which there were present—Mr. Benjamin Shaw (in the chair), Mr. James A. Youl, Rev. J. E. Hall, Mr. G. F. Wilson, F.R.S., and Mr. Phillips Bevan.

Mr. Augustus Morris, of Sydney, attended by invitation to explain his views with regard to the preservation of meat, for exportation to long distances, by the process of refrigeration.

The Chairman having requested Mr. Morris to favour the Committee with any statement he had to bring before them,

Mr. Morris said unfortunately he had very little to communicate, inasmuch as the persons with whom he was associated in Australia, had not been able to make experiments beyond those which were recorded in the public newspapers in Sydney. By the last accounts he had received from Australia, they were then making all preparations, and great confidence was expressed that the plan that had been adopted would be successful, viz, freezing by the compression and expansion of air. Mr. Thomas Mort had gone to an expense of at least £5,000 in preparing the machinery and apparatus for bringing the meat to this country, but he had not yet practically tested the apparatus. No person had ever devoted himself more earnestly, or in a more liberal spirit, to solve a question of great public utility. He feared it would be found that the process itself was scarcely practicable, and any way was far too expensive, though his friends in Sydney thought differently, and that the expense would not be prejudicial to the undertaking. It was estimated by authorities in this country that, by the process referred to, it would require a ton of coals to produce an amount of refrigeration equal to a ton of ice. The meat having been frozen before it was put on board ship, the operation of freezing would not, in the opinion of his friends, require to be repeated very often during the passage; while he thought that operation would require to be repeated every second day at least, because, however well protected by non-conductors the meat tanks might be, the loss by radiation and otherwise would be great. He had lately been engaged in experiments with an apparatus invented by Mr. Rees Reece.

The Chairman inquired whether that was the invention referred to by Dr. Paul*, in a paper lately read by that gentleman before the Society.

Mr. Morris replied it was described in that paper. He had had great hopes that the machine would have proved eminently successful, but he was not yet in a position to say that it had realised his expectations. The inventor himself was, however, still unwavering in his faith as to its ultimately proving a great success. He (Mr. Morris) was unable to detect any fault in the theory, and yet hoped, when its practical working was better understood, that the inventor's perseverance would be rewarded by complete success.

The Chairman understood that difficulties arose from want of sufficient closeness of the joints.

Mr. Morris said there was no practical difficulty about that. The greatest pressure that would be brought upon the machine, even in the tropics, was not more than 200 lbs. to the square inch, and there was no mechanical difficulty in making it to sustain 1,500 lbs. or 2,000 lbs. to the inch.

The Chairman asked whether the cost of the freezing process would not absorb all the profits likely to accrue from the undertaking?

Mr. Morris replied that the question resolved itself into the quantity of coal which would be required on a voyage from Australia. On that account he thought that, sooner or later, some process in which ammonia was the freezing agent would be adopted. He still trusted that Mr. Reece's apparatus would solve the question. Although 200 lbs. pressure to the square inch, under the ammonia process, might appear excessive, yet his friends, Messrs. Mort and Nicolle, proposed to compress air 300 lbs. to the square inch. It was merely a question of mechanical strength.

The Chairman apprehended it came to this; there was the question of expense in the first place, and the mechanical difficulty in the second place.

Mr. Morris stated that several scientific men and engineers had inspected Mr. Reece's apparatus, and none had been able to find out any theoretical objections to it. They all agreed as to the imperfect construction of the machine, which was not in all its parts calculated to bear high pressure. Much had to be learned as to the relative proportions of the different parts, but, although the apparatus was not, in its present form, properly adjusted, yet a fair trial of it might be obtained. Notwithstanding many delays and difficulties, he yet hoped all would turn out well.

The Chairman said the Committee would be glad to hear Mr. Morris's views with regard to the effect that was produced upon frozen meat, so far as his experience of it went.

Mr. Morris, on that point, could state that the experience of himself and his friends, with meat frozen in tin vessels, impervious to the atmosphere and external moisture, extended over fourteen months. The meat had been frozen at from 10° Fahrenheit to as low as 47° below zero. No change whatever took place in the flavour of the meat or in its appearance. A single drop of blood would be as distinct and clear after many months as if it had been just put on.

Mr. Bevan inquired what were the effects of a sudden unfreezing of the meat?

Mr. Morris replied he had never done it suddenly; if it could be done, he apprehended it would have a prejudicial effect upon the meat. The thawing must be gradually effected, by the meat being hung in a safe or other place till it was reduced to the temperature of the atmosphere; and his experience was, that it would remain good as long as fresh meat from the butcher. He had kept meat hung up in the air from three to fourteen days after it was taken out of the case in which it had been frozen, and, when cooked, it was fresh and sound. He had sent frozen meat to Melbourne, packed in saw-dust, the same as ice was packed here, and, when cooked eight and ten days afterwards, it was perfectly sound and well flavoured. No decomposition whatever took place on the thawing, any more than in ordinary fresh meat, so long as the freezing

* *Journal*, present vol., p. 67.

was effected by transmission of heat, and not by contact with ice at a low temperature. In Canada and Russia, so long as the cold was very intense, and there was no moisture in the air or from the ice, the meat retained its flavour, but, as soon as a thaw set in, beef, mutton, and poultry were scarcely distinguishable. At at temperature of about 60° it would take about 30 hours for a large joint of meat to become thawed through. In Canada and Russia, in winter time, the thawing of the meat was effected in water, at an artificial temperature. In Sydney, in the month of September, which was about equal to April in this country, meat had been kept for a fortnight (after it had been taken out of the place where it had been frozen) in the ordinary atmosphere. It might have been cooked after 30 hours without injury to the meat. After the thawing, meat assumed the condition and appearance of that which had not been frozen.

Rev. J. E. HALL gathered from Mr. Morris's statement that frozen meat did not decompose more quickly than meat which had not been frozen.

Mr. MORRIS said this was quite correct, as far as his own experience went. He knew the general opinion was that frozen meat would not keep good as long as other meat. Sir J. Young, during the last two years he was in Sydney, often sent his poultry and meat to the place where the freezing experiments were made, and it was kept frozen for two or three months. He thought it improved the flavour of the meat. He (Mr. Morris) did not go so far as that; his own opinion was that there was little or no difference in the meat. It certainly did not alter the character of the meat. If a tough piece of meat was frozen, it came out tough; if tender, it remained so. There was really no change in the meat.

The CHAIRMAN suggested that it would be very desirable if Mr. Morris would be kind enough to communicate to the committee, in his own words, what were the difficulties which delayed the carrying out of the system to which he had directed his attention; and, if they were printed in the *Journal*, they would come under the notice of engineers and scientific men, who might be able to point out a remedy.

Mr. YOUL understood Mr. Morris to say the inventor was still sanguine of success.

Mr. MORRIS said it was so, but the results had not as yet been such as to enable him to give a decided opinion. Mr. Reece seemed to be able to overcome the difficulties as they arose, and his confidence was unshaken as to the sonndness of the principle of his invention. The great thing to be done was to produce the refrigeration cheaply.

The CHAIRMAN suggested that the publication of the difficulties hitherto met with was probably the best way of getting a solution of the difficulties.

Mr. MORRIS remarked that he was afraid, after all the attention he had paid to this most important subject, he should have to return to Australia with his work unfinished. The inventor and himself had been working from month to month, confident of ultimate success. He (Mr. Morris) had consulted scientific men, and they really could say nothing against the accuracy of the theory, which justified the expectations he had formed.

Mr. YOUL inquired how many experiments with the apparatus Mr. Morris had seen?

Mr. MORRIS replied, a great many. At times the working of the apparatus seemed to indicate the production of 15 to 16 tons of ice for every ton of coal consumed, but, from some mechanical defect, no complete experiment had been made. He was satisfied in his own mind that the freezing process was the only practicable plan of bringing large quanties of fresh meat from Australia and the River Plate, and he had no doubt apparatus suitable for the purpose would eventually be produced. He might state that scarcely a day passed that some method of preserving meat was not brought under his notice; but, with the exception of the tinned meats and salted meat, not one of them was of any practical value as regarded Australia.

The CHAIRMAN remarked that if the production of a refrigerating atmosphere came to be a question of cost, and if the process had to be repeated from time to time on the passage, the shorter passage from South America, as compared with Australia, would be a material consideration in the matter,

Mr. MORRIS observed that sailing ships would perform the passage from Australia as quickly as they would from the Plate.

Mr. BEVAN suggested whether a modification of the old condensing air apparatus, used in the ventilation of mines, would not be applicable in this case, instead of going through repeated processes of freezing during the voyage.

Mr. MORRIS said the plan adopted by Messrs. Mort and Nicolle, in Australia, for compressing the air, was similar to that employed for compressing the air in the cutting of the Mont Cenis Tunnel, and that was done by hydraulics. The same air was used over and over again. If they used fresh air every time, as in mining, it would be a very expensive operation indeed. It had been suggested by those connected with Australia, that the government should offer a large premium, say £40,000 or £50,000, to any person who successfully accomplished the economical transit of fresh meat in large quantities from the colonies to England. He believed that suggestion would be carried out. A contribution of 10s. per thousand sheep, and £2 per thousand cattle in all the Australasian colonies, would raise £40,000. He thought some substantial reward like that would be the best means of getting the question solved. He would have the reward placed at such a figure as would be an attraction to eminent scientific men in Europe to take up the subject, and thoroughly carry it out. He suggested that it was a matter which could best be carried out by an association, inasmuch as individuals were unwilling to bear the great cost of carrying on experiments, however feasible they might appear to be. He felt satisfied that the only practical plan of bringing meat from Australia and South America, was under some modification of the refrigerating idea, whatever might be the particular process adopted. He did not imagine that, under any system, the expense of bringing the meat over in a frozen state ought to exceed 1d. per lb., including freight.

The CHAIRMAN asked Mr. Morris whether he thought that meat could compete with the article exported by the Ramornie Company.

Mr. MORRIS replied that in Australia they might safely calculate upon getting meat at 1½d. per lb., and the refuse of the animals—the skin of the sheep, the hides of the cattle, and offal fat—would quite pay the cost of preparing the meat, and putting it on board ship in a frozen state. He believed the meat could he brought over and sold wholesale here at 4d. per lb. But it was to be recollected that meat from Australia would compete, not with the low qualities here, but with the best meat; and the reason why the tinned meats arriving from Australia were so good was because the original quality was far superior to the generality of meat in England.

Mr. G. F. WILSON inquired how long the mechanical difficulties referred to by Mr. Morris had been discovered?

Mr. MORRIS replied during the last month or two. The inventor only regarded them as temporary hindrances.

The CHAIRMAN thanked Mr. Morris on behalf of the Committee for the information he had given them, and requested him to favour them with any further information he might acquire on the subject, previous to his departure for Australia.

The Committee then adjourned.

Mr. Morris, under date 1st May, writes as follows:—

"Since giving my evidence before the Food Committee, a further trial of Mr. Reece's apparatus has been made, and the result proved that, in continuous action, it would make, in 24 hours, 36 cwt. of ice, consuming during the

operation not more than 3cwt. of coals, or at the rate of 12 tons of ice for one ton of fuel. This result was obtained from a solution containing not more than 15 per cent. of ammonia. Had the solution been of the proper strength, and were the different parts of the apparatus adjusted as experience points out, I cannot but think that Mr. Reece's machine would produce results 40 or 50 per cent. greater. I think the Society would give a great encouragement to those who are trying to work out the animal food question, if it would appoint some competent scientific gentlemen to report on Mr. Reece's apparatus, and its suitability for maintaining on ship-board the requisite degree of cold."

Piscicultural Committee.

A meeting of this Committee took place on Friday, May 7th, James Caird, Esq., in the chair. The following members of the Committee were also present:—Messrs. G. W. Hart, Harry Lobb, Frank Buckland, Henry Lee, James A. Youl, H. Cholmondeley Pennell. The paper read was—

ON OYSTER CULTURE AND LEGISLATION.

By A. Francis Pennell, Esq.

The paper to which I ask the attention of the Piscicultural Committee this evening, is upon the subject of oyster culture and legislation. In treating this question, which is, however, a very wide one, I have endeavoured to confine myself strictly within the scope of the objects of the Committee, which are, as I understand them, the diffusion of knowledge, with a view to the adoption of measures calculated to promote practically the welfare and preservation of our fisheries. The preamble of an old Act of Parliament recites "that the maintenance and preserving of the fisheries of the kingdom is a great national object." With the increasing difficulty of finding an adequate food-supply for the people, this object, in a national point of view, has certainly not lost in interest, whilst the scarcity of oysters—almost amounting to famine—now existing in England, gives it special importance at the present time.

It has been said that he was a bold man who first swallowed an oyster; but, since this deed of daring, all oyster-eaters have borne witness to their highly nutritious qualities, and to their beneficial effects both in health and sickness. So far as can be ascertained, oysters have, from a remote period, been a most popular article of consumption, and, until late years, they have been produced in sufficient abundance to be sold at prices which brought them within reach of all classes. Now, however, an entire change has taken place, and an oyster is one of the most expensive of luxuries, and the greatest scarcity prevails at present. I believe I considerably understate the falling off in the supply, when I say that the quantity of oysters sent to market in 1868 was less than one-fourth of the annual quantity sent twenty years ago. The present prices give some indication of the change. Prior to 1861, the wholesale price of the best natives was £2 2s. a bushel; since then the price has risen rapidly to £4 4s. in 1865, in 1866 to £5, and during the past season they reached the prohibitive price of £8 a bushel, having thus risen nearly 300 per cent. in eight years; or, to descend to particulars, they have risen from less than ½d. to nearly 2d. each.

I now propose to treat of the causes which have led to this unfortunate result, and which are in themselves suggestive of the remedies to be applied—and in the first place it will be necessary to refer to the laws affecting oyster fisheries. Until the last thirty years, the statute-book contained but few laws upon the subject, but since 1839 they have received a good deal of attention. In that year a convention (which subsequently received the confirmation of Parliament) was negociated with France, applying to the seas between the two countries. Its chief provisions, as regards oysters, were the establishment of a close time from 1st May to 31st August, and the prohibition of the removal of oysters of a less diameter than 2½ inches, together with the arrangements necessary for the enforcement of these provisions. Besides these general regulations, and those established by the "Convention Amendment Act" of 1855, our own public beds have been variously regulated by numerous and conflicting Orders in Council.

To add to the complexity, in several cases where beds existed in the vicinity of large towns, the inhabitants—recognising the necessity of restrictions to prevent their destruction—obtained private Acts of Parliament, empowering them to regulate the beds according to their varying local requirements, and confining their working to the fishermen of the place, who had thus a strong personal interest in their welfare. It had from the first been doubtful whether the restrictions under the French convention applied to the fisheries within three miles of our coasts; and the various enactments subsequently passed at length resulted in such a hopeless confusion, that neither those who had to administer the laws, nor those who had to obey them, knew what was or what was not intended to be their practical operation. This state of things gave rise to much practical inconvenience and many complaints, until at length the government carried the "Oyster and Mussel Fisheries Act" of 1866, which again was repealed and re-enacted in the "Sea Fisheries Act" of 1868. Under this last Act all the restrictive rules previously in force on public fisheries have been entirely abolished, the only exception being that the Act confirmed a new convention with France, which establishes a close time for the Channel from the 16th June to 31st August, but does away with the previous limit of the minimum size under which oysters might not be removed. The convention, however, applies only to the beds situated outside the territorial seas; so that at the present time, upon all our public beds which are within three miles of the coast, the fishing is entirely free and unrestricted all the year round.

I would now draw attention to the practical results which immediately followed this crude legislation, in beds which had been previously maintained in a prosperous condition by the restrictions enforced; and I will take the case of Milford Haven as an illustration. Until the year 1866, the dredgermen here were prevented, under a local Act, from removing oysters of a less diameter than 2½ inches; a five months close time—from the 1st May to 30th September—was enforced, and strangers were excluded. By these means a fair stock of parent oysters was maintained, and the men were able to earn a decent livelihood, although the price was only 16s. a thousand; and, that only the large or marketable oysters might be sold, the small ones were picked out and thrown back upon the beds. Since then the fishery has rapidly deteriorated, and, although the men sell every oyster they catch, however small, and they are obtaining 28s. a thousand, yet many of the men and their families are in great distress. The number of oysters of all sizes caught this season was only half the number usually obtained in a season before the removal of the restrictions. Even in its present state, the Milford fishery is one of the least exhausted of our public beds; and, if prompt measures are adopted for the re-imposition of the previously existing restrictions, it might, with others similarly situated, be saved from complete ruin. And what is the condition of our other public fisheries, as, for instance, the beds at the Mumbles, off Tenby, at Falmouth, at Studlands, in Pool Harbour, those near the Isle of Wight and at Langston, and last, the magnificent fisheries in the estuary of the Thames on the Essex and Kent coasts, where alone the true native is produced? I am afraid of each and all it must be admitted that they have been dredged to the verge

of exhaustion, and that the number of parent oysters remaining is now so small that, even if no more were removed, years must elapse before the reproductive process could replenish them to any considerable extent. The recent legislation, however, cannot in fairness be held responsible to any large extent for the condition to which our beds have been reduced, which has been, in most cases, the result of previous persistent neglect; but so far as the removal of the restrictions has had any practical operation, that operation has been injurious.

Turning from our own neglected beds to those of France, we might, from the genius of the country, naturally expect to see there the beneficial results of a full code regulating the fisheries. This expectation, however, would be signally disappointed, in proof of which I will, with the Committee's permission, read a short passage from a book written by M. Rothschild, and which has received the official sanction of M. Coste, the Inspector-General of the French fisheries:—

"The seas washing the coast of France were once extraordinarily rich in oyster beds, and these beds were of such large size as to be measured by miles. Cancale, St. Brieux, Granville, La Rochelle, Marennes, Arcachon, all these places were the classic grounds of the oysters. And now? St. Brieux is destroyed. Happily it has been re-stocked. Brest is dredged out; so are the rivers of Brittany. Cancale and Granville are *bien malades*. Ile de Rhé, Oberon, Marennes, La Rochelle, Rochefort, mourn the loss of 18 out of 23 beds which once constituted their riches."

The writer, after adverting to all the different enemies of the oyster—dog-whelks, five-fingered star-fish, cold, heat, mud, and sand, sums up by saying that to none of these is the depletion of the beds attributable, but to the unrestricted dredging (*exploitation commune*) which has been permitted. Having last year inspected all the fisheries mentioned, and having received from the local officers the fullest official information, I can vouch for the accuracy of M. Rothschild's description, and for the opinion universally held, that their depletion has been caused by over-dredging. I should, however, add that the attempt to re-habilitate St. Brieux, by using artificial collectors, has since proved a complete failure. The rapid deterioration of their beds roused the French Government to a perception of the necessity of protecting them by legislative action, and, accordingly, a complete code of oyster laws has been at length established, with the means necessary for enforcing them—a point in which we have always lamentably failed. The beds, however, have already suffered so much, that years must elapse before they can recover their former prosperous condition.

As the instances I have mentioned afford a warning illustrative of the effect of unrestricted freedom of dredging, I will now mention one or two cases in which the beneficial results of following an opposite course are strikingly apparent. Near Herne Bay a grant of a considerable area of waste ground was made to a public company in 1864. According to the concurrent testimony given before a Parliamentary Committee by numerous local and official witnesses, this once favourite breeding ground had become, from over-dredging, a complete waste, and would for ever have remained so, unless stocked with parent oysters and cultivated. This the company have done on a very large scale, and the result has been, that not only has a certain quantity of young oysters been produced every year, but during the last season the fall of spat was so exceptionally good, that dredging operations have necessarily been suspended for fear of destroying the young brood. Had this fall of spat taken place on an unprotected ground, there can be little doubt that ere this nine-tenths of it would have been destroyed by dredging, as has been the case in the Swale and other localities.

As bearing upon the argument adduced in this paper, it is noteworthy that the quantity of spat on the Herne Bay ground is in exact ratio to the quantity of parent stock; where the parent oysters are laid thickly, there the young brood has been produced in proportionate abundance, and where the parent oysters are few, the brood is equally scarce.

The concession of barren ground to the Roach River Company has, I believe, been followed by equally favourable results. The pernicious effects of over-dredging, and, conversely, the beneficial effects of rest, where the bed is not subject to destruction by mud, have been conclusively exhibited in two other instances which have come under my own observation, the one in England, and the other in France. An oyster-bed near Studlands Bay, in Dorsetshire, had been dredged out and forsaken about 40 years ago. Shortly before I visited it, in 1867, it had been re-discovered, and a rich harvest of oysters of all ages was found upon it, greatly to the profit and advantage of the first discoverers. The other instance is that of the Cancale bed, once the largest and most important in France. It appears from official statistics furnished to the French Government that, from 1800 to 1815, the necessities of the great war with England produced such a drain upon the fishermen as practically to leave the beds in a state of repose. At the conclusion of the war, an immense stock of oysters was found to have accumulated, in some places a yard deep; this rich field at once afforded occupation to numbers of the discharged sailors, and the annual quantity dredged for market was immediately quadrupled, and, with the growing demand, greater quantities were taken each year, till, in 1847, the maximum of 71,000,000 oysters in one year was reached. This great drain on the bed proved to be beyond its recuperative powers, and the stock steadily declined till, when I visited it last year, three oysters only were caught in two hours' dredging. Facts like these, confirmed by official evidence, surely read us a lesson we cannot afford to overlook.

Our English Act of 1866, which has proved so mischievous in certain respects, contained, however, some valuable sections, enabling the Board of Trade to make grants of exclusive rights of oyster-fishing to persons or companies who might wish to embark in oyster-culture. The wisdom of these provisions is sufficiently evidenced by the success already achieved by the Herne Bay and Roach River Companies, to whom grants of this description have been made. The only cause for regret is that the process for obtaining a grant is such as practically to exclude the fishermen themselves, except in a corporate form, from the benefit of the Act.

I will now advert to that portion of the report of the Sea Fisheries Commission which formed the basis of the present law, under which all restrictions have been abolished. No one can doubt the great abilities and scientific knowledge possessed by the gentlemen who composed the Commission, and I can only attribute the mistaken, and in its effect most mischievous, conclusion at which they arrived, so far as oysters are concerned, to the fact that the practical element was not sufficiently represented, and that the true facts of the case and their bearings were not brought before them in a tangible form. The Commissioners' principal argument is based on the assertion that the present scarcity is solely caused by the oysters themselves having failed to breed since 1861 or 1862, and by this means they avoid the otherwise inevitable conclusion that the scarcity has been caused by the denuded state of the beds. And, further, they assume that an oyster produces 800,000 at a birth, and of these they also assume, without proof, that about 10,000 will survive and come to maturity, and that, therefore, those remaining after the closest practicable dredging are sufficient for the replenishment of the beds. It must be admitted, however, even on their own showing, that this assumption is a violent one, for the Commissioners proceed to remark of the young oysters, that they are surrounded "with changes of temperature, with gales of wind, with the multitudes of marine animals which prey upon the oyster-spat in all its stages, or with the currents which, by being a little swifter or

a little slower than usual, or by deviating a few points from their ordinary course, may carry millions of nascent oysters upon sands or mud unfitted for their development." As a matter of fact, experience has conclusively shown that the number surviving on open beds is infinitesimally small, probably not averaging more than three or four to each parent oyster, which are all that can be counted upon in the open beds in average seasons.

And now with regard to the other equally important argument, upon the truth or otherwise of which the whole value of the Commissioners' recommendations depend, viz., the alleged failure of oysters to breed. Now, what are the facts of the case? I have already incidentally mentioned circumstances disproving the alleged failure, and here is a statement of the foreman of the Whitstable Company, given by him in evidence, and showing the amount of brood actually purchased from English beds each year by that company, all of it since the time of the alleged failure, viz.:—

In 1861	2, 79,000	wash of brood,	cost	£35,000
1862–3,	12,836	,,	,,	8,450
1864–5,	2,842	,,	,,	3,003
1865–6,	9,939	,,	,,	11,676

Total quantity of brood purchased since the alleged failure, 104,617 wash, cost £58,129. The other Thames companies have bought in the same proportion. Again, in the case of the magnificent Blackwater fisheries, the official report on them states that, in 1867, full four years after the commencement of the alleged failure, for every mature oyster eight immatured or brood oysters were found. I have myself visited many fisheries during the last five years, and on each and all of them I have found spat of all ages, in small quantities no doubt, but still quite as much as the decreased numbers of the parent stock could be expected, in ordinary breeding seasons, to produce. Did time permit, I would adduce further evidence of the fallacy of the arguments upon which our present laws are based, but I believe this is unnecessary, as almost all practical men are agreed upon the subject.

To guard against misconception, I should observe that the true state of the case appears to me to be, that every year spat is produced, but that, in certain years, exceptionally heavy falls take place, such as those of 1858 and 1859. Our knowledge of all the circumstances and conditions affecting the oyster is not yet sufficiently advanced to teach what are *all* the essentials for a good fall of spat, and if we did know them we might be unable to control or provide for them. There are, however, two essentials which we do know and can provide for—these are, a fair stock of parent oysters, and clean substances for the spat to adhere to, essentials which, when observed, have produced the desired results.

And now, in conclusion, I think the foregoing examples and observations have sufficiently indicated the course our oyster legislation should take, and I will conclude this paper by stating the following propositions, in which I have embodied the leading principles which I conceive should govern that legislation:—

1. That to prevent the exhaustion of the beds, and to ensure the maintenance of a stock of parent oysters, a minimum size should be fixed, under which oysters should not be removed.

2. That except in the case of beds with a peculiarly muddy bottom, a close time should also be enforced, as is the case in France, Spain, Ireland, and, little as we might have expected it, in America.

3. That, in order to accomplish the above, authority should be given to the Board of Trade to make well considered bye-laws, for the regulation of the different public beds, according to their varying local requirements, thus carrying out the principle adopted in salmon rivers.

4. That, as in Ireland and other countries, the local authorities (police coast-guard and revenue cruisers) should assist, when required, in the enforcement of the bye-laws.

5. That the public beds should only be worked by persons having a strong and direct personal interest in their preservation and proper cultivation, and that therefore only the dredgermen of the vicinity should be allowed to work them. This system has been found very beneficial in France. With us, whenever a bed begins to thrive, the dredgermen from all parts of the coast come down *en masse*, and clear off every oyster, great and small.

6. That every facility should be given for obtaining oyster-fishery grants, under the recent Act, in all cases where an increased supply of oysters is likely to follow.

7. The government should exercise, by means of a general Fishery Board, or other arrangement, a closer supervision over all our sea-fisheries, and especially oyster-beds. In France there are no less than thirty-seven fishery-officers, with numerous subordinates, whose sole duties consist in the supervision of the fisheries. Considering the value and importance to England of her sea-fisheries, it would appear hardly credible that we should have only one officer charged with the care of them.

In conclusion, I will only observe that the question to which I have invited the attention of this Committee is eminently a practical one, and must be governed by and take its form from the results of actual experience. I have appealed to the experience of this country, of Ireland, and to that of France, Spain, and even America. The same concurrent testimony is borne by all these countries as to the mischievous effects of over-dredging, and the necessity of a close time. We cannot afford to overlook this universal experience of the old world and the new, and to mis-read the lessons they teach us, the result, in some cases, of long and very dear-bought experience. We cannot afford to rest our practical legislation upon a mere theory as to the number of young an oyster produces, and the number escaping a general wreck. We must fall back upon the common-sense principles—the homely and every day experience—that, other conditions being equal, the number of young must necessarily be governed by the number of the parent stock. We must remember, also, that the question is one on which the means of subsistence of a large industrial population is depending, and that therefore it is doubly incumbent upon us to tread upon safe ground. I venture to suggest to the Committee that a deputation should wait upon the government, to press upon them the necessity of prompt legislation in the manner I have indicated.

DISCUSSION.

Mr. G. W. Hart said that, in 1865, he visited France and saw there a very flourishing condition of oyster culture. He was so encouraged that he determined to attempt the same thing in England. There was nothing here to prevent a similar success. The existing circumstances were the same here as in France. We had the same clean bottom upon London clay, and under that chalk. He believed the only thing in which he was wanting at his ponds, at Hayling Island, was a control of the temperature. However, the result of his labours was a success, as could be seen by the formation and advancement of the South of England Oyster Company. In 1866 they obtained from 50,000 oysters two million of spat, and this, too, when they were novices, and did not know how to manage matters. Again, when they put down six hundred thousand, the result was about one hundred million. Unfortunately for the Company, the banks which they had built were not sufficiently strong, so that one of them gave way, and a great loss was the result. They had, nevertheless, £3,000 in hard cash, and that spoke for itself. It must be remembered that that place never produced an oyster before. This year they expected even a better return. There was one thing that should be remembered, as it went rather against Mr. Buckland's theory of heat. At the

place he was speaking of they had two ponds, to all intents and purposes exactly alike. In 1867, one of these ponds produced plentifully, while the other was comparatively barren; but the strange thing was, that the pond which produced nothing in 1867, produced plentifully in 1868, while the one that was successful in 1867, gave nothing in 1868, and this under precisely the same conditions. He was quite at a loss as to what cause this should be attributed. The only thing he could think of was that, owing to the great temperature of last year, there had been an immense growth of weed, which might probably have destroyed a number of the young oysters. The tides, too, fell off considerably that year, the spring floods were only equal to about an average neap tide, and that might probably have something to do with this peculiar result. He was sorry to say that London had not yet profited by his labours at Hayling. He had sent all he could to France, where he had learnt the method of culture he was practising. He hoped, however, to have some ready this year for the London market. There could be but little doubt that Mr. Buckland was right as regards temperature, but he must not make temperature his all in all. Temperature was not the only thing by any means; the chief thing was perfect cleanliness. It was not well to delude themselves with the idea that because there was a large amount of spat there would be a large quantity of oysters. It was much the same as with an orchard. Every spring the blossoms came forth, but it did not follow that every blossom would become an apple. It must not be supposed that because two millions of spat were produced in one year, that we were going to have two millions of oysters. From his experience he could say that only about one or two per cent. was the proportion to be relied upon to breed from. It generally took three or four days' fruitless effort to get up an oyster with spat upon it. He believed that the reason for this waste would be found in the fact—at least, he conceived it to be a fact—that the oyster, like the hen, could not contain its ova longer than a certain time, and that therefore vast numbers were liberated before they were in a fit state to encounter their adversaries. As to dredging, that should only be allowed under certain conditions. Ultimately the gr und would get so that it could keep itself clean. The tide was sufficient to keep it in a state of perfect cleanliness. Of course, restrictions on dredging might not be possible in muddy rivers, such as the Essex rivers. What was true of those rivers was not true of the Solent, and it would, therefore, be unwise to have general legislation. The local fishers should have the power to make bye-laws. The fisheries should belong to the fishermen on the shores. As soon as there was a fall of oysters in the Solent, the Essex men came down with different dredgers, and took away the oysters for the benefit of the Essex and Kent rivers. This, it must be observed, referred to the Solent Harbour, and should not be allowed. With regard to the French fisheries, the cause of their falling off was very simple; it was not owing to any defect in the system, it was owing to the bad management of the fishers themselves. A man went down in 1863, and put in a large quantity of breeding oysters, and got a good result in 1864; he repeated the process in that year, and then, in 1865, could not catch the oysters he wanted because they were covered over with another lot. Then again, they had not kept their water clean, but had been sitting down smoking their pipes, and counting their eggs before they were hatched. Oysters would not come up on a dirty stone. His opinion was that it was entirely through dirtiness that the French fisheries had failed.

Mr. Frank Buckland said that one great object of the Piscicultural Committee had been met that evening, in the interchange of ideas on the cultivation of our fish. On a subject like the one at present under consideration, it was almost necessary that there should be diversity of opinion. Whatever might be done or said, something or other would be sure to turn up to upset any theories with regard to that most mysterious and uncommunicative creature, the oyster. His friends and himself had found out a great many important facts by simply watching the little creature. From his experience, he must say that he disagreed with his friend Mr. Pennell on the subject of dredging. He had used hard words when speaking of the Royal Commissioners and the conclusion they arrived at. Those gentlemen were men of science and judgment, and it could not be believed that they came to the conclusion they had without much thought and upon good grounds. To his last life's blood he (Mr. Buckland) would set his face against Mr. Pennell's ideas on over-dredging. He would not say that, in some instances, it did not affect the small oysters, but he was convinced that, as a rule, millions and millions died soon after they were cast from their mothers' shell, on account of there being no safe resting-place for them. In the summer months he had seen a glass of water taken from the sea, and it was filled with spat, and yet there were none on the ground. The young oysters would not stick unless the conditions were such as suited them. These conditions were two—heat and tranquillity. With regard to the first, it would perhaps be as well to modify it, and say warmth, because over-heat might kill the young oysters. This condition had been disputed, but if the facts were looked at prudently they would substantiate his theory. Where, he asked, were there found the most oysters in the world? Why, in hot climates. Then, again, they must have quietness. The least movement sent them flying away. With regard to dredging, the secret of the scarcity of oysters was not to be found in the dredge. He objected to Mr. Pennell's observations on that point. Mr. Pennell had said he could produce many practical men who would support his view. That might be so, but he thought Mr. Pennell must be mistaken, as he (Mr. Buckland) knew a great number of oyster-breeders who would tell a very different story. Mr. Pennell had recommended legislation. He (Mr. Buckland) had had a good deal to do with legislation upon such questions, and he should most certainly say, not yet; we were unfit for it at present, and could not stand the cross-examination of a Committee. In conclusion, he wished to mention that the gentleman who sat beside him, Professor Mobuis, had made the tour of the oyster-fisheries of France, and had now arrived here to make a tour of those of this country. He trusted that the gentlemen present would offer him every assistance in their power.

Mr. F. Wiseman (Paglesham) said he disagreed with Mr. Pennell's opinion that the oyster scarcity was to be attributed to dredging. He had last year expressed his opinion upon the subject in a letter to *Land and Water*, and he saw no reason for changing that opinion. He quite agreed with Mr. Buckland that a high temperature was a desideratum. Here was an example in proof of this. The temperature of a well known river in Essex was, on June 10th, 1866, 72°, which was considered very favourable for the expected spat, the weather having been very hot for six days previously. This high temperature was followed by a frosty night, and on the morning of the 11th the temperature of the river was 62°, having gone down 10° in one night. The temperature continued to decrease until it got down to 58°. If the hot weather had continued there would have been abundance of spat. What was wanted during the spatting months was an even temperature. Before that time he had seen 140 spat upon one empty oyster shell, but after that time it was difficult to find one spat upon 140 shells. It had been urged that the scarcity of spat was owing to the scarcity of parent oysters, but when it was remembered that one oyster alone was supposed to produce 800,000, at first sight it might sound plausible. Such, however, was not the case. Where he resided there was an abundance of oysters and oyster brood on the beds, up to June, 1860, the produce of the great fall of spat in 1858 and 1859, and previous years, and yet, in 1860, with all that stock, there was not one spat seen in Essex or Kent. Surely there was no failure in this case for the

want of parent oysters. Besides, it was a well-known fact, that although the Whitstable and Herne Bay Companies had an enormous quantity of oysters, yet they had less spat than was found in Essex. He felt confident that the scarcity was not ascribable to a want of parent oysters or to over-dredging; it was simply temperature.

Mr. Harry Lobb said that the discussion very much reminded him of the quarrel in the fable as to the colour of the chameleon. For his own part, he agreed with every word Mr. Pennell had said. What he (Mr. Lobb) had laid before the Society on two previous occasions, together with later information, had been summed up by Mr. Pennell in his paper. It was well known that in England and France dredging had been going on to an enormous extent. The demand for oysters had been and was enormously increasing, and the supply had not been at all adequate; the result was, dredging had been going on, and, so to speak, the goose had been destroyed for the sake of the golden eggs. Perhaps the only fault to be found in Mr. Pennell's paper was that he did not give sufficient credit to what had been done at Arcachon. The results there, which he himself had seen, were, indeed, very remarkable, and he believed these results were brought about by leaving the bed unmolested. He had been told once, when there was a boat in quarantine, that during the time the flag was flying no dredging was allowed, and that when the flag was lowered the oysters were so thick that it was dangerous to mention numbers. With all due deference to the remarks that had been made, he was convinced that 20 per cent. could be saved if the spat were protected. The other recommendations which Mr. Pennell had suggested were most valuable, all of which he hoped would be attended to. He (Mr. Lobb) could not agree with Mr. Buckland regarding over-dredging; he believed it was decidedly injurious. The mass of evidence produced before the Commissioners was very defective. The Commissioners were, no doubt, very excellent gentlemen, but they had not studied the question practically. With regard to the remarks of Mr. Wiseman, it must be remembered that they were applicable only to a certain place, and did not apply to the Solent and other places where they had sea water.

Mr. Cholmondeley Pennell said that he did not know whether he did wisely in becoming a speaker instead of remaining a listener; but, as the letter of M. Souberron had specially referred to him, he thought it proper to say a few words. He had been accredited by the English government to the French government, to ascertain the state of the French fisheries, and the latter goverment had afforded him every facility; perhaps there were few men who had been placed in the same position with regard to the French fisheries as he had. He knew, therefore, that his information was accurate, and could not delude himself into the idea that his conclusions were incorrect. He entertained the greatest respect for the opinions of other gentlemen, but he failed to see how anyone could obtain better information on the subject than he had been able to obtain, from the position he occupied. He would be glad to be shown that his ideas on the subject were wrong. Hitherto, every attempt to prove his conclusions to be wrong had been in defiance of fair argument. No such thing as a comparison between the produce and expenditure had yet been shown. The result of investigation in France had shown that, up to the present time, the tile system throughout the coast of France had been a commercial failure. With regard to the other questions before the Committee, his hands were tied. His official position precluded him from taking further part in the discussion.

Mr. Woods said that as facts were perhaps more valuable than theories, he would state that Mr. Tomlin had, in one-fifth of an acre, laid down 340 oysters, and that the result had been 300,000 spat.

Mr. J. A. Youl would merely add a few words of encouragement. He hoped that nothing which had fallen from Mr. Pennell would in any way detract from the cultivation of a most wonderful, beautiful, and mysterious fish. He believed that the two things Mr. Buckland had mentioned were indeed elements of success. The peculiar phenomenon with regard to the two ponds alluded to by Mr. Hart was indeed very strange; but a similar thing was found with regard to the breeding of salmon; no doubt there were some reasons for it, and perhaps, if they were found out, it would lead to the discovery of the cause of the non-success of both oyster and salmon culture.

In reply to a question by a gentleman present,

Mr. Hart said that none of the oysters from his ponds had yet been in the food market, but they had been sent to France for the purpose of cultivation. They had spatted oysters in July, 1866 and 1867, and they would be brought to London during the present season.

The Chairman, in closing the discussion, observed that there was one thing upon which they would all agree, and that was that the paper and the discussion were both of great interest. Certainly, Mr. Pennell had not spared her Majesty's Commission, of which he (Mr. Caird) had the honour of being chairman, yet he had listened to those criticisms with all the respect due to one who had carefully considered the subject. That Commission was composed of some of the most distinguished men of the present day—Professor Huxley, for instance—but Mr. Pennell seemed to imagine there was a scarcity of practical men. If, however, any one would take the trouble to look into the Blue-book, and notice the mass of evidence therein, he would be convinced that the Commission had obtained the best evidence it was in their power to get. Perhaps the correctness of the opinion they arrived at might be disputed; but, at any rate, they had no prejudice. From what had passed at that meeting, he was inclined to think that the additional experience they had had, for the five years that the Commission had been in existence, could not be expected to give satisfaction to all parties, when during that discussion there had not been unanimity amongst any of the individuals who had spoken. As Commissioners, they weighed the evidence that was laid before them, and they endeavoured to do so without any prejudice whatever. They had come to the conclusion that it was better to leave the public beds alone, and that every protection should be given to those who employed their capital on private beds. These were the results they had come to, and from what he had heard at the meeting, he did not see that it was possible for them to arrive at any other decision. He believed that was the view taken on the subject, and he hoped it would continue to be so. He was sorry to hear from Mr. Cholmondeley Pennell that the culture of oysters, as far as regarded the tile system, had entirely failed. If that remark applied to the whole of the French system, it would be a bad thing for us. With abundance of protection in France, the result had been no better it seemed —nay, even worse—than in England with free trade. Although he was, therefore, in favour of this English freedom, yet he thought that, when an individual brought his capital, and cultivated on beds where other people might come and get the oysters, or, in fact, use his capital, then it was right for the law to step in and protect that individual. There were yet a great many very important things to find out. It was only by steps, slow but yet certain, that we could arrive at a proper conclusion. We were hardly ready yet to go to government to ask them to legislate upon the matter.

Mr. Pennell, in reply, said that he was very glad the Chairman had exonerated him from having expressed, with any undue strength, the opinions he held. The discussion having turned chiefly on artificial oyster-culture, with which his paper did not deal, he need not long detain the Committee, nor did he think it necessary to give the results of his own experience in artificial breeding. With regard to the depletion of the French fisheries,

his observations had referred solely to the natural beds, and not in any way to the results obtained under the new system of cultivating oysters on the foreshores, by means of artificial "collectors." Neither the results of the artificial system of England nor that of France affected his conclusions, which had reference solely to the great natural beds. He was glad to see that the Committee generally concurred in his views, and although Mr. Buckland did not attribute the scarcity of oysters to over-dredging, his opinion was unsupported by any proofs or arguments, and as he (Mr. Buckland) had already begun to change his heat theory, he might hope that next year he would come to the views he (Mr. Pennell) had expressed in his paper.

The following communication on the oyster beds of Arcachon, from Dr. J. Léon Souberron, Secretary of the Société Impériale d'Acclimatation, and Professor of l'Ecole de Pharmacie, was read:—

The imperial beds were made in 1860, under the direction of Professor Coste, in the basin of Arcachon, where they occupy an area of 26 hectares, divided into three beds, Grand Lès (ten hectares), Crastorbe (twelve hectares), and Lahillon (four hectares). They were made in places where oysters already existed, but in very small numbers, as at Crastorbe or at Grand Lès, or upon entirely exhausted grounds, as at Lahillon, and they began to produce oysters in 1862.* On the 1st January, 1868, the beds contained 34,000,000 oysters, that is to say, more than all the rest of the basin, distributed as follows:—

Grand Lès	15,000,000
Crastorbe	10,000,000
Lahillon	9,000,000
	34,000,000

The navy has been supplied, since the beds were made, with 14,311,102 oysters, of about the value of 111,000 francs. 100,000 saleable oysters, of the size 0·05 metre, make a cubic metre, weighing 2,800 kilogrammes; 148 cubic metres, weighing 103,600 kilogrammes, having been removed. Besides the oysters supplied to the navy, a certain quantity have disappeared from the bed, owing to the ravages of the dog whelk (*murex erinaceus*), and the effects of extreme temperatures.

The borers, which are found especially in the neighbourhood of collectors, and which destroy in a very short time a quantity of oysters, make their nest in a heap, near the old oysters. No mercy is shown by them. In 1867, 17,699 of these creatures, and 519 of their nests were destroyed. The separation of the young oysters (*detroquage*), which is necessary at a certain period, to allow an equal development of the oysters, which, without this operation, would inconvenience each other in their growth, is the cause of the loss of a certain number of oysters, a loss which is estimated at a tenth on an average; but since hydraulic lime has been substituted for ordinary cement for covering the tiles, this loss has been much diminished. M. Dauré's plan for placing wounded oysters in closed metallic tile cases, thus protecting them from the attacks of such enemies as crabs, small mollusca, &c., also much lessens the loss from separation (*detroquage*). The cold, which before the winter of 1867 had caused the death of about 3,000,000 oysters, continued its ravages in 1868. The temperature was so low that portions of the bottom (*crassats*) uncovered at spring-tides looked like small icebergs, and the consequence was that entire hectares perished. Then came heat, which was not in the least prejudicial (the temperature rose to 40° in the shade upon the *crassats*). The loss for the year 1868 was estimated at 10,000,000 oysters.

The navy that year was to have been supplied with 4,750,000 oysters, a number greater than the entire basin furnished, which was estimated to have produced 3,216,320 oysters, sold at the rate of 3,000 francs a million. To meet the orders which were received, it would have been necessary to dispose of all the saleable oysters, and even to furnish a certain quantity of less size than ·05m. in diameter. Such orders are evidently too heavy, and if they be continued the beds will be exhausted, though up to this time they have produced sufficient for the supply, but they are not inexhaustible; nevertheless, the navy has just forbidden the sale of oysters under ·05m. in size. It would be also desirable to stop the moving of breeding oysters before the 15th of March, so as not to subject the animals to the fatigue of the voyage, just as their organism was preparing for reproduction. Disappointments would thus be avoided, as those of Tremblade and the Mediterranean.

At the present time, in consequence of the above causes, there are now only remaining in the Imperial beds 12,000,000 oysters, of a size of from ·02m. to ·07m., besides 15,000 breeding oysters, which must be kept at any price; their loss would be irreparable. If these breeding oysters are taken, it would be like killing the goose for the golden egg.

To counteract the unfavourable effects of bad years to the spat, and the result of over-dredging, it has been proposed, and wisely so, in our opinion, to suspend taking the oysters for three years. For if the season of 1869 be productive, the brood not being separated till 1872, there will not be much loss from this operation, and this brood will almost completely effect the stocking of the oyster beds; if, on the contrary, 1869 be unproductive, as was the summer of 1868, there still will be time to hope that in 1872 there will be a better result, in not being obliged to separate the oysters at too young an age. The production of spat in the Arcachon Basin, which was small in 1867, in consequence of the severe storms which prevailed in the months of July and August, has been nothing, in consequence of extreme heat, excepting in the Imperial bed of Lahillon, the real breeding place, where 750 tiles have furnished 795,000 young oysters, and whose total produce is valued at 200,000 oysters. This year, in the Imperial beds, 200,000 tiles have been placed, covered with hydraulic lime, 5,000 tubes similarly covered, and 400 hurdles, half of which only were prepared with lime. The production has been:—

	1865.	1866.	1867.	1868.
Grand-Lès	5,890,000	700,000	200,000	..
Crastorbe ..	1,834,000	20,000	20,000	..
Lahillon ..	6,000,000	2,500,000	900,000	2,000,000
Total	13,724,000	3,220,000	1,120,000	2,000,000

In the Arcachon Basin there are 116 grants, occupying an area of 370 hectares. Some of these grants are very renumerative (certain persons who have them acknowledge a net receipt of 1,000 to 1,500 francs the hectare annually). A few only give a moderate or bad result, but that may be attributed to faults in their management. Since new grants have been made on the tidal bottoms of Lahillon, round the Imperial bed, which is the centre for re-stocking all the beds, which receive in part a great quantity of spat from the breeding oysters, these grants have answered, to those who have money to make the necessary outlay for the management of the beds, and who are on the spot and can exercise an active superintendence. At oyster beds, the master's eye is indispensable.

The production is generally less there than in the Imperial beds, but it is much greater when the practice of the Imperial beds is followed. The results must become better as soon as more grants are made. For the clearing operations, on a larger and larger scale, will, in the same

* The Report on the Oyster Culture at Arcachon, presented to the Société d'Acclimatation, the 29th December, 1865, should be consulted (*Bulletin de la Soc. Imp. d'Acclim.*, 2nd Serie, iii, p. 1, 1866.)

proportion, clear the basin from star-fish, destructive to young or old oysters, and will diminish the increase of *Murex erinaceus* (dog-whelk). Mud kills all in the basin, therefore dredging the channel is desirable; it will increase its healthiness, and allow a large amount of oysters to be secured; but this can only be done by the State whose property the channel is.

The results obtained in the Imperial beds have given a fresh impetus to the breeding of oysters; and oyster-culture, which was the monopoly of the State in the basin, has become more general during the last few years. Unfortunately, there was no increase in 1868; this frightened several proprietors, and they sold their grants, when, by a little perseverance, they might have had a remunerative return. On the other side, we regret to say, the idea of granting beds has been thought of—that is to say, special beds for the fishermen. It has been thought that this system will give greater facilities to the fishermen to guarantee their existence. But it has not been taken into account that the time when the beds require more particularly the care of the fishermen is when the fishery gives the greatest profits to the fisher, who is not disposed to sacrifice the means of realising money directly to the improvement of his bed, which will be only profitable at a certain time. It must be acknowledged that oyster-culture and fishery cannot be carried on at the same time. The establishment of small parks, to different proprietors, around large concessions, is the better plan, for each grant is surrounded by several small beds, on which the proprietors, not being able generally to look after their oysters at the proper time, leave them without care, or more frequently sell them, without attention to the conditions of their contract with the government. Moreover, certain amongst them are accused of robbing the neighbouring beds during the night, and of having organised the pillage of them.

Oyster-culture is not getting on badly at Arcachon, and it will get over some of those vicissitudes which are sure to be met with in all human undertakings. We were much astonished to read, in the reports on the "Oyster and Mussel Fisheries of France, with the applicability of the French system to British waters," by Cholmondeley Pennell, Esq., Inspector of oyster fisheries, that oyster-culture in France is dead or dying. We cannot explain what this gentleman means, unless he was informed about the beds by persons who were not in a position, as those who had the management of them would be, to tell him the facts. We cannot in particular accept Mr. Pennell's definition of the natural and artificial culture of oysters, which, according to him, do not differ; for, in the latter case, use is made of earthen collectors, which are not employed in the former.

In our opinion, the culture so-called natural, that is to say, cleaning the surface of the beds and depositing there, at a favourable time, a sufficient quantity of oysters for breeding, placing stones and shells to receive the spat, does not differ from the so-called artificial oyster-culture. Moreover, it is an undeniable fact, that the above care was not taken in the Arcachon basin, till M. Coste made known his process of culture.

An objection is made to the tiles being too dear, and it is said their cost is not covered by what is produced; but if that be true, how can it be explained that the people who have the grants, have asked permission to place round the Lahillon beds 100,000 tiles, to receive the spat on them, and then to remove it into their own beds, and, on the other side, at Lahillon, in 1865, 7,500 tiles produced 1,500,000 spat, of the value, in three years, at a saleable age, of about 50,000 francs; the cost of the tiles was about 400 francs, which appears to us a very satisfactory result. Another fact in favour of tiles is, that the government has ordered to be given to the fishermen who have the grant, several thousand of these tiles covered with spat. The average quantity of spat on the tiles in 1867, a bad year, was forty oysters; in 1866, a better year, three hundred on the tiles at the bottom, and twenty-eight on those at the top of the *ruches* (piles of tiles).

We cannot believe in the difficulty of cleaning the tiles, inasmuch as, before using them to receive the fresh spat, they must be covered with a coating of cement, which makes them like new.

As to the practice which some persons have of ceasing to use the tiles in their beds, as their agreement obliges them, the conclusion is that it is prompted by their negligence in placing them entirely covered by the tide, instead of so as to be out of water at spring tides, which gives marine organisms the opportunity of fixing themselves, and taking the place of the spat. We must remember that the only place where spat was found in 1868 was the bed of Lahillon, where true artificial culture is carried on, and where 2,000,000 young oysters were gathered. All this shows that the persons who informed Mr. Pennell gave him wrong facts, and we regret that he was not able to consult the official documents, which would have been communicated to him with the same liberality as to ourselves, and would have proved that oyster culture is not to be despaired of.

We must also remark that the process called English by Mr. Pennell, which consists in cultivating the spat in closed reservoirs, has been in use here for several years, in the *claies* (screens) at Marennes by M. Coste, at Règneville, by Mdlle. S. Felix, and by M. C. De Greny in Bretagne.

Twenty-second Ordinary Meeting.

Wednesday, May 12th, 1869; Earl Ducie in the chair.

The following candidates were proposed for election as members of the Society:—

Black, John Thomas, 9, Adelaide-road, N.W.
Broadwood, Walter Stewart, 3, Queen's-gate-gardens, South Kensington, W.
Couch, Enos, 172, High-street, Wapping, E.
Hart, G. W., Hayling Island, Hants.
Lacey, John, 4, Wellington-street, London-bridge, S.E.
Lange, Daniel A., 21, Regent-street, S.W.
Pamphilon, Frederick W., 5, John-street, Adelphi, W.C.
Ramsden, J. C., Little Horton-lane, Bradford, Yorkshire.
Robinson, Edwin, 76, Worship-street, E.C.
Yapp, George, 172, Oakley-street, Chelsea, S.W.
Young, John, 35, King-street, Cheapside, E.C.
Young, William, 47, Hemingford-road, Barnsbury, N.

The following candidates were balloted for, and duly elected members of the Society:—

Barnard, Clement, 2, Staple-inn, Holborn, W.C.
Beadel, Frederick, 25, Gresham-street, E.C., and Gidea-hall, Romford, Essex.
Brogden, Jas., Tondu-house, Bridgend, Glamorganshire.
Bunbury, Sir Charles J. F., Bart., F.R.S., Burton-hall, Bury St. Edmunds, and 48, Eaton-place, S.W.
Burch, Sampson Kingsford, 239, Vauxhall-bridge-road, S.W.
Burke, William Henry, 17, Newman-street, Oxford-street, W.
Cather, Rev. Robert G., LL.D., 8, Old Jewry, E.C.
Chatto, W. J. P., 23, Carlton-house-terrace, S.W.
Church, Jabez, Hamlet-house, Chelmsford.
Clarke, Rev. C. Pickering, M.A., 3, Adelaide-street, Strand, W.C.
Clarke, Joseph, 2, Earl's-court-road, Kensington, W.
Clarke, Robert G., 3, St. Alban's-road, Highgate-road, N.W.
Clover, Joseph Thomas, 3, Cavendish-place, Cavendish-square, W.
Clow, Leonard, 9, Fitzroy-street, Fitzroy-square, W.
Corderoy, George, 17, King William-street, Strand, W.C.
Corrie, J. M., 42, Lancaster-gate, W.
Crespin, Edgar, 28, Torrington-square, W.C.

Firth, James, 27, Shepperton-cottages, Islington, N.
Hackforth, Henry, 9, Bentinck-street, Manchester-square, W.
Vivian, William, Roehampton-lodge, Roehampton, and 51, Bow-lane, E.C.

The Paper read was—

ON THE VENTILATION AND TRAPPING OF DRAINS.

By James Lovegrove, Esq., Assoc. Inst. C.E.

The subject embraces the ventilation of drains, the trapping of gullies, and the various modes adopted for preventing sewer air passing out of gully and drain inlets.

The author of this paper has been led to attach considerable importance to the subject of drain ventilation, in consequence of having, in many instances, observed in houses where sanitary works had been carried out a larger amount of effluvia after the execution of drainage works than existed before. He therefore purposes, in order that the subject may be fully and fairly put before the Society, to refer to the various means by which sewage matter has hitherto been conveyed from houses; to notice the effect upon the air in drains of discharging sewage matter into them; to suggest a new mode of ventilation; and also to consider the means usually employed to prevent the escape of sewer-air through gully and drain inlets.

Some twenty or thirty years ago, public sewers were permitted to receive waste and refuse waters only, the closet drainage being carried into cesspools. The wash-house sink discharged the waste on to the surface of the back yard, by a pipe which passed through a hole in the external wall; the other waste water flowed along an uncovered drain beneath the floor of the house, and thence over the surface of the footway into the side channel of the street, so that, at all times during the day, a dirty stream of sewage might have been seen flowing along the channel. The exhalations from the uncovered cesspool, from the soaked and saturated materials of the uncovered drain, and from the exposed stream of sewage in the street, were most offensive. A covered sewer along such a street was next introduced. Gradually, covered drains were constructed beneath the houses, and connected with the new sewer, but with untrapped inlets, and untrapped gullies were also formed in the street channels, to carry off the surface water. Thousands of cesspools were next connected with the sewer by overflow drains, and these allowed the effluvia therefrom to escape through the inlet opening, and caused a nuisance as great, or nearly so, as existed under the original state of things.

The next step was that of abolishing cesspools, and fixing pan-inlets, in direct connection with the drain leading into the sewer. The result was, that although the nuisance arising from the cesspools had been removed, the effluvium escaping through the untrapped drains and gullies was increased tenfold. The cesspool had been a long-standing abomination before the water-closet was thought of as the readiest way of getting rid of the nuisance. But this remedy, though so universally adopted, should be regarded by all as one of a palliative character only, as it not only causes the pollution of our rivers, but requires more than half the water supply to keep the closets clean. It is, however, hoped that modes of collecting the excreta and the most valuable portion of town sewage, without destroying their valuable properties, will, ere long, be introduced, and that the sewers will simply be put to their original use of receiving waste and refuse waters only. The dry earth closet may be a step in the right direction, and should receive a fair trial, in spite of the few difficulties which have to be met with at the outset.

In inquiring into the causes of air currents, either from or within drains, it is suggested that the variable flow of sewage has a powerful influence on the air within the drain, whilst that produced by rainfall has still greater, and the variations of temperature are another cause of displacement and renewal of drain air. The Table shows a series of observations taken at the

No. of observations.	No. and sizes of drains.					Velocity in feet in five minutes.		Ingress or egress.	Remarks.
	18 inches.	15 inches.	12 inches.	9 inches.	6 inches.	Minimum.	Maximum.		
170	...	...	...	27	...	50	200	ingress	
	...	...	...	1	...	...	1,000	ingress	
	...	...	...	1	...	...	1,650	ingress	
	...	...	...	14	...	50	100	egress	
	...	...	...	1	..	...	250	egress	
	...	...	...	1	...	...	400	egress	
	...	...	...	125	...	...	...	...	quiet
48	...	...	...	...	11	50	100	ingress	
	...	...	...	...	8	50	1,600	egress	
	...	...	...	...	29	...	...	...	quiet
12	...	...	2	...	...	50	50	ingress	
	...	...	2	...	...	100	100	egress	
	...	...	8	...	...	...	...	...	quiet
8	...	2	...	...	...	50	100	ingress	
	...	1	...	...	...	...	150	egress	
	...	5	...	...	...	...	...	...	quiet

outlets of drains, at the point of connection with the sewer. They were taken by Biram's anemometer, and the results show that up and down currents of air are constantly passing to and fro. Whenever an up-current issues through a drain opening, it must be manifest that some of the inlets of such drains are untrapped, and, therefore, sewer air must be escaping through such untrapped inlets, to the danger of those who reside in the house. In the construction of gully inlets there are two principles which should be strictly observed, viz.:—

1. To prevent, as far as practicable, the entry of road detritus into the sewer.

2. To prevent the escape of sewer air through the inlet.

Various methods have been adopted. Twenty different forms of traps in general use are all dependent on being constantly charged with water, and may be easily proved to be inefficient for the purposes for which they were designed, and for these reasons should be condemned. The sewer air is separated from the atmosphere by the ¼-inch of water, or at the most an inch, and a few days' dry weather is sufficient to untrap most of the gully inlets, as the water quickly evaporates to below the syphon dip. This evaporation is aided, in many cases, by the absorbing power of the materials with which the inlets are constructed, and also by matters falling into them. These gully traps are often fixed in a narrow street close to the open doors and windows of the houses, and are it is feared, in many instances, the cause of much ill-health. Traps constructed on this principle have been observed by the author in an untrapped condition, in Derby, Leicester, Windsor, and other places. Another form of trap, largely used for street gullies in the metropolis, is known as the shackle-flap, sometimes fixed at the end of a twelve or fifteen-inch length of pipe, and sometimes in the form of a square block. The flap and its seating form two plain metallic surfaces, and it therefore does not admit of partial separation of the surfaces, as the smallest possible opening made by the overflowing water separates the surface throughout, so that, while the water is flowing through the lower part of the valve, the sewer air escapes through the upper part. The flaps are sometimes fixed at the point of connection with the sewer; their action has been tested where thus fixed. A lighted candle has been held at the sides of the flap during the passage of water through the gully, and a strong current of sewer air was found passing through the upper part of the flap during

the period of flow. The system* adopted by the author is constructed on the two principles hereinbefore mentioned, and forms a combination of the syphon-dip and shackle-flap. It is made in two forms; one form having the appearance of a bent tube, nearly semicircular in shape, and inserted so that one end of the tube, called the syphon-dip, dips into the cesspit beneath the gully grating, and the other discharges into the outlet, the valve-flap being fixed within the tube. The other form is that of an oblong block of stoneware, having a six-inch opening formed diagonally through it, so that the valve on the outlet side is from one to two inches higher than the opening in the block on the cesspit side, both on the same principle, but in different form. The syphon-dip prevents the escape of sewer air through the upper part of the shackle-flap during the period of flow, and the flap resists the upward pressure of the sewer air, thus effectually sealing the inlet. The pressure of the sewer air within assists in closing the flap, whilst the pressure on the inner face by the atmosphere opens the flap, and allows a refreshing current of air to pass into the sewer. This current is generally so strong as almost to blow out the light when placed near to the flap, and should be maintained, but so as not to admit of the escape of sewer air.†

The escape of sewer air into houses gave rise to the adoption of various forms of traps. For drain inlets, I believe the first trap used was the dip-trap—a brick cesspit formed usually about eighteen inches square and six inches below the drain, the inlet on one side being separated from the outlet on the other side by a division of stone, slate, of iron, made to dip about an inch into the water of the drain. The well-known common syphon was an improvement on the old dip-trap for the main line of drain, and in a ventilated drain these are efficient, inasmuch as, from one source or another, they are always charged with water. This form of trap is used by the author in combination with an air tube and valve, the latter acting as a ventilator. The principle of the water-dip has been put into various forms for drain inlets, but they all are dependent on a very small thickness of water for their action, and are quickly untrapped by evaporation, and then the result is precisely the same as if there were no trap at all. The common bell-trap is more frequently met with than any other form of trap. The mere film of water at the rim of the inverted bell is supposed to prevent sewer air passing through, but, generally speaking when the sewers are in the most foul condition, that is, in the summer season, the required film of water is not in the trap, and it then forms a sewer ventilator. A piece of house-flannel, cotton, or other similar matter entering the bell-trap inlets, will often hang partly in the bell basin and partly out, and, by syphonic action, quickly draw off the water to a level below the rim of the inverted bell. These traps exist in almost every house, and are the cause of a large amount of illness. These remarks are applicable to all the forms of trap dependent on a constant film of water for their action, which are, consequently, not reliable. The following examples have occurred in the author's practice:—At a nobleman's residence in Leicestershire, the smell of sewer air was perceptible throughout the bedroom floor. The closet appeared to be well constructed, and a very good apparatus fixed; the walls were cased with mahogany panelling, beautifully polished; but the smell was intolerable. The flame of a taper, applied to the top edge of the casing, indicated a strong current of air, also at several open joints in the wood-work. The casing was removed, when a 4-inch lead waste-pipe, leading from the cistern, and having a syphon-dip, was exposed. The pipe passed through an opening, much too large for its size, cut in the side wall, and thence into the cistern. The flame of the candle indicated that a strong current of air passed into the closet through this opening, and by the waste-pipe into an ante-chamber, and thence into the bedroom. The syphon was then pierced with an awl at the lowest point, and the candle-flame applied, when the current of air, passing through the perforation proved the syphon perfectly dry. The water-mark of the cistern showed distinctly that no water had reached the top of the waste-pipe for months. The waste-pipe was at once removed, and an overflow-pipe fixed, to discharge on to the roof gutter, in lieu thereof. Smells also arose from a number of dry bell-traps around the house; these were removed, and improved traps fixed in their place. The drain was also ventilated by means of an iron pipe, carried to a height of about 40 feet, and a supply of air obtained by fixing an air-supply valve near the outlet of the drain. These measures effectually prevented any smell escaping into the house. Another case was that of a house situated in Moorgate-street, City, the basement being occupied by the housekeeper as a living-room. On examination, the drain was ascertained to be in direct communication with the sewer, with a common bell-trap, which was dry, in the front area; another dry trap in the back kitchen, in the centre of the stone floor, giving out a strong current of sewer air; the raised sink had the usual bell-trap, but the bell was off. The effluvia arising from these sources passed up the staircase, also through several defective portions of the plastered ceiling, and corrupted the air of the whole house. On the upper floors of this house there were two water-closets, a lavatory, and a urinal, each discharging, by three separate branches, into a 4-in. vertical soil-pipe let into the wall. The lavatory basin emptied itself through an inch lead pipe, 20 inches in length, bent so as to form a trap. But when either of the water-closets was worked, the water in this trap was drawn off. The plumber had been again and again, and persisted in asserting that all was perfectly correct. Notwithstanding the plumber's statement, all was wrong. The bell-trap of the lavatory on the top floor was acted on in the same way. In this case, the author had the old brick-drain taken up, a pipe-drain laid down, and improved traps fixed to the sink-inlets. The sewer air was shut off by fixing a trap near the outlet, and the drain ventilated by means of an inch tube passed above roof height, and at a point remote from the chimney. An air-supply valve was fixed so as to produce a through current of air within the drain.

In a public hospital, near Portman-square, a brick-drain in direct connection with the sewer, passed sewer-air inwards so strongly as to blow out the flame of a candle. This drain continued through the building, and received in its way the raised sink-inlets, also the drainage from the lavatories, sinks, and water-closets on the upper floor. In this case, when water was passed from one or other of the inlets, it caused the contained air first to press against the water in the inlet water-traps, and, on reaction, to draw off sufficient water to untrap the inlet. Thus, through one or other of the inlets, air was generally escaping into the house.

At a large house in Piccadilly, the town residence of a nobleman's family, there were no less than 17 sink-inlets distributed about the basement, in the area, passages, and paved rooms. Ten out of the 17 were in an untrapped condition, the water contained being insufficient to seal the inlet. In the scullery, the bell portion of a 6-inch trap was found lying a little distance from the inlet, allowing a very strong current of sewer-air to escape into the room, and thence through a shaft opening, formed for ventilation, in the upper part of a window over the sink. This shaft again discharged it about two feet beneath an open window of a room which was in frequent use by the family. There were several water-closets and lavatory sinks on the upper floors, which were constantly untrapped by the action of the water-closets.

Again, at a gentleman's mansion at Hendon, there were 26 untrapped inlet sinks about the house, passages,

* A lithographic sheet of diagrams, illustrating the system, will be issued with next week's *Journal*.

† Gully and drain traps on this system are made by Mr. Jennings, of Lambeth.

and yards; of these, 12 were not sufficiently charged with water. On entering the dairy, the smell was almost intolerable, and this was caused by a dry bell-trap fixed over the drain, in one corner of the dairy floor.

Then at a house in Duke-street, Manchester-square, a dry bell-trap was found immediately against an air-brick fixed in the front wall, and one also against an air-brick in the back wall. Openings were also found in the floor of the basement, in connection with the air bricks, through which the sewer air entered. The raised sink was also untrapped. Then, at the top of the house, a rain-pipe was observed within three feet of, and below, an open window belonging to a bedroom; the rain-pipe received the discharge from a water-closet on the top floor, and was in direct connection with the drain. A very strong current of sewer air was discharged through the top of the rain pipe, and passed by the window into the room. These cases are given to show the practical defects of the present system, and the author could mention, if it were necessary, a large number of other cases of a similar character.

In further considering the action of drain-traps, we will refer to a drain trapped at its outlet with a shackle-flap, and the several inlets trapped with the ordinary water-traps. When water is poured into a drain thus constructed, the result depends in a measure on the relative weight of the shackle-flap at the outlet as compared with the resisting power of the water-traps. If the flap be lighter, the pressure exerted on the air, contained in the drain by the in-flowing water, will act on the inner face of the flap, force it open, and discharge a bulk of air into the sewer. Then, while the water is passing through the lower part of the flap, the sewer-air will enter by the upper part, and thus the drain will be filled with sewer-air, even while the water-traps are full. If one of the inlet-traps were unsealed, the air would pass through the unsealed trap instead of into the sewer. If the shackle-flap be the stronger resistant of pressure, the water poured into the drain will act on the surface of the water in the weakest of the water-traps, and impart to it a rocking motion, causing part of it to flow out of its basin. The atmosphere will also press on it, in the endeavour to take the place of the out-flowing water, and thus untrap the inlet, so as to allow sewer-air to enter the upper part of the shackle-flap during the period of flow. Then, if the outlet-trap be a common syphon, or the old form of dip-trap (which in principle are both precisely the same), then the sewer air will be entirely shut off, but the force of displacement of the contained drain-air will most likely enter the house through the kitchen sink, as the air of the drains must escape somewhere, under the pressure of in-flowing water. Into such a drain, the more water there is thrown into it, the more effluvia will escape. The slimy coating also of the interior of a long length of drain, is of itself sufficient to contaminate the contained air, no matter what fall the drain may have. In the methods just described, the one idea has been an unsuccessful endeavour to stop the opening from which the smell escaped, without inquiring if this or that opening is stopped, what will become of the foul air, what new state of things is produced, and what are the influences actually at work. Certain it is that the mode generally adopted of trapping inlet-drains, favours the escape of sewer air into the houses.

Now, all that has been stated suggests that, in the trapping of drains, there must be provided—

1st. A ready and proper outlet for the escape of the drain-air when under pressure.

2nd. A means of supplying air to the drain, to follow the out-flowing water.

3rd. Such a construction of the inlet-traps as will effectually prevent the escape of drain-air.

The way in which these three principles may be applied is as follows:—The outlet-trap is fixed at or near the point where the drain is connected with the sewer, and is made in one piece, with a syphon dip, to shut off the sewer air, and an air exit-tube passing over the syphon dip. Then, at the mouth of the air-tube a light metal air-valve is placed, so as to open outwards from the tube into the sewer on receiving a light pressure from within. Thus, when water is discharged into the drain, or a decided difference of temperature exists, the pressure of the air is exerted on the inner face of the valve, which then opens, and allows the drain-air to pass into the sewer. The syphon dip, without the shackle flap, is admissible at the outlet of a ventilated drain, as it is always charged with water. Then, at the several inlets are fixed valves to work freely, with syphon dips behind them, excepting the water-closets and scullery-sinks. The valve shuts off the drain air whether there is water in the trap or not, and the syphon dip prevents the escape of drain-air, during the period of flow, through the upper part of the valve. No amount of pressure from within the drain, or atmospheric influence from without, can affect the efficiency of these traps. Next, in any part of the drain (near the extremity is best) is placed an air-supply post, containing a light air-supply valve, which opens inward to the drain on a light pressure so that when the water emptied into the drain (having first displaced air through the outlet air-valve) flows out of the drain, it is followed by a supply of air through the air-supply post. The more water discharged into the drain, the more frequent will be the removal of air. In the application of this principle to a drain having inlets at a considerable elevation, in lieu of the air-escape at the outlet traps, an air tube is carried from the highest point of the drain to a height as far as possible from the windows and the influence of chimney down-draught. The inlets are secured by the same mode as that just previously described, a common syphon at the outlet, and the air-supply valve fixed near the outlet of the drain. By this mode a current of air is obtained from the lower part, passing through the drain, and discharging above the roof. In many instances air supply is obtained freely through the valve sink-inlets.

In the case of a house-drain connecting into a pipe-sewer, in order to obtain a ready access to the air-valve and syphon-dip, the air-tube is continued on to the surface side of the dip, where it receives a box, containing the air exit-valve. The air-tube thence continues down to the outlet-side of the dip, and the air is discharged into the sewer.

The form of sink made for a garden-sink is adapted for yards, areas, stables, gardens, cellars, &c. A cheaper one for cottages is made in stoneware, with spigot-ends at the valve-mouth to fit the socket of an ordinary drain-pipe, and finished with a socket-flange at the top, to receive a perforated iron or stoneware plate; the workman laying the drain can thus complete his work without sending for the bricklayer, labourer, bricks, and cement, to form the receiver usually constructed beneath a bell-trap or 5-hole sink.

The form used for stables and large yard-surfaces is made wholly of iron. An iron nozzle-piece is attached to the outlet, forming a spigot-piece, and is made to fit into an ordinary socket-pipe.

Scullery sinks are very difficult things to secure, because of the rapid accumulation of grease. Valves are inadmissible, except in the form of a gully-trap and receiver, which are found to be safe and effectual. The pipe from the sink should, in that case, be continued so as to dip into the receiver. In small scullery-sinks a deep form of garden-sink, without the valve, would be much cheaper, and is found to be effectual. The valve is also unsuitable for a closet-inlet, as the paper clogs the valve, and the syphon-trap of the closet is never dry, and is not subject to variation in a ventilated drain.

A few words on the subject of water-closets. It is as well to state some objections to the form of closet in general use. The well known valve-closet, formed by a valve about two inches in diameter, closing at the lower part of the pan, is liable to leakage at the valve, and, when this occurs, the corrupted air contained in the iron chamber beneath escapes into the house.

A large number of copper and zinc pan closets are in use. We have first the stoneware basin, then a swing pan of copper or zinc, then a large iron pan beneath these, and this iron pan has a surface of metal coated with foul matter equal to $4\frac{3}{4}$ ft. and in contact with the external air. The common closet pan contains one-third of a foot super., but the most cleanly closet I have met with is one made by Mr. Jennings, which was in use at the last Great Exhibition, exposing a surface of $1\frac{1}{8}$ ft. only in contact with the soil, giving off the least amount of effluvia. A common 7s. 6d. stoneware pan is preferable by far, in the matter of cleanliness, to many of those costly contrivances that are in daily use.

In conclusion, I hope the importance of this subject will be an excuse for the length of this paper.

DISCUSSION.

The Chairman said that the subject of the paper, although somewhat unsavoury, was really of vital importance, and none the less so that a great deal more attention was generally paid by engineers and others to the treatment of sewage itself than to the gases to which it gave rise. Mr. Lovegrove, however, had treated of air, which might be either man's best friend or one of his most dangerous foes, and had shown that it was not exempt from one of the conditions of humanity, inasmuch as it was exceedingly liable to be contaminated by evil communications. It had been shown that there were many schemes, of, he might almost say, diabolical ingenuity, for admitting to houses, under the guise of fresh air, that which really came from the immediate neighbourhood of the most corrupt materials, and that many of the sanitary improvements of recent times had led to evils before unknown. Great trouble and expense had been gone into in London in connection with a system of main drainage, which was the most magnificent, probably, in the world, but it must be borne in mind that the strength of a chain was only that of its weakest part, and while the main sewers were on so grand a scale, the system of house drainage was often radically defective. The appliances, therefore, which had been described by Mr. Lovegrove, for remedying these defects, were particularly valuable, if, as seemed to be the case, they were efficient. He thought that in the discussion the distinction should be borne in mind between the ventilation of the sewers and that of house drains. It was to the latter that Mr. Lovegrove's paper principally referred.

Dr. Alfred Carpenter, who had paid particular attention to the subject of the ventilation of drains for many years, could not agree with all the principles laid down by Mr. Lovegrove, because they seemed to go to the end of endeavours to keep in drains that which wanted to get out of them. The true principle of ventilating sewers was to let out everything, and abolish all traps in connection with houses, except those communicating with the waterclosets, which were necessary. His attention had been drawn to this subject through observing, as a medical man, the enormous amount of evil arising from the introduction of foul air into houses, and ultimately, he believed, he had been able to show how proper ventilation of sewers might take place, so as to leave the houses and drains perfectly safe, without any of the ingenious contrivances which had been displayed. Looking to nature as a guide, they found that in a tree or in an animal there were innumerable openings by which the foul gases which were generated were thrown out of the system. The true principle was to prevent the production in the sewers of the foul atmosphere, which was to be accomplished by keeping a continual current of fresh air running through them; and in this way, and this only, would they be safe, because, however perfect might be a system of traps, valves, as they knew, were always liable to get out of order, especially when they came in contact with the materials that passed through drains, and then there was an efflux of foul air. The principle he contended for was the prevention of foul air being formed in the sewers, by providing abundant openings for the admission of fresh air, by which the foul air would be oxidised or neutralised as soon as formed. There should be no communication between the house and the drain, except in the water closet, and the soil pipe should be carried up as straight as possible above the roof; there would then be no pressure on the water valve, nor any entry of foul air into the house. This principle had been carried out by a Local Board of Health, with which he was connected, within the last few years, and with the most perfect success. The openings from the sewers should, of course, be provided with charcoal to neutralise the foul air without any danger to the inhabitants in the neighbourhood. These openings might be placed at intervals of 50 or 100 yards, and by this means all stagnation of air in sewers would be prevented. The same principle was applicable to mines, where it was found necessary to keep up a constant current of air.

Mr. Varley was of opinion that too many outlets were made from the sewers; he believed that whatever quantity of air passed into the sewers would be contaminated before it came out again, and, therefore, the fewer openings the better. There must, however, be some escape, and for this purpose he proposed to have flues at certain intervals, conducted up to a height above the roofs of houses, and, where possible, in contiguity to a chimney where there was always a fire burning, so that the warmth might ensure an upward draught. The "commissioners' openings," as he termed them, in the crown of the sewers, should then be stopped up.

Mr. Campin said it had been proposed to ventilate sewers by means of ornamental iron lamp-posts, and this arrangement had been made in the new street in Southwark. He did not know whether or not the foul air would tend to put out the gas, but, if not, there would be a ready means of producing a draught by the same kind of action as that of the furnaces used for the ventilation of mines.

Dr. John Tripe said there could be no doubt that the best system of ventilating sewers so as to prevent injury to the public health was to let in as much fresh air as possible, and change it rapidly. Nothing would be better than the system proposed by Dr. Alfred Carpenter, if it could be carried out, but unfortunately this was not the case, and they must deal with matters as they actually were. Most persons would agree that if they were going to reconstruct the whole drainage system, there should be no direct communication between the sewers and the houses except the water closets; in fact, the surface-drainage should be altogether separated from the closet-drainage, and by this means small pipes would do instead of the enormous sewers now constructed; but this was not their position. Those who, like himself, were constantly engaged in sanitary work, and had to investigate the cause of the presence of foul air in dwellings, must be aware that, in a great majority of cases, the evil arose fom some defect in the traps, such as had been described in the paper; and there was no doubt that a vast improvement would be effected by the introduction of the syphon-trap or something similar in house-drains, particularly at the sink. When he took the house in which he now lived he was told that it was thoroughly trapped, but in a few days the stink was abominable, and, on examination, it was found that there was no syphon to the trap underneath the sink; one was put there, and the smell ceased immediately. This defect was very common in kitchens, and was the cause of an immense deal of mischief. He quite agreed that, if it were possible, all sink drainage should be carried off to an open yard, thus avoiding direct communication with the sewers; but this was impossible in the vast majority of houses in London and elsewhere, where the kitchens were below the ground level, and therefore it was necessary to adopt the best system of traps which could be devised. He had not seen any-

thing to equal some of the plans which had been described that evening; and he could speak from his own practical experience that they answered the purpose for which they were intended.

Mr. Botly said he was not so conversant with the subject as to be able to judge of the superiority of one plan over another; but, from his own experience, he could illustrate the great importance of the question. Some years ago he was for some time honorary governor to an hospital in the West of England, in which there were four wards. One of these wards had been for many years subject to skin diseases and erysipelas, and at length a committee was appointed to investigate the matter. It was then found that the closet drains from nearly the whole building went along the wall of that particular ward; this was altered by the introduction of some such arrangement as had been described to them, and there was scarcely a case of erysipelas or cutaneous disease afterwards. It was often found to be the case that skin diseases were very prevalent in houses where the drainage was defective, and, therefore, too much attention could hardly be paid to the subject.

Mr. Baldwin Latham remarked that the paper which they had heard was rather on appliances by which drains were trapped than on their ventilation. There could be no doubt that the secret of success of the water-closet system of town sewerage depended on the ventilation of drains and sewers, but much more mystery was made of this subject than necessary, many persons conceiving that it could not be carried out without some special appliances for furnishing fresh air, or exhausting the sewers of foul air, but no greater mistake could be made. From the very nature of sewage action there was a constant fluctuation in the supply and flow of matter through the sewers, which might be running at one period of the day three-quarters full, and at another only one quarter; and this fluctuation might be made the means by which perfect ventilation could be secured. Of course the augmentation of the flow caused a displacement of the air, for which an escape must be found somewhere, and, as the flow declined, fresh air would come in to supply its place; so that if this were only encouraged by making a sufficient number of openings, which must be supplied with ventilators for oxidising or deodorising the foul gases, a perfect system of ventilation would be secured. The general plan, on the contrary, had been to trap every possible opening into the sewer, and to lead the sewer to a point below the water-line of the river; this was just like draining into a bottle. If at one period of the day the sewer was nearly dry, and at another half full, the result would be a quantity of foul gas condensed to the extent of one atmosphere, which must find an outlet somewhere, and all the traps in the world would not prevent it. Mr. Lovegrove had shown one method by which the ordinary bell-trap would discharge itself, but there were several others. If, for instance, the housemaid poured a whole bucketful of water down the sink at once, it would act as a syphon of itself, and every drop of water would be drained off; and, again, it was a very common thing, if there were matters in the sink which would not readily pass away, to pull out the bell-trap altogether, and then there was a free communication with the drain at once. It had occurred to him, as the simplest method of guarding against these evils, that as the sink was generally placed against the external wall, the pipe might be carried through and allowed to discharge itself outside over an open grating fixed in the area, and then if there were any escape of gas from the sewer, it would be outside the house, and not within. Stand-pipes for the admission of fresh air had been recommended, but, as he had already stated, no forced supply was required; the air must enter the sewer without pressure. Wherever a valve was used there must be a certain amount of pressure before the air would take that direction, and he could not conceive what use it would be during certain periods of the day when the current would be outwards from the sewers, and any valve arranged merely for the admission of air would be simply inoperative. With regard to general principles, in laying down a correct system of drainage, they must begin at the beginning; when the water was flowing in one direction the gas would be flowing in another, and, therefore, the arrangement described by which the gas was to be made to go in the same direction as the water when there was a flush appeared contrary to natural laws. Any system of sewers ought to be broken up into short lengths, which should be disconnected as much as possible, so that the foul gas from one portion could not pass to another. Before a town was drained, the low-lying parts were always the most unhealthy, but after a system of sewers was constructed this condition of things was frequently reversed, and the higher parts became centres of disease; showing that by the system of impervious drainage, which was often adopted, the foul gases containing spores of disease were carried from one district to another. The ventilating openings in the middle of the streets had been much objected to, but they were not so injurious as the system recommended by Mr. Varley for carrying off the gas in close proximity to a chimney, for it often happened that there would be down currents in chimneys, which would thus draw in the foul air into the house. Foul air was rendered innocuous in two ways, by dilution, and by oxidation or destruction. The former took place when the gas escaped in the centre of the road, becoming of course more dilute every foot from the opening until it ceased to have any power for evil. The other plan, oxidation, when successful, was more complete and far preferable. Mr. Latham then exhibited a diagram, showing a new construction of charcoal basket for this purpose; around the charcoal chamber was a deep receptacle for the rain or falling water, communicating with the sewer by an overflow outlet below the level of the charcoal, which was thus kept constantly dry; in the centre, under the charcoal and communicating with it, was a spiral chamber, up which the gas ascended. He might mention, in conclusion, with regard to the town of Croydon, to which Dr. Alfred Carpenter had alluded, that when the sewerage system was first constructed, a few ventilating holes which were made were soon stopped up because of the stink which arose from them, but the result was that the town at particular periods became subject to attacks of low fever, which did not, however, appear in the low, but in the high-lying districts. It occurred to him that this was due to a lack of sewer ventilation, and in order to test it, when one of these epidemics was rife he took a long line of road, and instead of beginning to ventilate at the upper end, as he should have done if his object had been to do the work quickly, he began at the lower end and worked upwards. The result was, that as ventilation went on in that road, there was not a single fresh case of fever, and the patients began to improve rapidly; above the point of ventilation there were still fresh cases, and so it went on until the whole road was ventilated, and then the fever disappeared.

Mr. Glass did not consider trapping necessary, if drains were properly ventilated. If there were no traps there would be a constant influx of fresh air into the drains, and thence into the sewers, and there would be no nuisance whatever, provided there were a sufficient number of ventilating shafts to the sewers. The plan of carrying pipes up the sides of houses was never really effectual; the proper method was to have special shafts with disinfecting agents.

Mr. Edward R. Cook said the discussion seemed to have wandered from the ventilation of drains to that of sewers, both being highly important; but the paper had dealt rather with the former. One important point which Mr. Lovegrove had seized seemed to be this, that whenever there was a current of water down the feed pipe of a house drain, there would be a draught of air back again from the drain; and, therefore, it was necessary to provide against the water which

lay in syphon or bell-traps being accidentally drawn off. He could not help thinking that the plan which had been shown for carrying the foul air through the drain by the rush of water was, at any rate, a step in the right direction. He could not agree with all that had been said as to the free ventilation of drains. If nothing were requisite but free access of fresh air, then an open ditch would be the best drain they could have, which was evidently not the case. If an open ditch were offensive, so, and much more so, must be a brick sewer, which at one time would have in it three feet of sewage and at another only one. There were there present the three essentials to putrefaction, damp, heat, and air, and the generation of impure gas must consequently go on very rapidly. He hoped that by the attention of scientific men being called to the matter some means might be devised for preventing the generation of these gases, or for neutralising them before they reached the atmosphere, for he could not think that their mere dilution by admixture with a large quantity of air was the proper method of treating them.

Mr. James Marr said the question before them was one of immense importance, for the returns of the Registrar-General showed that a large proportion of the deaths in London, especially those in crowded courts and alleys, arose from the constant breathing of impure air coming from ill-ventilated sewers. The Board of Works, the local boards, and vestries, all had most extensive powers, which were generally very properly exercised; no one could build a house, lay out a street, or construct a sewer, without their approbation; and one of their powers was to stop up or cover over any offensive drain, water-course, or pond, and to require the removal of all offensive matters. The 71st section of the Metropolis Local Management Act was to this effect:—"Every district board or vestry shall, by providing proper traps or other coverings, or by ventilators, or by such other means as shall be practicable for that purpose, prevent the effluvia of sewers from exhaling through the gullyholes, gratings, or other openings of the sewers in any of the streets or other places within their district or parish." Now, the way in which sewers were commonly ventilated was by having openings in the middle of the streets, and by allowing the man-holes in various places to remain open for several hours at a time, and also by means of untrapped gullyholes, which ought to be hermetically sealed. In his opinion the Board of Works should compel every builder to construct a ventilating shaft, direct from the drain, leading from each large house, or in the case of small houses, one to every ten or twelve. This shaft might be carried up inside the wall of the house close to the flues, and taken to the height of some feet above the chimnies. This would only apply to new houses, but those already built might be treated in much the same way, only the pipe would have to be carried up externally. He could not condemn the system of trapping, because in many instances it was found to do its work well, but he at the same time agreed with Dr. Alfred Carpenter that a thorough system of ventilation would obviate the necessity for such appliances.

Mr. Ford regretted that the question had been limited to the ventilation of drains, as he considered the ventilation of sewers was the first and most important consideration, but he could not let the discussion close without bearing his testimony to the evils of the bell-trap system, which had been so well pointed out by Mr. Lovegrove. He recently, in company with a sanitary inspector, visited sixty houses in one parish, in forty-nine of which the traps were uncovered. This was the great evil, that the tenants would constantly uncover them, and consequently they were of no service at all. It would be much better, therefore, in his opinion, to abolish bell-traps, and go back to the old-fashioned plan of a deep trap, because when that got choked with silt, the water would not run off, and it was obliged to be cleared out.

Mr. James did not think the plan recommended by Mr. Latham, of carrying the pipe from the sink into the open air, would be a good one, as the bad smell would pass up the open pipe into the kitchen, and thence through the house.

Mr. Lovegrove, in reply, said that the proposal of Dr. Alfred Carpenter, to abolish all traps, would in the present state of things be, in his opinion, a most suicidal policy; they were everywhere in use, which was a sufficient proof that they had their work to do, and it was, therefore, important to see that they did it properly. The next speaker rather supported the same view, but as his own experience showed the evil consequences of badly-trapped drains, he need not enlarge further on the result of abolishing such appliances. Mr. Latham had made some valuable observations on the subject of ventilating sewers, which, no doubt, was one of the most important questions of the day. It was quite a distinct matter from that of the ventilation of the drains which connected the house with the sewers, and this latter was, in reality, the more important, since the total length of drains in London was probably equal to ten times that of the sewers, and they were in immediate connection with the house. He could not conceive of such a state of things as would admit of doing without traps at all. He had heard it suggested that such a fall might be given to the drain that all sewage matter would pass off so rapidly that no smell would arise, but still there would be a large surface which would soon become coated with slimy matter, which would contaminate the air. There were two systems recommended for ventilating house drains, one being an outlet trap with a water current, which had been stigmatised by Mr. Latham as opposed to natural laws. He could only say that notwithstanding these supposed natural laws, he had found the air escape that way, having tested it over and over again, both by the anemometer, and by the flame of a candle, and he had found the current of air as frequently passing in a contrary direction to the stream of water as with it. He believed the stream had nothing to do with the direction of the air currents. The fluctuation in the flow of sewage was no doubt a most important element of power in the ventilation of sewers, as he had suggested some 16 years ago to the Commissioners of Sewers. The same thing might also be utilised in the ventilation of house drains, which were but small sewers. The other system was to have outlets for the foul air at a considerable elevation. He saw no reason why both methods should not be adopted. With regard to the ventilation of sewers, he had had it under his attention for a long time, and now had a considerable length under experiment upon the principles shadowed forth in the paper he had read, the results of which, at some future time, he hoped to be able to communicate. In answer to a question, Mr. Lovegrove added that the distinction in legal phraseology between a sewer and a drain, was that the latter conveyed sewage from one house only, anything which was connected with two or more houses being denominated a sewer. He, however, regarded everything as a drain which passed under a house and emptied into the sewer in the street, whether it conveyed the refuse from one house or more.

The Chairman, in moving a vote of thanks to Mr. Lovegrove for his able paper, said the discussion had somewhat wandered, though it was very difficult to separate the ventilation of drains from that of sewers. Everyone, however, seemed to concur that abundant openings ought to be provided, with suitable apparatus for oxidising the foul air. There was some difference of opinion as to the best mode of doing this, and he was not sufficiently well acquainted with the subject to decide the question, but it was very gratifying to find so many able men turning their attention to the matter, and he did not doubt that before long a satisfactory conclusion would be arrived at.

The vote of thanks was then passed and acknowledged.

The paper was illustrated by a large number of diagrams and models.

THE AMSTERDAM EXHIBITION.

The Sub-Committee met on Monday, the 10th inst., at the house of the Society of Arts, to consider the question of applications for space from intending exhibitors. As these have now become very numerous, and the principal British trades and industries are likely to be well represented by important houses, the Committee have felt warranted in applying for an extension of space, which has been granted by the Central Committee at the Hague. The municipal authorities of Amsterdam have also placed at the disposal of the Exhibition Committee a square in front of the Palace, where booths or stalls will be erected for those desirous of effecting sales, which cannot be carried on in the building. This affords an opportunity of exhibiting and obtaining orders for many kinds of articles not coming strictly within the scope of the Exhibition. Parties desirous of renting these stalls or booths, which are 16 yards square, should make immediate application to Mr. P. L. Simmonds, the London Secretary, 3, Castle-street, Holborn.

Every arrangement has been made by the Mansion-house Committee and the various consuls, &c., for the Netherlands at the shipping ports to facilitate transport, reduce expense, and relieve British exhibitors from all trouble. A fund has been set on foot to defray the contingent expenses of publicity, printing, correspondence, &c., to which the following sums have already been contributed:—

	£	s.	d.
The Right Hon. the Lord Mayor ..	10	10	0
The Society of Arts..	25	0	0
Samuel Morley, Esq., M.P.	25	0	0
Thos. Baring, Esq., M.P.	10	0	0
G. D. Wingfield Digby, Esq... ..	10	0	0
Baron Gevers	5	0	0
D. Everwyn, Esq.	5	0	0
J. W. May, Esq.	5	0	0
T. Twining, Esq.	5	0	0
W. R. Sandbach, Esq.	5	0	0
Messrs. F. H. and A. Collier	5	5	0
Messrs. J. M. Johnson and Sons ..	5	5	0
Hodgson Pratt, Esq.	2	2	0

Further subscriptions to this fund are invited, and should be sent to the Treasurers, S. Redgrave, Esq., and Seymour Teulon, Esq., Society of Arts.

Fine Arts.

Exhibition at Bordeaux.—The Bordeaux Exhibition of Works of Art, which opened in the latter part of March, contains the large number of 645 pictures, many of them by Parisian and other artists of high reputation. Provincial exhibitions are assuming an importance which scarcely any one would have predicted for them a dozen years since. A considerable number of artists exhibiting at Bordeaux are medallists of the Paris Salon.

Manufactures.

Distilleries in Holland.—This industry, formerly so flourishing, suffered a good deal from the civil war in America. The annual export of Hollands, called Schiedam, varies from 70,000 to 80,000 hectolitres. The principal distilleries of Geneva are situate in the province of South Holland, where there are 328, employing about 2,000 workmen. The town of Schiedam alone has 226, with 600 to 800 workmen. These employ steam-power. The towns of Delft, Gonda, Rotterdam, and Lingden have also distilleries, but of less importance. At Delftshaven, near Rotterdam, there are 36 distilleries, which ship 26,000 hectolitres. The 25 distilleries of liqueurs in Amsterdam produce annually 1½ million litres. In all the other provinces there are small distilleries to supply the local wants. There are besides, at Nimeguen, and at Voorburg, near the Hague, two perfume distilleries.

Colonies.

Mining in South Australia.—The mining interest in this colony has commenced the year with revived energy. The gold fields and silver mines are still the subject of eager interest. Nothing yet discovered has been sufficient to justify the belief that the fields of this colony will bear comparison with the most celebrated gold-producing countries; still, the quantity obtained is sufficiently encouraging to induce the miners to go forward with confidence.

Emigration from Sydney, New South Wales, to San Francisco.—Some time since, when work was slack in the colony, about 1,300 men were tempted by the expectation of high wages to emigrate to San Francisco. Some of the journals there quoted very high rates of wages, and stated that the railway works were being pushed on with an energy that made it impossible for anyone willing to work to remain without employment, but much disappointment in this respect has been experienced.

Correspondence.

Colonel Maude's Paper.—Sir,—I find in your *Journal* of yesterday an important error in the report of my speech in the discussion on Colonel Maude's paper. At page 466, at the top of the second column, in the third line, instead of "taking the yield at only 20 lbs. an acre, that gave a result of 400 lbs. of cotton per family," the words should be, "taking the lowest estimate, twenty acres (per family), averaging 400 lbs. of cotton per acre."—I am, &c., Thomas Briggs.

The Homestead, Richmond, S.W., May 8th, 1869.

MEETINGS FOR THE ENSUING WEEK.

Mon.....Victoria Inst., 8.
Tues ...Statistical, 8. Mr. Samuel Brown, "On the Statistics of the Netherlands."
Royal Inst., 3. Prof. Grant, "Astronomy."
Pathological, 8.
Anthropological, 8.
Wed ...Society of Arts, 8. Mr. John Robinson, "On the Progress of the Colonies."
Pharmaceutical, 11. Annual Meeting.
R. Society of Literature, 8½.
Thur ...Royal Inst., 3. Prof. Tyndall, "On Light."
Zoological, 4.
London Inst., 6.
Chemical, 8.
Numismatic, 7.
Aëronautical, 8.
Fri .....Philological, 8. Annual Meeting.
Royal Inst., 8. Prof. Fleeming Jenkin, "Submersion and Recovery of Submarine Cables."
Sat .....R. Botanic, 3¾.
Royal Inst., 3. Prof. Seeley, "Roman History.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb. *Delivered on 1st May*, 1869.

99. Bill—Pharmacy Act (1868) Amendment—Amended.
104. Joint-Stock Companies—Return.
106. (I.) Mail Contracts - Index to Report.
151. Harbours of Refuge—Letter.
Public Petitions—Seventeenth Report.

Session 1868.

344. (A. IX.) Poor Rates and Pauperism—Return (A).

Delivered on 3rd May, 1869.

173. Volunteer Reviews (Manchester, &c., 1868)—Reports.
175. Metropolitan Workhouses—Return.

Delivered on 4th May, 1869.

99. Bill—Pharmacy Act Amendment (1868) (amended)—Corrected copy.
101. ,, Stannaries (amended).
140. East India (Staff Corps, &c.)—Correspondence.
171. Assessed Taxes and License Duties—Return.

Delivered on 5th May, 1869.

102. Bill—Sheriffs (York County).
104. ,, Norfolk Island Bishopric.
2. (7.) Railways Abandonment—Report of the Board of Trade.
120. Election Petitions—Copy of the Shorthand Writers' Notes of the Judgments delivered by the Judges.
176. Evesham Union (Orphans)—Return.
Public Petitions—Eighteenth Report.

Delivered on 6th May, 1869.

105. Bill—Greenwich Hospital.
108. ,, O'Sullivan's Disability.
163. Greenwich Hospital—Account.
169. Wisley Common—Report, Evidence, &c.
174. Light Dues—Memorials.

Delivered on 7th May, 1869.

107. Bill—Recorders' Deputies.
181. Postal Conventions (England and America)—Correspondence.

Session 1868.

344. (A. x.) Poor Rates and Pauperism—Return (A).

Delivered on 8th May, 1869.

103. Bill—Contagious Diseases (Animals) (No. 2) (amended).
110. ,, Endowed Hospitals, &c. (Scotland) (amended.)
111. ,, Park-gate Chapel Marriages, &c.
136. Poor Law (Ireland)—Return.
182. Ecclesiastical Commission—Report.
183. Government Insurances and Annuities—Accounts.
Public Petitions—Nineteenth Report.

Second Delivery.

112. Bill—Irish Church (amended).

Delivered on 10th May, 1869.

81. (II.) Railway and Canal Bills—Third Report.
112. Superannuations (Public Offices)—Account.
187. Ramsgate Harbour—Statement.
190. Mails (United States)—Return.
193. Temporary Laws—Register.
194. Education (Ireland)—Return.
199. Civil Services—Estimate, "On Account."

Patents.

From Commissioners of Patents' Journal, May 7.

Grants of Provisional Protection.

Anchors—1289—R. Sterne.
Animal and vegetable matters, drying—1207—R. J. Ellis and C. L. W. Fitz-Gerald.
Armour-plated structures, screw bolts, &c., for—1247—W. Palliser and T. English.
Bobbins, winding yarns or threads on—1308—G. Heyes & E. Barlow.
Boilers—1291—G. Hawxhurst and J. Pollock.
Boilers, apparatus for preventing the bursting of—1255—H. E. Newton.
Bolts—999—W. Marston.
Boots and shoes—1302—T. Aspden and E. H. Lambert.
Boots and shoes, applying elastic fabrics in the manufacture of—1314—T. Bostock.
Carding engines—1235—G. Dania and J., T., R., and S. Stott.
Carding engines—1295—B. Dobson.
Carding machinery—1267—S. Brooke.
Carriage wheels—1300—R. Marshall.
Cartridges—1257—T. Wilson.
Cask spiles—1271—D. A. S. Mackintosh.
Cask stands or tilts—1309—N. Voice.
Corks, &c., machinery for cutting—1268—J. Crabtree.
Crushing and pulverising machines—1265—R. Foster.
Excreta, collecting and treating—982—J. C. Lee.
Fires, extinguishing—1253—W. B. Dick.
Fish, apparatus for keeping alive for market—1276—O. Engholm.
Food, preserving articles of—1275—O. Engholm.
Furnaces—1285—J. K. Broadbent and S. and J. Prestwich.
Fuses, &c.—1297—J. Cane.
Gas furnaces, generating gas to be used in—1316—J. Frölich.
Graining in oil colours—1320—H. Bray and H. Adams.
Harrows—1266—J. Heal.
Harrows or drags—1241—M. Hillary.
Hats, ventilating—1313—E. Cooper.
Hats, &c., ventilating—1306—I. J. J. Lewis.
India-rubber, &c., compounds containing—1278—T. Forster and P. B. Cow, jun.
Iron and steel—1317—A. Meredith.
Iron, puddling—1256—H. E. Newton.
Knitting machines—1292—W. Prowett.
Lavatories, &c.—1196—W. H. Smith, jun.
Locks—1293—W. R. Lake.
Lubricators—1218—J. Fletcher, sen., J. Fletcher, jun., and W. Fletcher.
Motive-power engines, &c.—1169—J. H. Johnson.
Motive-power machinery—1274—J. Cudbird.
Motive-power, obtaining—1284—H. Hall.
Motive-power, producing—1159—C. E. Brooman.
Nuts and bolts—1294—J. P. Cooper.
Oil-expressing apparatus—1139—M. Samuelson and C. Eskrett.
Ovens—1301—H. W. Hart.
Parasols—1287—A. V. Newton.
Percolators—1307—J. B. Kroll and A. Froment.
Pianofortes, &c.—1319—W. E. Gedge.
Pneumatic machinery—1303—J. H. Simpson.
Railway carriages, radiating the axles of—1322—M. Wilkin and J. Clark.
Railway carriages, &c., axle and axle-box for—1252—S. Smith.
Railway carriages, &c., axle-boxes for—1279—W. R. Lake.
Railway engines, &c., self-couplers for—863—T. Carrodus.
Railway signals—1286—J. Smith.
Reaping and mowing machines—1272—A. Jack.
Reaping and mowing machines—1273—A. Clark.
Saws for cutting slate, &c.—1107—J. Parry and R. Morris.
Screwing bolts, &c., stocks and dies for—1263—A. Muir.
Sheep-washing apparatus—1251—G. T. Bousfield.
Ship-weirs or moveable dams—1238—G. White.
Shirt studs and solitaires—1264—J. and B. Weigel.
Smoking pipes—1304—O. Moseley.
Slashers, apparatus for lessing warps in machines called—1237—J Eccles.
Sleeve links, &c.—1282—A. Watson.
Steam cultivators—1318—D. Greig, R. Burton, J. Gozney, and T. Atkinson.
Steam engines—1321—O. Rose.
Steam generators and condensers—1288—W. E. Newton.
Steam generators and condensers—1321—W. R. Lake.
Tables, &c.—1312—L. Isaac.
Tobacco, twisting—1175—R. Legg.
Tow, apparatus for carding—1280—G. White.
Toys—1213—W. R. Lake.
Velocipedes—1248—N. Wilson.
Velocipedes—1269—C. D. Abel.
Velocipedes—1281—I. Farrell and W. Turner.
Vessels, rigging square-rigged—1315—R. B. Forbes.
Voltaic batteries—1250—W. A. Lyttle.
Warp machines—1258—E. Tatham.
Wheels, machines for moulding—1254—J. Whittaker.

Inventions with Complete Specifications Filed.

Bottle envelopes—1332—F. Bujeaud.
Heated water used for bathing, concentrating the caloric of—1310—H. A. Bonneville.

Patents Sealed.

3073. J. Barcroft.
3405. T. Rose and R. E. Gibson.
3408. G. Clark.
3411. J. H. Wilson.
3418. T. R. Crampton.
3420. T. Vaughan & E. Watteeu.
3427. F. Holmes.
3445. W. Thomas.
3471. H. Aitken.
3482. E. Hogg.
3487. S. W. Campain.
3527. A. Leykauf.
3533. G. Eguillon.
3718. A. Homfray.
3725. T. Kennan.
3951. H. Yorath.
3979. W. R. Lake.
595. W. R. Lake.
641. F. A. Gatty.
759. W. R. Lake.

From Commissioners of Patents' Journal, May 11.

Patents Sealed.

3441. W. Donisthorpe.
3442. G. P. White.
3443. J. Kellow.
3447. J. Dendy & J. H. W. Biggs.
3454. R. A. Gold.
3457. C. Jones.
3462. P. Hill.
3464. R. Beckley and J. J. Hicks.
3467. W. Richardson.
3484. A. McNeil & W. Wheaton.
3485. R. M. Boniwell.
3488. J. Jones and S. P. Bidder, jun.
3501. C. W. Siemens.
3504. F. O. Ward, W. Ibotson, and A. G. Southby.
3517. W. Avery and A. Fenton.
3525. D. Burns.
3526. A. Guthrie.
3563. W. H. Dreaper.
3571. T. Prideaux.
3658. J. H. Johnson.
3662. P. Ellis.
3663. P. Ellis.
3699. J. R. Swann.
3906. J. H. Johnson.
3939. W. H. Ridgway and F. W Walker.
3985. G. M. Wells.
187. H. A. Bonneville.
518. E. Hewett.
803. L. Engel.

Patents on which the Stamp Duty of £50 has been paid.

1263. A. T. Becks.
1264. H. and J. Douglas.
1281. J. Marsh.
1282. G. Davies.
1291. H. K. York.
1317. J. R. Swann.
1352. J. M. Hart.
1350. W. Prosser.

Patents on which the Stamp Duty of £100 has been Paid.

1321. J. and T. Mellodew and C. W. Kesselmeyer.
1337. J. Roscoe.
1342. B. Cooke.
1360. P. H. Colomb.
1376. W. Riddle.

Journal of the Society of Arts.

FRIDAY, MAY 21, 1869.

Announcements by the Council.

Ordinary Meetings.

Wednesday Evenings at eight o'clock :—

May 26.—*Derby-day.*—No Meeting.

Committee on India.

Conferences are now in course of being held for the discussion of various subjects connected with India.

The following arrangements have been made for the remaining conferences :—

This Evening (Friday), May 21.—"Waste Lands." By George Campbell, Esq. Adjourned discussion.

Friday Evening, May 28.—"Trade with Central Asia, Thibet, and South-Western China." On this evening the chair will be taken by Lord William Hay.

At these Meetings the chair will be taken at 8 o'clock.

Members of the Society interested in Indian questions are invited to attend.

Postal Reform Committee.

The Council have appointed a Committee for the purpose of "promoting the adoption of reduced rates of postage, particularly in reference to printed matter and parcels," and that Committee is now engaged in the consideration of the question, with a view to secure newspapers and printed matter being carried at rates not higher than those which are found practicable in France, Belgium, and the United States of America.

The Committee met on the 3rd inst., and in accordance with its recommendations, communications have been sent to the proprietors of the principal London newspapers, to the Religious and Charitable Societies, and to the Chambers of Commerce, inviting their co-operation.

Communications have also been sent to Foreign Governments, asking for information as to the postal regulations in their respective countries, especially relating to newspapers, printed matter, and small parcels.

Cab Reform.

The Council will appoint an early day for discussing any practical measures for improving the cab system in the metropolis.

Any persons who may desire to submit proposals for discussion are requested to communicate them in writing to the Secretary on or before Saturday, the 29th inst.

Conversazione.

The Council have arranged for a Conversazione at the South Kensington Museum on Wednesday evening, the 23rd of June. Cards of invitation will be issued in due course.

Designs for Channel Steamers.

The Council of the Society of Arts offer the Gold Medal of the Society, and the large Silver Medal of the Society, for the best and the second-best block model of a steamer, which shall afford the most convenient shelter and accommodation to passengers on the deck of the vessel crossing the Channel between France and England. The steamer is not to exceed in tonnage and draught the best vessels now in use between Folkestone and Boulogne, and the model must be on a scale of a quarter of an inch to a foot. The models, marked in cypher, are to be sent in to the Society of Arts' House, John-street, Adelphi, on or before the 1st November, 1869, with a sealed envelope, giving the name and address of the designer.

The Council reserve the right of withholding either or both medals, in case, in their opinion, the models sent in do not possess sufficient merit.

The following particulars of the South-Eastern Channel steamers, *Victoria*, *Albert Edward*, and *Alexandra*, are given for the convenience of competitors, but it is not intended to confine the designs to them, except as to tonnage and draught :—

Length between perpendiculars, 200 ft.
Breadth of beam, 24 ft.
Depth underside of deck amidships, 12 ft. 6 in.
Draught of water, 7 ft.
Bow, clipper.
Stern, elliptic.
Rig, polacca with two masts, lug foresail, gaff mainsail, staysail, and flying jib.
Engines, oscillating.
Paddle wheels, 17 ft. 6 in. diameter.
Tonnage, 568 tons.
Speed, 17 miles an hour.

Technical Education.

The following communication has been addressed to the Institutions in Union with the Society and the Chambers of Commerce :—

Society for the Encouragement of Arts, Manufactures, and Commerce, John-street, Adelphi,
London, W.C., May, 1869.

Sir,—I am directed by the Council of this Society to draw your attention to the accompanying petition in favour of technical education, which has been presented to Parliament under the seal of this Society.

The Council suggest that, if the authorities of your body agree in the prayer of the petition, they should prepare similar petitions, for presentation by the Members of Parliament representing the locality, who should also be requested to support the prayer of such petitions.

I am, Sir,
Your faithful servant,
P. Le Neve Foster, Secretary.

To the Honourable the House of Commons in Parliament assembled.

The Humble Petition of the Society for the Encouragement of Arts, Manufactures, and Commerce,

Sheweth,

That this Society, as described by Royal Charter, is "actively engaged in the advancement, development, and practical application of every department of science in connexion with the Arts, Manufactures, and Commerce of the country."

That the Society has for some years been connected with a large number of the Mechanics' Institutions and Literary Societies throughout the United Kingdom, and has established, for the benefit of students in such Institutions, annual examinations in various branches of science and art, and granted certificates and prizes to such as have shown themselves qualified to receive them.

That it appears from the reports of the Examiners engaged in this work, and from other sources of information open to the Council of the Society, that a serious obstacle to the progress both of science and of art in the United Kingdom is to be found in the imperfect and limited range of instruction given in secondary schools.

That, in 1867, the Council raised a fund, to which Her Majesty's Government contributed, by means of which they were enabled to assist a large number of working men, engaged in various branches of trade, to visit the Universal Exhibition and the manufacturing establishments in Paris; the only condition imposed on these men being that each should report on what he saw.

That each of these men on his return to England presented a written report to the Council; that these reports have been printed and published for the Society in a separate volume, and are remarkable for the great importance the writers attach to the facilities which the French workmen have for obtaining instruction in science and art, as contrasted with the want of such facilities for the English artisan.

That the Council of the Society are aware that the views expressed by the artisans were fully borne out by the communications of the British Jurors at the Paris Exhibition to the Schools Inquiry Commission. These communications were judged by the Commission to be of such importance as to be made by them the subject of a special report in 1867, laid, by order of Her Majesty, before your Honourable House.

That since the presentation of the above-mentioned Report, the subject of scientific education in foreign countries, in relation to arts and manufactures, has been inquired into and reported upon, under the direction of Her Majesty's Secretary of State for Foreign Affairs.

That in the month of January, 1868, the Society summoned a conference on the subject of Technical Education, which was numerously attended by manufacturers from various parts of the kingdom, Members of both Houses of Parliament, scientific men, professors, artisans, and others interested in the subject.

That resolutions were passed by the conference declaratory of the importance of improved education in secondary schools; of the introduction of science and art as part of the instruction to be given in them; and of the necessity for greater facilities being afforded for the higher education of artisans.

That the Conference also appointed a Committee to draw up a report on Technical Education; that the report of the Committee has been printed and published, and that it lays the greatest stress on the indispensable necessity for sound secondary education in schools, and the introduction into them of systematic instruction in science and art as the basis of Technical Education. The views expressed in their report are in general accordance with those of the Schools Inquiry Commission.

That a Committee of your Honourable House was appointed in the month of March, 1868, "to inquire into the provisions for giving instruction in theoretical and applied science to the industrial classes," and that such Committee in its report affirms "that the reorganisation of secondary instruction, and the introduction of a larger amount of scientific teaching into secondary schools, are urgently required, and ought to receive the immediate consideration of Parliament and of the country."

That, in the opinion of the Council, the study of natural science and of art is of the highest importance in the education of youth, even more so as an effective means of mental discipline than on the ground of its direct utility, and that it ought to be introduced into all secondary schools.

That the Council consider the secondary education given in schools, and especially the means provided for giving instruction in science and art in the United Kingdom, fall greatly short of the necessities of a well-organised community.

They, therefore, humbly pray your Honourable House to pass such laws as will remedy the existing defects in secondary schools, and give to Science and Art that place in public instruction which the wants of the nation so urgently demand.

Sealed with the corporate Seal of the Society for the Encouragement of Arts, Manufactures, and Commerce, in the presence of

P. Le Neve Foster, *Secretary.*

Subscriptions.

The Lady-day subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

India Committee.

The fifth conference on Indian subjects was held on Friday evening, the 14th inst., W. S. Fitzwilliam, Esq., in the chair. The paper read was on "Waste Lands in India," by George Campbell, Esq. The discussion which followed was adjourned to this evening (Friday), the 21st inst. The proceedings of this Conference will be given in next week's *Journal.*

Twenty-third Ordinary Meeting.

Wednesday, May 19th, 1869; Sir George Grey, K.C.B., late Governor-General of New Zealand, in the chair.

The following candidates were proposed for election as members of the Society:—

Crookenden, J. A., Phœnix Gas Company, Bankside, S.E.
Curtis, Dr., 15, Albemarle-street, W.
Gardner, Edward Vincent, Berners-college, 44, Berners-street, W.
Gardner, John Dunn, 19, Park-street, Park-lane, W.
Hall, G., 3, Westminster-chambers, Victoria-street, S.W.
Hallé, Charles, 11, Mansfield-street, W.
Hammond, Edward W., 29, Charlwood-street, South Belgravia, S.W.
Hankey, William Barnard, Fetcham-park, Leatherhead.
Harrison, Octavius B. C., 4, Paper-buildings, Temple, E.C.

Harvey, John, 33, Harewood-square, N.W.
Jago, Arthur, 38, Tregunter-road, Brompton, S.W.
James, Hugh, 68, Church-street, Chelsea, S.W.
Lamplough, H. T., 22, Myra-villas, King Henry's-road, Hampstead, N.W.
Lane, George Henry, 16, Redcliffe-gardens, The Boltons, S.W.
Morton, William Scott, 65, Great Russell-street, W.C.
Murray, A. J., 181, Albany-road, Camberwell, S.E.
Napier, John, 1A, Fitzroy-square, W.
Nash, Joseph, jun., York-chambers, York-buildings, Adelphi, W.C.
Nelson, Thomas A., 10, Nottingham-terrace, York-road, Regent's-park, N.W.
Ramsay, Frederick William, M.D., 15, Somerset-street, Portman-square, W.
Tayler, Stephen S., Prospect-villa, Peckham-rye-common, S.E.
Warburg, Frederic E., 53, Prince's-square, Bayswater, W.
Ward, Edward Matthew, R.A., Kent-villa, Lansdowne-road, Kensington-park, W.
Ward, John Edward, Elm-cottage, Grosvenor-road, S.W.
Waterlow, Alfred James, 25, Park-crescent, Regent's-park, N.W.
Young, Frederick, 10, Russell-road, Kensington, W.

The following candidates were balloted for, and duly elected members of the Society:—

Anderson, T. H. W., 6, Stanley-crescent, Kensington-park-gardens, W.
Bartleet, George A., 1, East India-avenue, Leadenhall-street, E.C.
Bowring, Samuel, 1, Westbourne-park, W.
Cliffe, Thomas, 49, Cathcart-road, West Brompton, S.W.
Cooper, Henry, jun., Livermead-cottage, Torquay.
Cory, Richard, Commercial-road, Lambeth, S.E.
Cotton, Rev. Arthur B., Parsonage, Bow-common, E.
Cotton, Henry, Q.C., 10, Sussex-square, Hyde-park, W.
Stubbs, Thomas, Coombe-lodge, Lavender-hill, Wandsworth, S.W.

The Paper read was—

ON THE PROGRESS OF THE COLONIES.

By John Robinson, Esq., F.R.G.S.

Perhaps it may be as well that I should, at the outset of this paper, explain that it is neither within my power nor my purpose to give anything like a general view of the past history and present position of each of the British colonies. Such an undertaking would require far more time than the limits of one evening's discussion will afford, and means of information which it is scarcely possible for one person to compass. The conditions of the colonial empire over which our gracious Queen holds rule are varied beyond those of any other empire concerning which history bears record. In treating of them, you treat in a manner of the world. In glancing at these colonies, your eye ranges around the globe. Men of all colours and nationalities; climates which represent all extremes of heat and cold; lands washed by every sea, and yielding the products of every zone; nature under all her aspects and in all her types, have to be dealt with in considering such a fertile and exhaustless theme as Anglo-Saxon colonisation.

Nor would it be seemly in one whose direct personal experience has been confined to one group of colonies only, to attempt a detailed description of countries whose resources and conditions can be far better and more appropriately set forth by local representatives. My object in bringing under the notice of this influential Society, "The Progress of the British Colonies," is not to give a hasty series of geographical pictures—which must of necessity be vague and imperfect—but to place before an institution that has done so much to promote the advancement of our national commerce and industry, a few plain facts, borne out by statistical testimony, indicating the part taken by the colonies in the advances that have been made by, and proving, as I venture to hope, the benefits which these colonies are, in more senses than one, to the mother country.

I am well aware that there may be many in this room, as there are, undoubtedly, very many in this country, who hold that the colonies have not contributed, and do not contribute, in any material sense, to the prosperity and advantage of the parent land. Seven years ago a paper* was read before this Society, having as the apparent result of its arguments, the maintenance of that proposition. From that time to the present, so far as I know, only one attempt has been made to present the question in another, and as I think, in a fairer and truer light. Since the present paper was prepared, I have had the pleasure of reading a most admirable one on colonisation, read in this room four years ago, by Mr. Stones.† Until this document was brought under my notice, I was not aware that the subject had been so exhaustively treated, and I must apologise for having unwittingly traversed the same ground in one or two respects, although the subsequent publication of more complete returns than were accessible in 1865, enables me to show more conclusively that the views we hold in common are confirmed by the indisputable testimony of figures and facts. The opinions expressed in 1862 have gained ground and been more generally adopted, without, as it seems to me, any corresponding endeavour being made to see whether or not the argument was duly sustained by the evidence of positive facts. Over and over again it is asserted that the colonies are no substantial gain to the empire; that England would be better without than with them; that they cost more than they are worth; that they are not only a drain on the imperial exchequer, but a constant source of difficulty to imperial statesmen. I regret that no colonist of wider experience, higher standing, and greater ability, should have come forward to plead the cause from a colonial point of view; but, in the lack of such advocacy, I propose to do my best to show that something may also be said on the other side. And in doing this, I have strictly confined myself to the data furnished by the statistical returns published yearly through the Colonial Office. Later, fuller, and perhaps more accurate information, might have been gleaned from books and from local sources; but as parliamentary returns, accessible to all, and stamped with the authority of the crown, these bluebooks are on all accounts less assailable, and therefore more likely to be conclusive and satisfactory.

I propose to consider the progress of our colonies as revealed in their historical development, their commercial advancement, and their social conditions, and then to glance at the future which past experience and present aspects may seem to foreshadow. Under the first head I must necessarily be brief.

The history of British colonisation is, comparatively speaking, a thing of yesterday. Its records belong entirely to modern times. To a great extent, it comes within the range of the present century. It may be said to date from the first settlement of what are now the United States, for the Pilgrim Fathers were the pioneers of that vast band of colonising adventurers by whom so large a portion of the world's surface has been explored, occupied, and reclaimed. It is a noteworthy fact, construe it as we may, that some of the most prosperous and progressive settlements have been founded by organisations stamped more or less with a religious character. The New England states in America, the district of Albany in the Cape colony, and the Canterbury settlement in New Zealand, are cases in point. As regards the first of these communities, the rules under which it was established, and the principles which animated its founders, might advantageously have been adopted in connection with later systems. I take it that

* See *Journal*, vol. x., p. 301.
† See *Journal*, vol. xiii., p. 405.

the strict subordination of individual interests to the common weal was the secret of the success which, in course of time, crowned the labours and the sacrifices of the exiles. In reading the history of the early settlers of North America, we read the history of like settlers in South Africa, Australia, and elsewhere, with the mere difference of local colouring. In colonising all new countries the same difficulties have to be met and conquered, the same vicissitudes to be passed through, whether the land so invaded be in the south or in the north world; be worn by wintry winds, or burnt by a tropical sun.

Before the present century set in, British colonisation differed in one respect widely from what it has been subsequently. Then, new lands were regarded not so much as the resorts of home-seeking and home-making people—as outlets for the redundant population and pent-up enterprise of the mother-country—but as regions where absentee proprietors might add to their possessions and their wealth—sources of aggrandisement and enrichment to men who had otherwise no personal interest in the strange but fruitful lands beyond the sea. Now, the colonies are, in the main, possessed by the men who have formed their homes and reared their families in them—whose fortunes are identified with the soil they own by all the ties and associations that can move and attach a man. This difference, perhaps, may in part account for the far greater value which was set upon colonial possessions, in these earlier times, by the statesmen and people of this country, and for the far greater disfavour with which any encroachment upon these possessions, or any threatened curtailment of them, was then contemplated.

I had intended, in preparing this paper, to glance as fully as might be at the history of the colonies as bearing upon the immediate subject of this paper. The more pressing demands, however, of the other topics compel me to defer to some other occasion this review of the past. Meanwhile, to such as are interested in the matter, I would remark that Mr. Merivale's admirable and appreciative work on "Colonisation" supplies almost all that a student can desire.

Commercial Advancement.

In dealing statistically with this part of my subject, I intend to restrict myself to the period over which the published Parliamentary returns extend. It is to be regretted that no abstract of colonial statistics, prior to the year 1850, has been issued under the authority of the Crown, as, in the absence of such official data, the retrospect is unduly limited. But, brief as is the period to be reviewed, it represents the whole lifetime of some colonies, and furnishes all that we need for the purpose of illustration, respecting the progress of trade and the advances of industry in all of them. With the exception of Canada and the Indies, none of the British colonies had any notable commercial standing prior to 1850. It was not until 1851 that the gold discoveries in Australia turned the attention of the world to that Southern Continent. The Cape colony, Mauritius, and Ceylon, like New South Wales, Victoria, and New Zealand, did a small trade with the mother country, but it contributed as yet very inconsiderably to the sum total of that commercial greatness which still gives Great Britain pre-eminence.

To those who care for figures, the tables appended will supply in a clear and compact form the information which I shall now proceed to give in fuller detail, and I only regret that it is out of my power to render these dry statistics more attractive.

India, by right of its wealth and importance, justly takes precedence in the list of our dependencies. That magnificent group of territories forms an empire in itself, of which any nation less ambitious than the English might be proud indeed. Its commercial progress is in keeping with its magnitude and its traditions; its industry keeps pace with its trade. In 1850 the import trade of India was more than £13,000,000; in 1866 it was £56,000,000. In 1850 its exports amounted to £18,000,000; in 1866 they were £67,500,000. In 1850 the tonnage of vessels entered and cleared at Indian ports was 1,403,633; in 1866 the tonnage was 4,160,356. In 1850 India consumed £7,500,000 worth of British manufactures; sixteen years later her consumption was close upon £25,000,000. Although India is so large a producer of cotton, she consumes as largely as ever the textile fabrics of this country. In 1850 the value of cotton piece goods imported was more than £3,500,000; in 1866 it was nearly £12,000,000.

We find the progress of Indian industries reflected in the list of her exports during this period. The shipments of coffee have advanced from 2,191 to 17,350 tons. Raw cotton has increased almost four-fold, the export in 1866 being 803 millions of pounds, against 165 millions. Up to 1863 the export of manufactured cotton goods was almost stationary. Since then it has advanced to a value about double what it was, being now £1,732,133. Dyes have also remained as they were. Pastoral enterprise does not appear to be as active in the east as in the south, the value of hides and skins exported having only quadrupled. Jute, a staple of great value, and susceptible of boundless production in other countries besides India, has increased from £88,989 to £771,691. The export of opium is nearly double what it was in point of value, and represents above one-sixth of the total exports of the peninsula. Rice, the most important food-stuff of the east, shows great advancement, the value in 1866 being five millions, against £688,000, and the quantity being 3,850,000 quarters, against 818,992. Silk-culture does not appear to have made any progress, the export remaining almost where it was, at about 1½ millions of pounds. The value of silk goods shipped from Indian ports has positively declined, from £441,749 to £88,829. Sugar has also declined from a value of nearly two millions to £361,362. On the other hand, we must recollect that a large portion of the sugar production of other countries is due to the labours of Indian coolies, who have emigrated to Mauritius, Natal, and the West Indies. Sheep or goat farming would appear to be more systematically conducted than of yore, the export of wool being more than six times what it was eighteen years ago. Notwithstanding the extension of enterprise in Assam, no export of tea figures in the returns up to 1866, and the chief industries of the Indian empire are represented by cotton (which takes more than half), rice, opium, coffee, dyes, and fibres. It must suffice to close this reference to her Majesty's great eastern possession by saying that the public debt in 1866 was 98 millions, against 55 millions in 1852.

Ceylon has the happiness to be a prosperous as well as a beautiful and productive country. A few years ago it was in the privileged position of having a surplus revenue wherewith to get its local railways out of certain difficulties that beset them. The import trade of this flourishing colony has increased from a million and a-half to five millions, but more than a million of this is for the rice consumed by the coloured population, and nearly a million and a-half represents specie and bullion. The exports advanced from £1,246,956 to £3,586,454. Coffee occupies about exactly the same relation to the sum total of exports that it did in 1860, being still more than two-thirds of the value. Cinnamon-culture appears to have declined, but there is progress under the heads of areca-nuts, cocoa-nut, and more particularly of cotton. The tonnage of shipping is nearly trebled, being 1,182,325, against 490,662, and of this aggregate more than ten-twelfths represent British vessels. It may be as well here to state, so as to save the repetition of wearisome details, that this proportion of British shipping prevails in all but a few special cases, where the tonnage of foreign vessels is somewhat larger, as at Mauritius, the Falkland Islands, Gambia, Honduras, and the naval stations of Gibraltar and Malta. The public debt of Ceylon has been incurred since the year 1861, and now stands at £450,000.

Mauritius is another colony where an insular situation, and a limited area, have proved no bar to the realization of extraordinary productive capacity. That fair island imports goods which, in 1866, were valued at £2,227,093, being a little more than double the value of its imports in 1850. Mauritius, however, depends upon other countries for most of her food stuffs, and only a fourth of this amount comes from the United Kingdom. The exports have nearly trebled, and still, as sixteen years ago, almost wholly consist of sugar, the shipments of which, in 1866, amounted to two millions and a quarter. The shipping trade of the island is more than twice what it was in 1850, a fact which bears strong testimony to the value of Port Louis as a port of call for vessels navigating the eastern seas. Like most other colonies and countries, the Isle of France has been smitten by the railway mania, and, since 1863, has gone into debt to the amount of a million sterling for the construction of public works. Connected with the Mauritius, as a dependency of that government, are the Seychelles Islands, a settlement of which little is known by the people of this country. And yet no lovelier group of islands can be found throughout the wide seas than this. Although situated close to the Equator, these islands enjoy a mild, equable, and pleasant climate. Formed of bold and rocky hills, and clothed with rich, tropical vegetation, they present the most charming varieties of scenery. Their inhabitants, mostly of mixed coloured origin, are "contented, quiet and prospering," and find their subsistence in fishing, picking coir, and the manufacture of vacoa bags. It is here that the celebrated *cocoa de mer*, or double cocoa-nut, has its habitat; and thick groves of that graceful tree line the shores of the islands at many points. I am not aware that any garrison of regular troops is maintained there, nor, indeed, is there need for one. Illicit distillation appears to be the only foe that has to be guarded against, and an efficient police suffices for that duty.

From the islands of *Labuan* and *Hong-kong* there are no regular returns, and I name them because their position is of so much political importance in connexion with China and the Indian Archipelago, as to render an allusion to them necessary. There are some settlements whose value in relation to the interests of civilisation and commerce cannot be measured by the actual trade done at them. According to the important report furnished to the Governor of Hong-kong by H.M. consul at Canton, the foreign trade with China for 1866 was taken, in round numbers, at the enormous sum of £120,000,000, the tariff duties paid at the foreign custom-houses alone being nearly £3,000,000. The imports of Labuan were £30,970 in 1852, and £109,134 in 1866, the exports being half that amount. This little settlement is intrinsically valuable on account of its coal-mines, while its position in the centre of the East Indian islands may make it a useful base of operations in connexion with those fruitful territories.

Such has been commercially the growth of our Eastern possessions—an empire which covers an area of 1,014,671 square miles, and has a population of 152,973,671 souls. In 1850 the trade of these territories amounted in value to thirty-six millions. In 1866, these last figures had multiplied more than fourfold, having advanced to one hundred and fifty-six millions per annum. In both cases the exports were considerably larger than the imports, and these exports consisted in the main of the raw materials which afford employment to the industry, or contribute to the nourishment and comfort of the people of this country.

We now pass to the South world, and arrive at the great *Australasian* group of Anglo-Saxon colonies. These in point of size and opulence, though not of population, take second rank in the muster roll of imperial dependencies. Forty years ago, as we have seen, these communities had, practically, no existence. Neither Victoria, nor South Australia, neither Queensland, nor New Zealand, were colonised before 1836. Even at that time New South Wales, the oldest member of the family, was only known as a penal settlement. All the wealth and industry—all the progress and cultivation—which now distinguish these prosperous countries, have been the outgrowth of a time within the memory of almost all of us.

New South Wales on the South-eastern seaboard of the Australian continent, in 1850, had an import trade worth two millions, and an export trade worth two millions and a-third. In 1866, its imports were valued at nearly nine millions, and its exports at eight millions and a-half. The imports of Victoria during the same period advanced from £744,000 to more than £14,000,000, an advance of nearly 2,000 per cent.; those of South Australia increased from £798,000 to £2,835,000; Western Australia moved on from £52,000 to £251,000; Tasmania was least impulsive, having only advanced about 50 per cent., from £658,000 to £942,000; New Zealand, however, sustains the credit of the antipodes, having imported, in 1850, £349,000 against £5,894,000, in 1866, something less than an advance of 1,700 per cent. in 15 years. Queensland, which had no official existence, being part of New South Wales prior to 1860, has, in six years, pushed on her imports from £742,000 to £2,467,000.

The exports of the Australian colonies in 1850 amounted in the aggregate to £4,648,178, of which New South Wales contributed £2,399,000; Victoria, £1,041,000; South Australia, £570,000; Western Australia, £22,000; and Tasmania, £613,000. New Zealand exports are first set down in 1851 at £84,000. In 1866 the aggregate had advanced about 700 per cent., and was more than £31,000,000, apportioned as follows:—New South Wales, £8,500,000; Victoria, nearly £13,000,000; South Australia, nearly £3,000,000; Western Australia, £152,000; Tasmania, £834,000; New Zealand, £4,500,000; Queensland, £1,366,000. New South Wales, therefore, had multiplied her exports about four times, Victoria twelve times, South Australia five times, Western Australia seven times, Tasmania about 25 per cent., and New Zealand about 52 times, or 5,200 per cent. in 15 years.

It would be impossible to review in detail the various export lists. They embrace many varieties of produce, and indicate a wide range of industrial energy. Gold, of course, absorbs a large share—more than one-third of the aggregate. The export of gold from these colonies in 1866 amounted to £11,708,397. Of this amount New South Wales and New Zealand yielded nearly the same proportion, while Victoria contributed about as much as did the two together. Queensland in this year shipped gold valued at £85,561. But Australia can boast of other sources of wealth besides her adventitiously-developed endowment of precious metals. Her shipments of wool—the produce of flocks so vast as to be almost unprofitable—have advanced from five to nine millions sterling. Coal and coke, flour and grain, hides and skins, horses and cattle, copper, gum, and timber, have been shipped from her many ports. Many of her home needs are now being supplied by local manufacturers, and any review of her commercial progress would be wholly incomplete were it to ignore the rapid development of colonial industries in every channel where skill or enterprise can turn to account the raw materials of the country. But notwithstanding the self-supplying disposition on the part of the colonies, no diminution in their trade with the outer world is apparent. Their imports have advanced in sixteen years from £4,333,000 to £36,000,000; their exports have advanced from £4,500,000 to £31,000,000. A trade, therefore, which in 1850 was estimated at £9,027,894, in 1866 reached the limit of £67,164,616, and of this £30,500,000 was done with the United Kingdom. The tonnage of shipping entered and cleared at all the Australian ports in 1857 (the earliest complete record published), was 1,517,267; in 1866 the total was 4,538,968, being an advance of 300 per cent. These facts tell their own tale. I need only add that the public debt of the Australian

colonies in 1866 amounted to more than £24,000,000 sterling, and had been incurred, I believe, almost exclusively on account of railways, public works, and immigration. The entire area of these seven dependencies is 2,582,070 square miles, and the population, which, in 1861, was 1,266,432, is now 1,662,063.

We next come to the *African* settlements, which are scattered over a wider area, and are less compactly situated than their sister groups in Australia, India, and America. These have had none of the historical prestige of India, the golden attractions of Australia, or the energising influences of American enterprise and rivalry, to help them onward. They have been less in favour with home-seeking emigrants than other and better-known lands. Erroneous ideas as to climate, and a traditional avoidance of Africa and its conditions, have combined with other causes to keep the African colonies in obscurity. Great Britain has only a partial hold on the African sea-board. Her settlements on the West Coast, and her colonies on the south, comprise only a small portion of that vast coast line, washed by the waters of three seas. But insignificant, when compared with those of other countries, as may be the figures that represent these communities, no less do they indicate a marked ratio of progress. In 1850, the imports of the seven colonies thus grouped together amounted to £1,752,790. In 1861, the date of the last complete return, the total was £3,631,080. In 1850, the imports of the Cape Colony were a million and a-quarter; in 1866, they were two millions. In 1850, the imports of Natal were £111,000; in 1865, they were £455,000. In 1850, the imports of Sierra Leone were £97,000, and of Gambia £87,000; in 1866, they were £251,000, and £108,000 respectively.

The producing powers of the African settlements have shown even a more rapid capacity of development. In 1850, their aggregate result in exports was £1,702,261; in 1866, it was £3,254,093, or about double. No details of the exports from the western ports are published, but we may assume that they are chiefly represented by palm-oil, fibres, cotton, gold-dust, and ivory. From the Cape Colony, wool is principally shipped, and the steady increase in this export indicates the extension of pastoral enterprise, on the almost limitless plains of that scantily-peopled country; but copper-ore, valued at £90,000, is also shipped, together with ostrich feathers, ivory, skins, and hides, the products of the chase. In one respect the Cape has retrograded. Twelve years ago nearly a million gallons of wine were exported, valued at £155,000. In 1866, only 93,000 gallons, worth £13,000, were sent abroad. This declension was due to the disease which attacked the vines. Wine-farming, however, is again in the ascendant there, and a great improvement is already manifest. I may here remark that it is more than probable that, in course of time, the wine consumers of England may have their wants largely supplied by the British settlements in the Southern Ocean. Australia has for years produced excellent wines of a claret character. The Cape can exhibit sweeter wines of no less excellence, and is now producing wines of a lighter description. It is unfortunate that these colonial beverages should be looked upon with so much disfavour in Europe. It is true that bad kinds of Cape wine have found their way to Europe; it is true that home dealers have found it convenient to palm off these noxious compounds under the name of South African, but it is also true that the mere fact of a wine being colonial is enough, in many minds, to condemn it without a fair trial of its merits. In South Africa, as in Australia, the wines of the country are regularly drunk, by persons who would not scruple to avoid them were they the unwholesome trash they are taken to be.

The colony of Natal has been brought so recently under the notice of this Society, that it is only necessary to state that its exports, which in sixteen years advanced from £17,000 to £263,000, or fifteen-fold, include sugar, wool, cotton, arrowroot, butter, hides, ivory, ostrich-feathers, grain, and salted meat.

The tonnage of Cape shipping shows an increase of about 33 per cent., and that of Natal about 65 per cent., in sixteen years, but the latter advance would be much higher were a later year taken for the purpose of comparison. Sierra Leone exhibits about the same rate of increase as Natal, but at Gambia the shipping has more than doubled since 1850. St. Helena, being merely a port of call, can hardly be taken into account, and the lonely and distant Falkland Islands, probably for the same reason, can boast a shipping trade six times what it was in 1850. The possession of these islets makes England practically the mistress of the whole south world below the 40th degree of south latitude. Her flag waves over the capes of Australia, New Zealand, and South Africa, and at this point may be said to guard the passage around the American continent. Long may it be ere that standard, which is the guarantee of freedom for the world's commerce, and the harbinger of an active civilisation wherever it may be planted, shall cease to symbolise Anglo-Saxon supremacy over these natural outposts of the southern globe.

Sweeping across the whole length of the Atlantic, we come to England's eldest dependency, the noble dominion of *Canada*, which, as befitted her seniority, has so lately set her younger sisters so excellent an example of the work they are called upon politically to do. The earlier returns of her trade are so defective, that I am compelled to give them separately. Canada proper, in 1850, could speak of barely £3,500,000 worth of imports, but, in 1866, she absorbed £11,000,000, her wants having trebled in that period. New Brunswick advanced from £815,000 to £2,000,000; Nova Scotia, from £1,000,000 to nearly £3,000,000; Prince Edward Island, from £123,000 to £444,000; and Newfoundland, from £867,000 £1,200,000. British Columbia appears for the first time in the returns for 1860, when that colony took £282,000 worth of imports. During the following year that amount was doubled; but, in 1866, the year's total was £298,000. The neighbouring settlement of Vancouver's Island, in 1861, did an import trade worth £416,000; here, also, there was a rapid rise and a subsequent decline, the imports for 1866 being £594,000. Turning to the exports of these vast territories, we find that Canada during the sixteen years advanced from £2,500,000 to more than £11,500,000, her producing capabilities having kept pace and in line with her consuming powers. New Brunswick passed on from £658,000 to £1,333,000. Nova Scotia sent abroad £1,500,000 instead of £671,000. Prince Edward Island, starting with £60,000, in 1866 reached a limit of £246,000. Newfoundland made less progress than her sister colonies, the increase being only from £975,000 to £1,186,000. British Columbian exports for 1860 were £11,000, and for 1866, £43,983; those from Vancouver were, in 1863, £39,000; and in 1866, £120,000. In both these cases, however, gold is excluded, a rather important omission, seeing that, in 1860, the shipment of gold from British Columbia was estimated at £600,000, and that from Vancouver, in 1865, at £426,000.

The list of Canadian exports gives one a fair idea of the resources of these noble provinces. Foremost in bulk and in value comes timber, the produce of those far-reaching forests, upon whose bounds the axe of the woodman and the plough of the settler are encroaching day by day. Next come flour and grain, which are, strictly, the products of industry and the tokens of civilisation. In the space of sixteen years the export of grain, in the form of barley, rye, oats, peas, and wheat, from Canadian ports increased five-fold, from 2,250,000 bushels to 11,500,000, while the shipments of flour nearly doubled. Animals and their produce also contribute largely to the export trade of our North American dependencies. Copper-ore, fish (Newfoundland more especially), seal-skins, and oil, also figure in the returns, a glance at which suffices to show that, in the western world we have the materials of an empire

stretching over an area of 632,000 square miles, with a European population of 4,000,000, nearly four times what it was in 1850, carrying on a foreign trade worth £35,000,000 per annum, threefold what it was sixteen years ago; having a shipping trade represented by a tonnage of 6,500,000 against a tonnage of 4,750,000 in 1859, and burdened with a public debt of £15,500,000.

The last great group of British dependencies which pass under review are the *West Indian Colonies*. These are so numerous that it is impossible to take them separately, but their general characteristics and products are so similar, that they may fairly be considered in the mass. Including Bermuda, Honduras, and British Guiana, there are eighteen distinct governments under British rule in the Spanish main. Although these are amongst the oldest of England's colonial settlements, they have made less progress in proportion than the younger colonies in the southern hemisphere. In some, of course, the area to be occupied has been too small to permit of much expansion. In others, retarding causes of a different nature have been at work. It would be a work for which I by no means feel myself competent, to discuss the influences that have helped to depress the progress of those beautiful islands. It is noteworthy, however, and it may be significant, that in those colonies where the advancement of trade and of productiveness has been most apparent, free labour, supplied by means of East Indian immigration, has been at work. Thus, in British Guiana, the imports in sixteen years increased from £785,000 to £1,500,000; and the exports from £815,000 to more than £2,000,000. In Trinidad the improvement in imports was from £476,000 to £930,000; and in exports from £319,000 to £1,000,000. In Jamaica, the largest of the islands, imports declined from £1,218,000 to £1,152,000, but at St. Christopher there was an advance from £92,000 to £172,000; at Antigua, from £163,000 to £291,000; at Barbadoes, from £951,000 to £1,246,000; and at the Bahamas, from £24,000 to £328,000.

It is satisfactory to find that, in spite of all their drawbacks, and the lack of that energising influence which the labours of European colonists confer, the producing powers of the West Indian settlements have, in the aggregate, made considerable advances. In 1850, the sum-total of their exports was £4,194,000; in 1866 it was £7,359,000. These exports consist in the main of articles peculiar to tropical latitudes. Sugar and its products, rum and molasses, are the leading features in every case, and, with the exception of Jamaica, the production of this staple has materially increased. Coffee, cocoa, rice, fish, spices, arrowroot, and even meat and flour, are also included in the category.

An attentive perusal of the annual reports furnished to the Colonial Office by the governors of the West Indian colonies will, I think, lead to the opinion that a very bright future lies before these islands and countries. Taught by experience the errors of past legislation and policy, both the governments and the communities at large appear to be entering upon a new career. Scattered though they are, the dependencies I have named cover an area of 102,207 square miles, and have a population of something more than 1,119,000. Of these, but a small proportion are of European origin. I cannot but think that, with the help of free coloured labour, under the influence of resident English settlers, bound, like the planters of Mauritius, by the attachments of home to the soil, and ruled according to principles of government which, among communities of such kindred interests, may apply to them all in common, those regions may yet realise the rich promise of their rare natural endowments, and present in future years a new modification of Anglo-Saxon life and conditions.

I regret that it is out of my power to supply complete and trustworthy statistics, setting forth the progress made in agriculture and in manufacturing enterprise throughout the colonies during a term of years. It would be easy to do this, were the reports sent home from all the colonies as regular and as complete as they are in some cases. In the matter of statistical information, some of the colonial governments, and notably those of Australia, show remarkable enlightenment and liberality. Nothing can exceed the fulness and breadth of the reports forwarded with the Blue-books for 1866, from New South Wales, Queensland, Tasmania, and South Australia. But as these reports are not uniformly comprehensive, and are in some instances wholly wanting, it is better to withhold statements that must be incomplete and data that might mislead.

The facts set forth, however, will, I think, suffice to show what measure of progress the colonies have made since 1850, and what direction that progress has taken. We have seen that the colonial empire of Great Britain now embraces an area of 4,562,000 square miles (exclusive of the Hudson's Bay territory), considerably more than the area of Europe. We have seen that this immense range of territory is peopled by 160 millions of men, representing every shade of colour and all extremes of civilisation and of barbarism. We have seen that the combined trade of these regions has, in the space of sixteen years, increased fourfold, that is, from £65,000,000 in 1850 to £280,000,000 in 1866. We have seen that, at the beginning of that period, the aggregate of the colonial imports was £33,000,000, and of exports, £31,000,000, and that at the end of it these figures had become £137,000,000 and £143,000,000 respectively. But, what to my countrymen will be a yet more interesting result, is the fact that the consumption by the colonies of British manufactures has kept pace with the rest of their trade, the imports from the United Kingdom having been, in 1850, £18,000,000, and in 1866, £61,000,000. The exports from the colonies to the mother country have increased in a yet greater ratio. In 1850 they corresponded with the imports, being £18,000,000; in 1866 they were £74,000,000. In sixteen years, therefore, the trade of the United Kingdom with her colonies advanced from £37,000,000 to £135,000,000. If we exclude India from the estimate, we find that what may be strictly regarded as the colonial trade of Great Britain, the simple result of Anglo-Saxon colonisation during the last twenty-five years—the fruits of the efforts and enterprise of Anglo-Saxon colonists in Australia, Canada, South Africa, and the Indian islands—has advanced from £34,000,000, in 1850, to £157,000,000, in 1866. The tables of exports we have so rapidly glanced at are, in themselves, revelations of industrial progress. They tell of mining enterprise deep in the bowels of the earth, employing hundreds of thousands of hands, representing millions of capital expended in labour and machinery, and producing results which seem almost fabulous; of ploughs set to work in remote bush-lands of Australia, upon distant uplands in Africa, amongst the far pine-forests of the Canadas; of flocks and herds spreading over the new pastures of unpeopled lands; of homesteads springing up in regions where barbarism has brooded, and where nature alone has reigned; of multiplying mills, outbranching railways, and thickening traffic in and through countries which but yesterday were untrodden solitudes. To colonists, these figures tell also a further tale, of privations endured, of sacrifices undergone, of disappointments borne—a tale of struggle with stubborn difficulties; of battle with ignorance, inexperience, and novelty; of contention with nature's baffling forces encountered under new conditions. I suppose that in no colony has any one export been established without a measure of failure and loss on the part of its first promoters, such as can only be understood by persons who have passed through such an ordeal. In the early years of all new settlements agriculture is entirely experimental, and industry is often fruitless. Before a body of colonists can feel confident of what the country of their choice is capable, and how its resources can be most profitably developed, they have to pass through a wearisome probation of trial and of failure. The process is slow and tentative; its results are only attained by constant toil and unabated

perseverance. It may seem that the progress of trade, as set forth by figures, indicates unbounded prosperity, and an ease of production which entails inappreciable effort. If such an impression be conveyed, it is a false one. The prosperity of the colonies is by no means exceptional, nor are colonists, as a rule, wealthy people. Their produce, though abundant, is not always remunerative, and is often only marketable at rates which leave but a slight margin of profit to the producer. Labour, in many cases, is not only exceedingly scarce, but unduly dear. Transport is always an oppressive charge. Colonies are mostly lands of magnificent distances and of indifferent roads, and, even where railways are established, there are usually special taxes required which have to be reckoned against profits. In some countries there are risks of loss from fire, drought, flood, or other special causes, for which provision and allowance have to be made. The rapid increase in production has a direct tendency to reduce prices, although there may be no corresponding reduction in the expenses of production. Out of the £143,000,000 worth of raw materials exported to other countries from the colonies, I believe it to be more than probable that foreign dealers and manufacturers make a far larger proportion of gain than do the actual producers. It must not, therefore, be assumed that, because the trade of the colonies has exhibited such rapid expansion, and now has attained to such vast amounts, the colonists themselves are, as individuals, proportionately opulent or inordinately prosperous. That many of them have made and are making fortunes, is probably the case, as it is with persons in other parts of the world; but, as to colonists in general, the advantage of their condition rests rather in greater independence than in superior wealth.

Political and Social Conditions.

Let us now quit the dry region of statistics, and consider the more attractive questions connected with the political and social circumstances of the different colonies. And here I must deal generally with the subject, as each colony would supply ample materials for a separate paper.

The principle of self-government has now, for many years, been recognised as the basis of England's relation with her dependencies. In former times the Imperial policy was just the other way. Then, the mother-country ruled her scattered offspring with a high and stern hand; power was all centralised in Downing-street, and the rights of representation and free action were denied to the colonial subjects of the Crown. No despotism could be more perfect than was the rule of a governor in those days; but the tyranny, though illiberal, was paternal, and signified both attachment and appreciation. Now, the position of a colonial governor has been shorn of its irresponsibility; his difficulty is rather how to humour than to restrain the free instincts of the people under him, and he may be said to represent the indifference and the regardlessness of the parent land. There is probably no colony which could not obtain the fullest powers of self-government, if it liked earnestly to ask for them, and there are, indeed, very few that do not already possess these privileges.

Responsible government, that is, government by ministers elected by popular suffrage, has been enjoyed for many years in all the Australian and most of the North American colonies. In these colonies only the governors and, I believe, the judges, are appointed by, and solely responsible to, the Crown. In all other respects the chief features of parliamentary institutions, as known in this country, have been reproduced. In Victoria and South Australia manhood suffrage and the ballot are in operation. In other colonies some kind of qualification is necessary, but the low standard of this—never exceeding a rental of £10, or a freehold of £100 in value, and generally much less than that—practically gives a vote to every one who has any real stake in the country. In the Mauritius, Ceylon, the West Indies, and one or two other minor settlements, the principle of close government still rules. Not only are the governor and his chief officers the mere nominees of the Crown, but they are assisted by administrative or legislative councils, composed of non-official persons, nominated by the Queen's representative. The circumstances of these communities differ much from those of colonies where the population is chiefly of European origin, that is, where the labouring people is not coloured. I am not aware that even the most advanced believer in the equality of races professes indiscriminately to invest natives, whether they be of African or Asiatic descent, with the political rights of European freemen. The sad experience of Jamaica is probably sufficient to discourage any such attempt. In both the Cape and Natal a modification of the self-governing principle is established, in the form of popularly-elected legislative assemblies, acting in conjunction with irresponsible ministers of the Crown. This system, however, though useful as a preliminary measure, is not found to work successfully, and both communities are likely to ask, ere long, for extended powers of self-government.

It would be folly to deny that, in their early exercise of parliamentary privileges and functions, colonists make frequent exhibitions of inexperience and incapacity. It could not be otherwise. They are but 'prentice hands in the art of government. They have no precedents to guide them, no light from the past illuminates their difficult way. Few colonists possess the independence and leisure requisite to the proper pursuit of statesmanship. Fewer still have had any special training for the work of legislation or the duties of administration. They have, moreover, an immense field of action before them. All the numberless wants of a new country press for satisfaction. Their business is to create, not to reform. They have not to pull to pieces and amend the doings of their predecessors, but to build up, out of materials gathered from other and dissimilar countries, a structure that shall fit the peculiar circumstances of the new land. Then they are responsible as representatives to men who are less bound by set rules of thought and habits of action than are the citizens of older states. Colonial electors think and act for themselves, and usually have very strong opinions upon most subjects. Party and faction, it is true, often run high, but they are more things of a moment than fixed and strong lines of political demarcation. When a judgment is passed upon self-government in the colonies, allowance should be made for the different circumstances of colonial senators, nor should condemnation be pronounced before mischief is really seen to be flowing from the system. A ministerial crisis, a popular commotion, a deadlock between a government and a parliament, may all ensue, and yet the internal administration of affairs be satisfactory and successful. I believe you will find that, in those colonies where events of this kind most prominently transpire, all the functions which a government has to discharge are efficiently fulfilled; justice ably and impartially administered; a vigilant police established; a cheap and regular postal system in operation; roads and railways maintained; education promoted on a broad and liberal basis; public institutions nourished; and statistics actively collected. If all these are secured, as they are in most if not all the colonies, and the community at large is found to be prosperous, contented, and orderly, surely a few political distractions ought not to outweigh the solid good that is done in communities whose faults may be traced to their unavoidable and yearly diminishing misfortune in being, like David Copperfield, so exceedingly young. It might also be possible to suggest that, in far older countries which are the very centre, source, and example of the self-governing principle, the political waters are not always unruffled, nor the parliamentary atmosphere unexceptionably serene.

Self-government in the colonies works under the pecu

liar condition of having republican elements to deal with under a monarchical head. In a social sense, a colony is a reproduction upon a small scale of the American republic. There are practically no hereditary titles, no landed aristocracy, no social grades, save such as money, ability, or taste suggest. Prescription is unknown. The rich man, the ready man, the fortunate man, may rise to the top of the social tree, but no man can do so without one or another of these claims to recognition. In some colonies, perhaps, accident or custom may have brought about a certain social distinction of classes, such as exists between town-people and country-people, tradesmen and farmers, but the division thus created can be regarded neither as material nor permanent. Unless there be some especial personal disqualification, the opportunities of social advancement and of wealth-getting are about equal, to the ambitious and to the capable man; and it is difficult to say whether the time may come that shall see the general recognition of superiority by birth awarded to any one class.

Whatever shifts and privations their early struggles may necessitate, it cannot be said that colonists are at all backward, when their means will permit it, in surrounding themselves with the costlier accessories of civilisation. A strange contrast is that presented by a colony between the first five or ten years of its existence and when a generation has been matured upon its soil. Then, all was rough, raw, and disorderly; now all is set, finished, and trim. Then, here and there patches of badly broken-up ground, small bush-clearings, straw huts, wattled houses, or sod cabins, were the only evidences of European life through vast stretches of bushy wilderness or grassy upland. Now, well-enclosed and carefully-cultivated fields, wide expanses of plantation, substantial homesteads, with all fit environments of garden, orchard, and farm-buildings, meet the eye in every direction, and give to the landscape that angularity of aspect which has ever seemed to me a marked token of civilisation. Europeans follow straight lines, savages keep to circles and curves. Then, might be seen carts and waggons, not too heavily laden, drawn toilsomely along self-made roads, sticking for days by the side of baffling mud-holes, or breaking down in the ascent of stony hills. Now, traffic is carried on conveniently and regularly, in some colonies by railways, in others by means of waggons of an improved description, bearing enormous loads over easy and well-made roads, and across friendly bridges. Then, the villages and towns consisted of confused groups of hastily-erected buildings, compounded out of any material fitted to give shelter—mud, poles, felt, canvas, iron, or the insides of packing cases—with a few structures of a better order standing oddly amongst the shanties around; with unpaved streets deep in mud or sand, and full of hills and dales, with clumps of bush yet left flourishing in the centre of them. Now, in some colonies there are cities that would do no discredit to Europe. Melbourne and Sydney, Quebec and Montreal, are on a par in all respects with leading provincial towns or minor European capitals, while the other chief towns of England's fifty colonies, well-built, well-paved, and well-lighted, though they may have a distinct local character, are, it may fairly be said, in advance of provincial towns in this country, of the same population, in many respects. In towns, for instance, of from 5,000 to 10,000 inhabitants, you will often find established institutions, clubs, banks, chambers of commerce and agriculture, and other forms of social and commercial organisation, which would, in other countries, be only found in equal measure in towns of much greater size and population. In many of these centres public works of much magnitude have already been carried out at great cost; water-supply from distant sources has been secured, roads macadamised, town halls erected, parks and gardens laid out—the latter, indeed, being a very common provision—museums and libraries founded, and other like undertakings provided on no mean or inconsiderable scale. Personally I know of no colonial town of any standing which has not its public park and public gardens, maintained at the public expense and for the public benefit.

This contrast between the present and the past might be pursued much further. The first settlers not only find a natural wilderness before them, but they have a social desert to encounter. They have neither schools for their children nor churches for their families. They have to be their own post-masters and post-carriers. They are remote from shops, stores, or other sources of household supply. They are out of the reach of masons, smiths, tailors, and other handicraftsmen, They are cut off from social intercourse, and in a great measure from mental sustenance. These are among the chief drawbacks of their condition as pioneers. But it is astonishing how soon, as their numbers increase, and their labours bear fruit, the settlers manage to supply their wants, and improve their position. Itinerant schoolmasters are followed by district schools. Pastoral visitations from house to house are succeeded by the erection of country churches. Branch post-offices are established. Stores are set up in outlying districts, and in course of time village communities gather around them. Mechanics settle down in the neighbourhood, and ply their callings. Families locate themselves around and form a social circle. With the increase of postal facilities, the operations of the newspaper-press expand, the local journals come more frequently and regularly, while book-clubs and libraries spring up for the satisfaction of their mental needs.

It would be far too wide a task to attempt to describe the educational systems in force throughout the colonies. They have no particular principle in common, nor is there much uniformity of any kind. Each government adopts its own plan, and where circumstances differ so materially there must necessarily be variance in action. In no case, however, is the education of the people wholly neglected by the State. In many colonies large sums of money are appropriated from the public revenues to this service. In some, government schools, directly maintained and controlled by the State, are established; in some, schools are merely subsidised, or teachers receive so much per head for every registered scholar; in some, education is left to denominational agency, and government aid is given without reference to sect; in some, and perhaps this is most general, a mixture of all these plans is in operation. I believe it may safely be said that, in every instance, government aid is given impartially to all, irrespective of creed or colour. A favourite principle is that of supplementing private contributions by a sum in a certain fixed proportion. In the older colonies, colleges and even universities have been formed for the education of the richer classes, although it is still a common practice, and will probably remain so, for parents who can afford it to send their children to Europe.

Naturally associated with this subject is the progress made by the press in the colonies. Perhaps in no respect has greater advancement been evident than in this. The first newspaper issued in a colony—and it is never long before one, or an apology for one, makes its appearance—is usually a literary curiosity, and ought to be enshrined as such in the museum of the country where it is published. Little better than a letter-sheet as to size, it exhibits a rare variety of type of all sizes and shapes; it generally bears some Johnsonian motto, and starts with the most grandiloquent assurances of the course it intends to pursue; it is not unfrequently printed upon blotting, brown, or coloured paper, for which apology is made on the score of delayed supplies; it chronicles beer of the smallest and thinnest body, and has generally a grievance with somebody or some power to combat. But, such as it is, it suffices for the immediate wants of the small and scattered community in whose behoof it is issued, and speedily improves and developes into a sheet that is at least on a par with the provincial journals of this country. In Australia the daily papers differ little from the London ones, while the *Australasian*, a Melbourne

weekly, may safely challenge comparison with any weekly throughout the world. That admirable journal is a more complete embodiment of matter suited to the tastes of everybody, than any that I am aware of published elsewhere. In the older colonies, a few illustrated periodicals are issued, but they are so far a less success than those of their contemporaries whose efforts are confined to letter-press. Comic publications are also common. Literature proper has not made so much advance, and is usually represented by pamphlets and works of a minor character. The time has hardly yet arrived for the outgrowth of authorship in its true sense, in communities that are still absorbed by the busy avocations of their new life. As yet, journalism affords a sufficient outlet for the literary aspirations of colonists, and if higher flights are essayed by them, the home press is preferred. It cannot, I think, be doubted that the influence of the newspaper-press in the colonies is of special value and utility, not merely as a medium for the expression of opinion, but as an educational agency, far-reaching in its operations, and ameliorating in its effects.

The claims of religion are not likely, I imagine, to be overlooked in any community of Anglo-Saxon origin. Throughout the colonies there is not only strong and active religious life, but there is, I believe, much progressive ecclesiastical energy. This is manifested in the many costly and beautiful edifices that are being and have been erected for purposes of worship by different religious bodies. In the early days the offices of the church are administered in the room of some settler's residence, lent willingly enough for the purpose. Then a simple and unpretending building will be set apart for the purpose, and in a few years more a church or a chapel, as the case may be, will be built. In many colonies the Christian minister has been the first representative of civilisation; the evangelist has preceded the farmer, the missionary has been the forerunner of the merchant. It must, I think, be satisfactory to my countrymen at home, who contribute so generously towards the propagation of the Gospel in foreign parts, to know that in spite of the deadening influence of adverse circumstances, that attachment to the Christian faith, in all its multiform varieties, which is happily a characteristic of our race, abides with the British colonist in the seclusion of his distant home, and must be as potent an influence in shaping the destinies of the colonial empire as it has been in directing the fortunes and moulding the character of this great patriarchal nation.

The colonies are not merely self-governed; they are almost wholly self-supporting. There are, I fear, too many people in this country who cherish the belief that the mother country, by which we mean the British taxpayer, is, to a great extent, burdened with the cost of governing these numerous dependencies. It was once said in this room, not many years ago, that the governors were paid by Great Britain. Were the first of these statements correct, a very large basis for just complaint would exist, but there is no foundation whatever for it. I cannot too emphatically assert that, in no one case that I know of, does the home government, except for some specific object, and with some definite reason, do more than meet the expense of such regular troops as may be stationed in the different colonies. Whatever the expenditure required for their internal government may be, the colonists meet it out of their own resources; and this is the case even in colonies where no representative institutions exist, and where the people who supply the requisite revenue have no control over its disbursement. As to the salaries of the governors, who are invariably appointed by and solely responsible to the Crown, they are as much part of the colonial expenditure, and therefore as much a charge upon the colonial revenue, as the salary of the lowest official. And although the home authorities please themselves entirely in the matter of these appointments, the colonial legislatures show usually the most liberal disposition to vote emoluments fully proportioned to the dignity of the office. In two colonies at least the salaries of these functionaries were doubled, at the express instance of the local chambers.

Whatever the commercial progress of the colonies may have been, their progress in the art of raising and expending revenue has been in equal degree. Even in India, the revenue nearly doubled itself in 16 years, being now close upon £50,000,000. In 1850, the aggregate revenue raised by all the other colonies amounted only to £3,633,000. In 1866, the one colony of New South Wales raised and spent almost as much, and the aggregate of the whole expenditure of the several British colonies taken together went up to £18,250,000, having advanced more than fivefold. Of this amount Australia contributes £10,000,000, North America £3,500,000, the West Indies more than £1,250,000, Africa £1,000,000, and the Eastern Islands £2,000,000. The West Indies appear to have made, in this respect, the least progress, and the Australian colonies the most. The progress of expenditure may of course be measured by the state of the revenue, or *vice versa*, but, with a few exceptions, if the returns were taken literally, the colonies, in 1866, spent a little more than they raised. The ordinary sources of current revenue are, however, found inadequate to meet the wants of most of the colonies. So many public improvements are called for, railways, roads, and immigration make such pressing demands upon the exchequer, that the redundant capital of Europe is called into requisition, in the shape of loans advanced upon colonial debentures. In the year 1866, New South Wales alone raised and spent more than £1,000,000 in this manner, and, be it also observed, paid off more than £1,000,000 under the same head. In that year, India had a public debt of £98,000,000, Australia of £24,000,000, North America of £15,000,000, Mauritius of £1,000,000, South Africa of £1,000,000, the West Indies of £1,500,000, and other colonies of smaller amounts, making a sum total of £145,000,000, which are due to fundholders in this country, and upon which from five to six per cent. interest is annually paid by the colonists.

Although the revenues of the different European colonies, when reckoned against the population, appear to imply a heavy rate of taxation, ranging from £4 to £7 per head, the pressure is probably more easily borne than is a far lower average by the people of this country. In most cases from one-third to one-half the revenue is contributed indirectly, in the form of customs duties. This, in a new country, is a necessity. Property, in the true sense, has to be created. Land has to be made both productive and valuable. Industry has to be helped and nurtured, rather than crushed by premature burdens. By taxing the commodities of trade, the local governments replenish their exchequer in an easy and inexpensive way, and by means which are not felt by the people to be unduly burdensome. The colonial tariffs are continually being altered as circumstances change and as experience suggests, but the general character of them is more or less uniform. Except in the North American and some West Indian colonies, such questionable but popular luxuries as spirits, tobacco, beer, and wine are saddled with the heaviest duties. At Eastern ports the duty on spirits ranges from 5s. to 6s. per gallon. In Australia it is fixed at 10s. and 12s.; in South Africa at 6s. and 8s.; in North America from 1s. 4d. to 3s. 4d.; and in the West Indies from 1s. to 8s. Breadstuffs, books, and industrial appliances are usually admitted free.

The other sources of revenue are more numerous, and comprise land-rents and land-taxes, stamps, excise duties, tolls, and local rates. Direct taxes of all kinds are avoided as much as possible by the colonists. One of the great charms of colonial life, as regarded by many people, is its immunity from the visits of the tax-gatherer. People prefer to pay a trifle more for the articles of their daily consumption, or upon specific transactions which are

supposed to imply gain or profit of some kind on both sides, to being liable to direct calls upon their pockets. Nor are they entirely free from direct imposts of that description. In all colonies there are municipal charges in towns, and county rates in the country, to be met. And when you come to consider how varied and urgent are the requirements of a new settlement, where roads and bridges have to be made, streets paved and lighted, water secured, drains and sewers constructed, and police maintained, all by one and the same set of people, it is obvious that the scanty resources of colonial settlers must be strained to the utmost in their endeavours to satisfy these primary needs.

Having now, as far as time will admit, reviewed the chief elements of colonial progress, I cannot forbear devoting a brief space to a question of a more delicate and debatable character, one upon which great difference of opinion exists, I mean

The Worth of her Colonies to England.

Upon this point, I wish it to be particularly understood that I speak as a colonist, as one accustomed by habit and association to look at the subject in a particular light, but at the same time as one who is well aware that his views will not probably be shared by many who hear him, and who is prepared to hear with all candour whatever arguments can be urged on the other side.

I have no hesitation in expressing my honest belief that England, in her colonies, possesses the truest and most lasting sources of national greatness, and the proudest pledges of moral and commercial pre-eminence that any land and people have yet enjoyed. I believe, moreover, that not only is this country bound, by all the solemn obligations that can bind a nation, to retain and to cherish her colonial possessions, but that it is on all accounts to her self-interest to do so.

As it is on grounds of commercial expediency that the converse of these propositions is affirmed, let us treat the question, in the first instance, strictly as one of gain or loss to the mother country. Tried by the favourite standard of the age—expressed in the symbols £ s. d.—how stands the account between the parent-land and her offspring?

In 1851, India and the colonies were customers of the United Kingdom to the extent of £20,000,000 worth of British goods, or something more than one-fourth of her whole export trade. In 1866, these possessions had increased their consumption of British manufactures three-fold, and out of the exports from the United Kingdom, that year amounting in round numbers to £188,000,000, £61,000,000, or one-third, went to her dependencies. Thus, so far from the colonies becoming worse customers of the mother-country as they advance in years and in self-productive power, they have, in 15 years, increased their proportion of trade by a very considerable percentage. In 1858, the colonies did as much business with Great Britain as the United States, France, Germany, Turkey, and Holland together.

But of even greater consequence in a national point of view than her export business is the import trade of the kingdom. The commodities she gets from her colonies are mostly raw materials, which give employment, in so many countless forms, to the labouring millions of her population and the vast capital of her manufacturers. British colonisation benefits the mother-country in two ways; it opens out new fields for the energy and industry of her sons, for the enterprise and wealth of her capitalists; but it also, by the extended production of raw staples, which that energy and that capital stimulate, quickens the industry of her toilers, and gives fresh and continuous vitality to her own manufacturing interests. How many hands are employed, how much capital and machinery is engaged in converting into marketable commodities the cotton, wool, flax, jute, sugar, timber, hides, spices, and other staples sent to the ports of the United Kindgom from her colonial possessions. These materials are the life-blood of British commerce, and are pouring in year by year in a gradually dilating stream. In 1851, the total imports of Great Britain amounted to £142,000,000, of which only £20,000,000 came from her colonies. In 1866, this country's importations were estimated at £295,000,000, and of this amount £74,000,000 were colonial shipments. In fifteen years, therefore, England's importations from her colonies, as compared with the aggregate of her imports, have advanced from one-seventh to one-fourth. England therefore benefits commercially by her colonies thus:—They give, in the first place, fresh and wider fields for the reproductive outlay of her superfluous industry and capital. They open out boundless sources, whence the manufacturing and industrial needs of the mother-country may be supplied with these raw materials without which her commercial system would be paralysed; they keep at work those endless manufactures upon which so many millions depend for their subsistence; they increase the production of marketable commodities, and thereby give additional vitality and vigour to trade; they give employment yearly to British shipping (vessels, that is, belonging solely to owners in this country), which represent a tonnage of more than 20,000,000, that being, in round numbers, the aggregate tonnage, for 1866, of British vessels entered and cleared at colonial ports; and then they themselves become, in their turn, customers of the mother-country for the manufactured products, whose raw materials they supplied, to the extent of more than a third of her whole export trade. Finally, they offer openings for the investment of the redundant savings of this country, at higher rates of interest than are obtainable in like securities here; these openings being already taken up by British capital, to the extent of a hundred millions in India, and about fifty millions in the other colonies.

Against the arguments that as the colonies advance in population and in wealth they will become their own manufacturers, and thus cease to draw so largely upon the mother country, I put the fact that throughout these returns there is no retrogression, little fluctuation, and nothing but steady progress—progress, too, be it marked, in an advancing ratio. In point of fact, the colonies do not, as they get older, do less business with the United Kingdom. The tendency is distinctly the other way, and for very obvious reasons. The wants of all communities multiply as they advance in influence, in civilisation, and in refinement, and these wants are not likely, during any period to which we need now look forward, to be susceptible of home-supply. It has not been so in America, nor is it probable that it will be so in Australia, in India, or in Africa. The colonies will, for long years yet, have enough to do in supplying the old world with raw materials. That is their obvious function. They have the virgin soil, the boundless pasturelands, the unpeopled acres, which are required for the purposes of extended production. That the colonies are making progress in the arts of manufacture is undoubted, but it is not in a manner or to an extent likely to affect their commercial relations with this country. It pays them better, as a rule, to grow the raw stuff than to manipulate it. Take the case of sugar for instance. The latest discovery in connexion with that staple has for its object, not the manufacture of the perfect article by the grower, but the production of it in the crudest form, and at the cheapest cost, for the final operations of the home refiner. So far as we may venture to forecast the future there seems every probability that, as the colonies get more populous, more widely cultivated, more opulent, as their natural resoures come to be better known and more fully developed—as their distant districts are brought into closer contact with ports of shipment by means of railways, and new centres of production are thus made available for purposes of export—their trade with England will make yet greater progress in years to come than it has done in the past, and, before long, rival and eventually outstrip the relative value of her foreign trade.

Another great substantial advantage which her colonial possessions secure to Great Britain is, that they provide adequate scope for the expansion of new industries, and the extended exercise of those mechanical and manufacturing capacities for which our race has become famous. In an old land like this, where every rood of ground is occupied, and all the avenues open to human enterprise and ingenuity are filled to excess, this lack of elbow-room would be a serious matter, were there not in all parts of the world fields for experiment and energy open to all comers, but not the less under the British flag. To a Society established like this for the promotion of Arts, Manufactures, and Commerce, a reference to this subject seems highly applicable. As the world grows older, its needs get more varied and imperious, and it is well that there are lands not yet broken-up, where new products may be discovered and old ones improved. There are many indigenous substances to be found in those distant regions, whose uses are so far slightly known, if known at all, but which may yet have an important part to play in the industry of future ages. Pastoral pursuits, too, can there be undertaken on a scale and under circumstances highly favourable to any movements that may be made to improve and to increase the insufficient meat-supply of European nations. Coal likewise exists in indefinite abundance thoughout the southern as well as in the western hemisphere, and should the time come when the mines of this country cease to fulfil the requirements of the day, there will yet be—let us hope under British rule—vast coal mines untouched and unmeasured, to supplement, to relieve, or to take the place of the exhausted coal-beds of England.

Leaving the groundwork of material advantage, and rising to the higher level of national obligation and of moral gain, I think it can be shown that there are yet better reasons even than those I have named why England should set value upon her colonies. It is, I am aware, common in this age of materialistic thought, to exclude sentimental considerations from the bounds of political discussion. But where the action of our modern statesmen, in dealing with other questions, so signally belies the fashionable creed of the day, it may not be out of place, in treating of so strictly a national question as this, to take a broader platform than mere statistics can supply.

I hold that Great Britain is bound, by all the solemn obligations of honour, of good faith, and of self-respect, to retain her colonies so long as they remain loyal to her standard, and ask for no dissolution of the bond. Many of those dependencies she acquired by conquest, some she gained by cession; others she took possession of for purely Imperial purposes, in order to protect the natives from aggression, and advance civilisation in the world; while all of them, by the free exercise and full recognition of her authority during many years, she has constituted integral parts of her empire, and, as such, she cannot, without a breach of faith scarcely paralleled in history, get quit of her Imperial responsibilities in connection with them. This country has entered into a tacit covenant with every man who has gone to settle in those colonies; with every man who has invested money in them, on the strength of the fact that they were under British rule, and trusting in the security and order, of which the British flag, happily, is everywhere the guarantee.

It is argued that, as England has conferred upon the colonies the rights of self-government, they are bound to protect themselves, and that, if they are not prepared to do so, England would be better without than with them. This is a plausible, but a one-sided, and, I cannot but think, not very dignified argument. In leaving the colonies to govern themselves, England has pleased herself as much as them, and freed her statesmen from duties that were found to be both irksome and embarrassing. In giving them the management of their own affairs she has made no sacrifice, save that of an authority the discharge of which caused constant trouble and complication. There is, too, a limit even to the fullest development of these self-governing powers. The Crown still retains in its hands the appointment of its governors, and enjoys, very properly, as fully as ever its power of veto, which is practically exercised by ministers who are responsible only to the people of the mother-country. No colonists object to these reasonable and constitutional checks, but they do, I submit, form a considerable modification of the principle of self-government as understood here.

As regards the matter of protection, it may, with some exceptions, be considered in the abstract, as in many of our principal colonies its practical bearings are unimportant. The Australian colonies have no elements of internal danger to guard against, and in New Zealand, until lately, the colonists seemed well enough pleased to have the natives left wholly to themselves. If England likes to abdicate her time-honoured function of looking after the aborigines, it is her business, and not that of colonists, to whom the Imperial policy in that matter has often proved harassing, and seemed to be shortsighted. In South Africa, where self government does not exist, and where the management of the natives is, as yet, entirely an imperial matter, where the native tribes are numerous and powerful beyond example in other colonies, and where the home government, by its policy in the past, has entailed upon the European communities the gravest political complications, there are special reasons why, for some time to come, a considerable Imperial garrison must be maintained there. Not that, even in that country, exposed as it is to peculiar dangers, the colonists depend very anxiously upon the protection of the mother-country. I suppose no colony is more delicately situated than Natal, where we find a European community of 17,000 souls, scattered over an area larger than that of Scotland, amongst a resident native population exceeding 200,000, and surrounded on three sides by still larger and more warlike native races. But in this community a small garrison of about 400 Imperial troops, has sufficed to keep the peace unbroken throughout a period of twenty-five years, and the colonists do not shrink from the responsibility of defending themselves, so far as their limited numbers and scanty means will enable them to do so. In these young settlements, however, every inhabitant may be said to be still striving for his daily bread; and I would merely ask whether it is wise or generous—whether it is a policy befitting a great, wealthy, and ancient nation, to impose upon feeble shoulders, however willing, the whole burden of responsibilities which would tax the capacities of states far older, far more populous than are they, and possessed of some measure of practical experience in military pursuits.

On one point, the colonies cannot, however, avoid almost entire dependence upon the mother-country—I mean as regards naval defence. Their need of that kind of protection springs almost wholly from their connexion with a great European power. As independent states, their obscurity, their distance, and their insignificance, would shield them from aggression by Northern powers. As vulnerable parts of a great empire, they present tempting inducements to attack. I rejoice to observe that this feature of their condition is so generously recognised, and seems likely to be so fully provided for by the ruling powers in this country. Comparatively speaking, but a small Imperial expenditure would, I believe, be required for this purpose.

Time fails me to set forth the other advantages which I humbly conceive that the mother country derives from her colonial possessions. I leave military authorities to say whether the command, in all parts of the world, of lands variously circumstanced, where troops can be garrisoned, exercised, trained to difference of climate, and practically versed in the art of warfare, be a benefit or not. I leave also unconsidered the question whether the standing army of the United Kingdom would be materially reduced were the garrisons withdrawn from

TABLES OF COLONIAL STATISTICS, SHOWING THE PROGRESS MADE BY THE COLONIES BETWEEN THE YEARS 1852 AND 1866.

TABLE I.—AREA AND POPULATION.

POSSESSIONS.	AREA.	POPULATION.					
		1850.			1861.*		
	Sq. Miles.	Males.	Females.	Total.	Males.	Females.	Total.
India (British)	988,091	(1855) ..	..	123,931,369	..	..	143,271,210
Straits Settlements	1,095	..	..	..	..	..	282,831‡
Ceylon	24,700	825,603	749,950	1,575,553	975,117	917,423	1,892,540
Mauritius†	708	119,381	61,482	180,863	202,961	107,089	310,050
Labuan	45	1,030	120	1,150	1,672	701	2,373
Hong Kong	32	24,929	8,214	33,143	87,945	31,376	119,321
Australia :—							
New South Wales	323,437	154,575	110,928	265,503	202,099	156,179	358,278
Victoria	86,831	45,495	30,667	76,162	321,724	220,076	541,800
South Australia..	383,328	35,302	27,737	63,039	65,048	61,782	126,830
Western Australia	978,000	3,576	2,310	5,886	9,852	5,839	15,691
Tasmania	26,215	..	..	..	49,593	40,384	89,977
New Zealand	106,259	(1851) 15,035	11,672	26,707	61,035	37,936	98,971
Queensland	678,000	(1860) 17,275	11,612	28,887	21,231	13,654	34,885
Total of Australia	2,582,070	..	..	..	730,582	535,850	1,266,432
Falkland Isles	7,600	304	129	433	352	214	566
Natal	16,145	46,892	73,735	120,627	71,999	80,705	252,704
Cape of Good Hope	200,610	141,609	143,670	285,279	..	..	267,096§
St. Helena	47	(1854) 3,584	2,679	6,263	3,774	3,086	6,860
Gold Coast	6,000	(1858) ..	..	151,346	..	..	..
Sierra Leone†	468	24,050	20,422	44,472	21,107	20,390	41,497
Gambia	21	2,687	2,164	4,851	3,985	2,954	6,939
North America :—							
Canada	331,280	(1852) 949,034	893,231	1,842,265	1,293,440	1,214,217	2,507,657
New Brunswick	27,037	(1851) 99,526	94,274	193,800	129,948	122,099	252,047
Nova Scotia	18,670	(1851) 137,677	138,440	276,117	165,584	165,273	330,857
Prince Edward Island	2,173	(1848) ..	..	62,449	40,880	39,977	80,857
Newfoundland	40,200	(1845) 52,274	44,232	96,506	64,268	58,370	122,638‖
British Columbia	200,000	..	..	..	7,862	3,954	11,816
Vancouver's Island	13,000	..	..	..	..	..	23,000
Total of North America ..	632,360	..	..	2,471,137	..	..	3,328,872
Bermuda	24	4,797	6,295	11,092	5,302	6,579	11,881
Honduras	13,500	..	..	..	13,789	11,846	25,635
West India Islands :—							
Bahamas	3,021	11,479	11,931	23,410	17,666	17,821	35,487
Turk's Island	..	..	..	..	2,128	2,224	4,372
Jamaica	6,400	(1844) 181,633	195,800	377,433	212,795	228,460	441,255
Virgin Islands	57	3,130	3,559	6,689	2,907	3,144	6,051
St. Christopher	103	10,523	12,654	23,177	11,437	13,003	24,440
Nevis	50	4,418	5,153	9,571	4,734	5,088	9,822
Antigua	183	16,722	19,456	36,178	17,060	20,065	37,125
Montserrat	47	3,336	4,019	7,355	3,447	4,198	7,645
Dominica	291	(1844) 10,596	11,624	22,220	11,830	13,235	25,065
St. Lucia	250	11,673	12,843	24,516	13,118	13,587	26,705
St. Vincent	131	13,957	16,171	30,128	15,005	16,750	31,755
Barbadoes	166	56,004	66,194	122,198	70,799	81,928	152,727
Grenada	133	13,732	15,195	28,927	15,413	16,487	31,900
Tobago	97	6,335	6,693	13,028	7,433	7,977	15,410
Trinidad	1,754	(1854) 35,631	32,969	68,600	46,074	38,364	84,438
Total of West India Islands ..	12,683	379,169	414,261	793,430	451,846	482,351	934,197
British Guiana	76,000	67,267	60,428	127,695	79,644	68,382	148,026
Gibraltar†	1⅔	5,867	6,315	12,182	7,139	8,323	15,462
Malta†	115	64,139	61,660	125,799	67,477	68,862	136,339

* The Return for 1866 is so incomplete that that for 1861 is given instead.
† Exclusive of the Military. ‡ In 1862. § In 1856. ‖ In 1857.

TABLE II.—PUBLIC REVENUE AND PUBLIC DEBT.

POSSESSIONS.	Public Revenue.		Public Debt.	
	1852.	1866.	1852.	1866.
	£	£	£	£
India (for years ended 30th April)	27,832,237	48,935,220	55,114,693	98,383,651
Straits Setttlements..	..	376,776*	..	..
Ceylon	411,806	962,874	..	450,000
Mauritius	311,854	639,577	..	1,000,000
Labuan	5,817	7,370	..	..
Hong Kong	21,331	160,226	..	15,625
Australia:—				
New South Wales	682,137	3,253,179*	212,000	6,418,030
Victoria	1,634,448	2,990,842	..	8,844,855
South Australia	243,174	975,180*	..	775,600‡
Western Australia	37,022	89,383	..	..
Tasmania	181,079	313,832*	..	553,230
New Zealand	161,287	1,978,711*	..	5,435,729§
Queensland	..	592,969*	..	2,150,300
Total of Australia..	2,939,147	10,194,096	..	24,177,744
Falkland Islands	6,524	9,024	..	..
Natal..	29,650	156,883*	..	160,000
Cape of Good Hope*	288,942	732,298*	..	851,650
St. Helena	16,306	28,152	..	..
Gold Coast	5,147	..	..	..
Sierra Leone..	27,034	62,263	823	..
Gambia	13,959	19,080	..	..
North America:—				
Canada (for years 1857 to 1863 ended 31st December, for years 1864–5–6 ended 30th June)..	..	2,640,183	4,291,051	12,793,634‖
New Brunswick	111,134	298,494	..	1,249,174†
Nova Scotia (for years ended 30th Sept.)..	113,962	307,477	..	971,706†
Prince Edward Island	20,856	63,629	5,960	120,599
Newfoundland	83,925	150,290*	111,712	202,018
British Columbia	..	90,586	..	223,078
Vancouver's Island*	..	88,894†	..	40,000†
Total of North America	..	3,639,553	..	15,070,169
Bermuda	16,120	26,638*	..	1,500
Honduras	13,480	27,334	..	..
West India Islands:—				
Bahamas	27,784	53,283	19,872	..
Turk's Island	..	16,335	..	..
Jamaica	236,964	334,140*	737,005	757,317
Virgin Islands	1,444	1,994*	5,570	..
St. Christopher	13,266	24,505	..	..
Nevis..	3,601	7,015	9,600	3,600
Antigua	25,185	69,629*	78,940	47,655
Montserrat	3,196	5,325	..	3,920
Dominica	8,569	18,422*	..	9,620
St. Lucia	14,454	15,294	..	18,000
St. Vincent	17,241	21,240*	..	..
Barbadoes	59,363	103,935*	..	3,541
Grenada	17,366*	21,140	..	9,000
Tobago	7,819	9,815	17,740	1,534
Trinidad	107,310	226,218*	..	172,837
Total of West India Islands ..	543,562	928,290	..	1,027,024
British Guiana	218,014	304,817	..	660,646
Gibraltar	28,752	34,744	..	..
Malta..	127,729	196,459	..	206,628

* Including amounts raised by loans, &c.
† For 1865, no return having been received for 1866.
‡ Exclusively loans for reproductive public works.
§ Including for Provincial Governments £236,000 in the year 1862, £689,750 in 1863, £769,450 in 1864, £1,351,400 in 1865, and £1,917,675 in 1866.
‖ Direct funded debt less the amount held as a sinking fund for the redemption of a loan from the Imperial Government.

TABLE III.—TOTAL TONNAGE OF SHIPPING AND TONNAGE OF BRITISH VESSELS.

POSSESSIONS.	Tonnage of Shipping.		Tonnage of British Vessels.	
	1852.	1866.	1852.	1866.
	Tons.	Tons.	Tons.	Tons.
India (for years ended 30th April)	1,591,937	4,160,356	..	3,323,584
Straits Settlements	..	1,897,279*	..	1,090,965*
Ceylon	537,817	1,182,325	..	1,032,194
Mauritius	338,366	608,156	277,252	433,112
Labuan	..	37,362	..	34,327
Hong Kong	478,447	1,891,281	..	1,047,477
Australia:—				
New South Wales	373,326	1,514,735	..	1,400,917
Victoria	758,512	1,325,720	655,854	1,182,452
South Australia	202,507	339,871	196,360	323,339
Western Australia	49,352	113,736	41,369	85,786
Tasmania	271,459	213,968	..	211,950
New Zealand	112,149	637,282	55,778	597,539
Queensland	..	393,656	..	386,516
Total of Australia..	1,767,305	4,538,968	..	4,188,499
Falkland Isles	22,024‡	80,573	..	47,983
Natal..	12,598	51,769	12,104	51,421
Cape of Good Hope..	463,764	478,937	375,345	399,338
St. Helena	151,160	138,382	..	115,294
Gold Coast	26,922	..	..	..
Sierra Leone	59,763	96,099	34,483	74,841
Gambia	59,462	55,416	10,301	15,743
North America:—				
Canada (for years 1852 to 1863 ended 31st December, for years 1854–5–6 ended 30th June)..	1,142,301	1,803,643	977,718	1,603,135
New Brunswick	1,120,808	1,859,577	..	1,287,600
Nova Scotia (for years ended 30th Sept.)..	..	1,947,092	..	1,618,462†
Prince Edward Island	27,928§	336,890	..	308,388
Newfoundland	263,079	296,246	247,660	271,615
British Columbia	..	119,397	..	94,015
Vancouver's Island..	..	313,064†	..	138,339†
Total of North America	..	6,675,909	..	5,321,554
Bermuda	60,720	98,614	..	83,534
Honduras	48,840	48,581	..	25,620
West India Islands:—				
Bahamas	83,533	121,950	..	79,636
Turk's Island	..	114,558	..	63,954
Jamaica	216,822	331,517	117,858	279,577
Virgin Islands	8,266	8,085	..	8,085
St. Christopher	39,290	64,474	..	51,447
Nevis..	..	17,272	..	11,634
Antigua	..	58,062	..	55,079
Montserrat	8,616	11,918	..	11,573
Dominica	24,647	14,123	..	12,714
St. Lucia	22,388	22,920	..	20,063
St. Vincent	..	38,334	..	33,183
Barbadoes	213,947	316,321	78,372	255,923
Grenada	43,442	30,421	33,369	26,482
Tobago	17,468	14,070	..	14,070
Trinidad	126,054	281,304	79,980	194,363
Total of West India Islands ..	..	1,445,329	..	1,117,783
British Guiana	245,425	336,983	..	..
Gibraltar	873,414	2,138,921	..	1,587,260
Malta	1,064,730	2,369,314‖	..	253,210¶

* Inclusive of the coasting trade.
† For 1865, no return having been received for 1866.
‡ Entered only.
§ Cleared only.
‖ Sailing and steam vessels.
¶ Sailing vessels only.

TABLE IV.—TOTAL VALUE OF IMPORTS, AND IMPORTS FROM UNITED KINGDOM.*

POSSESSIONS.	Value of Imports.		Imports from United Kingdom.	
	1852.	1866.	1852.	1866.
	£	£	£	£
India (for years ended 30th April)	17,292,549	56,156,529	10,267,743	24,912,617
Straits Settlements	..	9,700,195	..	2,026,425
Ceylon	1,642,170	4,961,061	246,438	1,390,687
Mauritius	1,062,739	2,227,093	332,256	499,100
Labuan	30,970	109,135	..	1,299
Hong Kong (No Returns)	..	..	..	..
Australia:—				
New South Wales	1,900,436	8,867,071	1,395,091	3,352,768
Victoria	4,069,742	14,771,711	1,752,216	7,846,828
South Australia	798,811	2,835,142	517,856	1,880,273
Western Australia	97,304	251,907	65,477	143,521
Tasmania	860,488	942,107	535,190	253,180
New Zealand	359,444	5,894,863	204,132	2,737,702
Queensland	..	2,467,907	..	742,884
Total of Australia	8,086,225	36,030,708	4,469,962	16,957,156
Falkland Isles†	16,132	20,948	..	20,948
Natal†	103,701	263,305	45,695	189,299
Cape of Good Hope	1,861,194	1,942,281	1,724,898	1,280,529
St. Helena	..	112,506	..	63,656
Gold Coast†	71,635	..	45,350	..
Sierra Leone†	87,531	251,212	68,643	200,265
Gambia†	110,174	108,189	45,190	64,825
North America:—				
Canada (for years 1852 to 1863 ended 31st December, for years 1864–5–6 ended 30th June)‡	4,168,457	11,208,816	2,192,698	6,040,527
New Brunswick†	1,110,601	2,083,499	496,597	843,109
Nova Scotia (for years ended 30th Sept.)† ..	1,062,079	2,876,202	..	1,178,719
Prince Edward Island†	171,971	444,746	47,265	219,843
Newfoundland†	795,751	1,205,177	303,205	531,198
British Columbia†	..	298,149	..	14,336
Vancouver's Island†	..	594,297§	..	202,474§
Total of North America	7,308,866	18,710,886	..	9,030,206
Bermuda†	125,697	192,123	28,524	38,305
Honduras†	202,112	169,033	109,695	107,734
West India Islands†:—				
Bahamas	139,563	328,622	26,374	52,124
Turk's Island	..	56,091	..	9,535
Jamaica	837,894	1,030,796‡	415,488	684,448‡
Virgin Islands	5,571	10,209	939	..
St. Christopher	76,680	175,917	34,987	94,902
Nevis	17,867	34,936	..	8,579
Antigua	151,083	203,257	63,645	72,815
Montserrat	9,354	18,685	89	1,032
Dominica	53,054	62,188	20,368	25,941
St. Lucia	81,001	91,504	38,509	31,715
St. Vincent	167,079	158,158	83,185	61,500
Barbadoes	767,974	988,082	489,232	379,725
Grenada	149,718	122,255	73,049	52,115
Tobago	53,529	57,645	17,441	23,481
Trinidad	493,274	930,329	254,797	500,666
Total of West India Islands ..	3,003,641	4,268,674	..	1,998,578
British Guiana†	964,986	1,530,675	625,699	823,282
Gibraltar	..	..	..	..
Malta†	553,095	1,851,526	6,728	26,809

* These returns are all inclusive of Bullion and Specie.
† The imports of Bullion and Specie are not specified in the returns from these Colonies.
‡ Imports for consumption.
§ For 1865, no return having been received for 1866.

TABLE V.—TOTAL VALUE OF EXPORTS, AND EXPORTS TO UNITED KINGDOM.*

POSSESSIONS.	Value of Exports.		Exports to United Kingdom.	
	1852.	1866.	1852.	1866.
	£	£	£	£
India (for years ended 30th April)	20,798,342	67,656,475	7,145,939	43,397,640
Straits Settlements	..	9,924,088	..	1,248,829
Ceylon	1,350,670	3,586,454	704,293	2,385,126
Mauritius	1,100,212	2,525,805	896,354	718,568
Labuan	16,564	58,294‡	..	..
Hong Kong (No Returns)	..	..	..	..
Australia:—				
New South Wales	4,604,034	8,512,214	3,607,269	3,162,615
Victoria	7,451,549	12,889,546	6,198,433	6,754,536
South Australia	1,787,741	2,858,737	1,257,294	1,155,866
Western Australia†	24,181	152,240	16,751	103,732
Tasmania	1,509,883	834,606	796,991	344,131
New Zealand	145,972	4,520,074	40,458	1,713,062
Queensland	..	1,366,491	..	321,939
Total of Australia..	15,523,360	31,133,908	11,917,196	13,555,881
Falkland Isles†	8,300	21,780	..	21,780
Natal†	27,846	203,402	2,799	128,093
Cape of Good Hope..	772,537	2,599,169	710,214	2,087,663
St. Helena	18,250	11,653	15,962	5,261
Gold Coast†	159,250	..	92,300	..
Sierra Leone..	117,760	259,719	47,717	73,874
Gambia†	217,836	158,370	41,850	19,201
North America:—				
Canada (for years 1852 to 1863 ended 31st December, for years 1864–5–6 ended 30th June)	3,145,399	11,735,079§	1,388,395	2,704,508**
New Brunswick	796,335	1,327,855	602,295	620,715
Nova Scotia (for years ended 30th Sept.)† ..	785,052	1,608,619	..	57,577
Prince Edward Island†	106,256	246,816	16,468	118,609
Newfoundland†	965,772	1,186,314	373,181	327,867
British Columbia†	..	43,983‖	..	10,495
Vancouver's Island†	..	120,254¶	..	26,804¶
Total of North America	5,798,814	16,268,920	..	3,866,575
Bermuda†	10,116	31,842	7,944	6,925
Honduras	391,223†	277,156	340,908	169,013
West India Islands†:—				
Bahamas	90,419	261,976	11,345	63,012
Turk's Island	..	54,310	..	1,493
Jamaica	927,377	1,152,898	733,271	971,080
Virgin Islands	3,023	8,314	..	..
St. Christopher	91,742	172,096	78,414	139,172
Nevis	27,690	46,549	18,672	27,845
Antigua	142,775	291,861	137,941	277,386
Montserrat	7,388	19,898	50	12,866
Dominica	52,236	106,452	42,535	92,883
St. Lucia	57,211	109,483	46,553	98,789
St. Vincent	204,995	194,175	178,930	183,590
Barbadoes	951,726	1,246,844	783,801	817,980
Grenada	131,940	113,237	113,999	98,688
Tobago	56,831	69,872	56,503	63,471
Trinidad	458,851	1,031,683	407,637	825,133
Total of West India Islands ..	3,204,204	4,879,648	2,609,651	3,673,388
British Guiana†	978,296	2,170,967	917,667	1,742,545
Gibraltar	..	..	..	..
Malta†	279,640	1,324,496	..	898,681

* These Returns are all inclusive of Bullion and Specie.
† The exports of Bullion and Specie are not specified in the Returns from these Colonies.
‡ Returns incomplete.
§ Exports of domestic produce for the years 1852 to 1865.
‖ Exclusive of gold, which in 1860 was estimated at £600,000, in 1864 at £1,200,000, in 1865 at £578,790, and in 1866 at £600,000.
¶ For 1865, no return having been received for 1866.
** Exports of domestic produce.

the several colonial stations, and whether the Imperial exchequer would indeed be a gainer by the sum of £2,000,000, now expended upon the maintenance of these garrisons, were the colonies to be abandoned.

But I may speak of the moral gain secured to the people of this country by the existence of lesser Englands, where boundless opportunities of advancement are presented to every class of migrating people. Here, in this old and thickly-crowded land, it may be that men find it hard to stem the torrent of competition, or to rise to higher levels of social life or public usefulness. But there, in those fifty dependencies, openings abound for every kind of effort, and every grade of ambition. There, the farmer can acquire by slight outlay, and by indisputable title, breadths of soil that in Europe would almost make a small principality. There, the honest working man can live on his own freehold, and work his way on by rapid steps to a condition of honourable independence. There, the earnest youth who looks to public life as the proper field of patriotic aims, can find the object of his aspirations within ready reach. There, the distinctions may be less dazzling, the sphere of public recognition may be obscurer and less prominent, but the chances of attaining them are incomparably more abundant, and the influence exerted, when viewed in its bearing on the future that is now being shaped and foreshadowed, is, if anything, more direct and more enduring.

Surely, to a race impelled, as ours is, by its own natural instincts to go abroad, it is no slight privilege and advantage to have, in all zones, and by all seas, lands for its sons and daughters to occupy, where English institutions are established, where the English tongue is spoken, where the habits and customs of our race are reproduced, where the English principles of self-government can be gradually applied, and, perhaps, gradually extended; and where, under the English flag, freedom can be enjoyed without licence, and religion in its purest forms can be fostered, shielded, and upheld.

If we may venture to glance into the future, at a time when the future seems to unfold itself with such rare rapidity, I should say that the principle of confederation, which has received so much development during the last ten years, will in a few years have extended itself to the whole colonial empire of Great Britain. What has been achieved so successfully in Italy, in Germany, in the United States and in Canada, can hardly fail to be carried out in the case of the various groups of colonies that are bound together by natural and geographical affinities. I believe that, in the future, England will find herself the parent and head of six grand and compacted nationalities. Canada has already taken the step which has converted her once fragmentary settlements into a strong Dominion. New Zealand may be said to be already similarly consolidated. In Australia, in the East Indies, in South Africa, and the West Indies, the same process seems inevitable. Inevitable, that is, if, as I devoutly hope, nothing shall occur hereafter to sever the bond that gives to those communities the right to style themselves "British." What would happen were this severance effected—were these young states left in their immaturity to shift for themselves, were the controlling influence of the parent State to be suddenly withdrawn from them, I do not care to contemplate. Rather would I hope that it will be the policy of this great nation to preserve and consolidate, not to cast off and disown. Let the master statesmen of this country, who bring to their work minds trained by special education and long experience—gifts which few colonial legislators can in the nature of things possess—help the less privileged statesmen of these distant lands in the labour that lies before them of forming systems of government adapted to their needs, and defensive organisations suited to their capacities. Let no momentary impulse of economy lead to the hasty adoption of a policy which, while it would give but a trivial saving to the home taxpayer, would leave a lasting slur on the national honour, and entail endless mischief on the discarded community. Above all, let it be considered whether the time is not coming, if it be not at hand, when the affairs of the empire must be dealt with on a larger scale and in a broader spirit than past experience prescribes, and when either by the addition of colonial representatives to the House of Commons, or, better still, by the creation of a Council of Empire, charged with responsibilities above and beyond those of a merely national or local character, there shall be established betwixt the mother-country and its self-governed dependencies a bond of union, formed not by force or law merely, but by the conjoint recognition of common interests, and by the combined representation, on an equal footing, of the local circumstances of each and all.

Other European nations, stirred by the invigorating sense of their new national unity and life, are seeking to find abroad lands where they may plant their nationality and reproduce their name. Is England—the great coloniser of the nineteenth century—to relinquish to these rival powers the function she has so worthily and so magnificently discharged? Is England to abandon her crowning mission—that of being the dispenser of Christianity and the minister of civilisation in the wild places of the earth? Is England—with her multitudes of struggling toilers, with her thousands of suffering poor—to withhold the wholesome influences of her tutelage from lands where there are room for countless homes, and work for hosts of busy hands? Let not the prospect of world-wide empire—moral no less than political—opened out to this our country by the Allwise Disposer of events, be blighted by a callous indifferentism, or an inadequate conception of what the empire truly is; but rather let us hope that old England shall, through the times that are to come, find herself the heart of a vast system of states, whose interests shall be her interests—and who shall say of Britain, in her ancient grandeur, as the Jewish maiden said of her mother in her afflicted age, "Thy people shall be my people, and thy God my God."

DISCUSSION.

Mr. Hyde Clarke said he had listened with particular pleasure to the very able and deeply-interesting paper of his friend Mr. Robinson, and the more so because he saw before him an audience worthy of the subject, and which showed the growing interest of the public upon those questions in which the chairman, and other gentlemen had so long laboured without hitherto obtaining the attention they had deserved. After the great length to which Mr. Robinson had proceeded, and after the very able statement he had given of the condition and progress of the colonies, it would not be possible for anyone to enter much into detail, and therefore he would rather endeavour to make a few observations supplementary to what Mr. Robinson had said. He would first observe that in treating of colonial progress he had confined himself to so comparatively recent a period as rather to curtail our view of colonial history. He had only looked back about half a century, and within that period we had witnessed a very great advance in progress and prosperity. But he thought we must not omit, in the consideration of this subject, what had occurred in the preceding century, when we lost those great colonial possessions which now constituted the United States of America, which had been founded as English colonies a hundred years before. Therefore, in a whole review of this subject, we ought to consider that we had had to start afresh, as it were, with a new set of colonies. He thought, too, that Mr. Robinson had rather limited the extent of our empire in his paper. First of all, with regard to the area, he had left out the Hudson's Bay Territory, which was now about to be annexed to Canada, and of course when we came to compare our empire with other empires of the world, it was necessary that we should take into account the whole of our space, as

was done in Australia, with regard to the unoccupied land. And if we were to measure the extent of area with Russia, or with the United States for instance, of course we must bring everything into the balance. Then as regarded the extent of the population of our colonial empire, he should be disposed to include the population of other states, which, though not actually part of our colonies, were yet protected by our Government, and thus a more correct statement of the population would be obtained; as for instance in India, where, instead of its being given at 143 millions—if the protected territories were included—(because they were really more or less at the present moment under the English government, and must ultimately fall entirely under it), in that view India would have a population of at least 200 millions, and some would carry it even further. When, therefore, to these were added the other figures of our colonial empire, and when to this was added the population of these islands, we already had a population equivalent to about a quarter of the whole human race, according to the current estimate of a thousand millions; and if to these could be added the numbers of our kindred population in the United States, we might then mass together one of the greatest empires in the world. Even now, whether we regarded the population, the extent of area, or the amount of wealth, the empire of England stood second to none in the world. As regarded population, it came only after China, as to area only after Russia, though it now pressed Russia very closely since the large domain of Alaska had been united to the States, and those were considerations which should not be omitted when speaking of that important subject of our colonial empire, or our empire generally. We were too apt to restrict ourselves simply to these islands, and to this fault we were led from our early childhood, and our primary education tended to it, to the neglect of the consideration of those great colonies which constitute the mighty empire which the Chairman, and many others in the room, had been actively interested in and connected with during their lives. This was one great reason why our colonial empire had never been properly recognised, and that was why we found ourselves now in regard to this important question in our present anomalous position—one contrary to our own constitutional precedents. It was but a few years ago when, by a change in our policy towards the colonies, we separated them from us. We offered them absolute independence at the price of what was virtually a severance from the mother country. He was one of the few who, at that period, believed it to be a cardinal error, and events had since shown that it was so—events which were now bringing us back to a correction of that policy, and it might be that our former errors were assisting us to get into the right path. Thus Canada had built up a new confederation, and our colonial statesmen had begun to shadow forth that period when there would be a number of these, which would ultimately result in and constitute a congress of the whole empire. And what was that but the realisation of an idea long looked for by those who had been intimately connected with the colonies, and one known to the students of our colonial history;—what but the realisation of the project of union which was commenced by the great statesmen of nearly 200 years ago. The union of Scotland was not effected for fifty years from that time; the union of Ireland was deferred for 150, but ultimately they were brought about; and perhaps in the present day we might at length see the union of our whole empire accomplished, and men sitting in the Imperial Parliament as representatives of our colonies. If we looked at some of the figures Mr. Robinson had brought before the meeting, we should see the important bearing of those figures, and of the policy he (Mr. Clarke) advocated upon our present situation. Mr. Robinson, looking at it colonially, had sought to impose upon the mother-country great obligations, and had asked us not to sever our connection with the colonies, and that we should entail upon ourselves considerable burdens for their defence, but he had not provided us with the means. He had asked us to look at the general interests of the colonies, which, from that point of view, were being more than ever regarded with anxiety. He had asked us to look at the question sentimentally, rather than from those real interests which ought to bind us up together. If we had dealt with our colonies as the United States did with California, in regard to the question of gold—if all had been united as a confederation—then out of the £18,000,000 of revenue some £6,000,000 would have gone into the Exchequer, and we should have had funds for the purposes of defence. He congratulated the meeting that they had met under such presidency, and that such an opportunity had occurred of considering the important question thus brought before them under circumstances so favourable to its discussion, and by one so well able to treat it as Mr. Robinson. It was but two or three evenings ago that he had an opportunity of hearing him upon another question—the social aspects of colonisation. He referred then to the opportunities that colonisation gave to the humblest to elevate himself in the social scale, and stated that the effect of emigration was to elevate the whole of the population. But if that was the effect on the lowest classes, those circumstances were much more favourable to the middle classes of our population when such opportunities were afforded for the display of ability and the acquirement of a practical acquaintance with all the departments of public life. He could not but be struck with the fact that Mr. Robinson had had the opportunity, in consequence of his colonial career, of acquiring a degree of parliamentary and political experience which he could hardly have had at home, and of moving about the world in such a way as to obtain greater knowledge of mankind than he could have had here, and which in the future he trusted would not only be of the greatest benefit to our colonial communities, but an advantage to the imperial power.

Mr. P. L. SIMMONDS said it was a happy termination of the session of the Society to close with a paper on so important a subject as the progress of the British colonies, by a gentleman well able to deal with it, and presided over as the meeting was by so eminent a colonial ruler and statesman. Mr. Robinson was specially fitted to handle the topic he had dealt with, from his great experience as a colonist, as a journalist (being the editor and proprietor of an influential colonial newspaper, which he conducted with great ability), and as a legislator (being a member of the Legislative Council in Natal). Although located in a comparatively small colony, the comprehensive view he had taken of British colonisation, and all its contingent features in every part of the globe, showed that he had made the subject his special study. Only those who had attempted to deal with the comprehensive statistical details scattered over so many channels could form any adequate idea of the vast amount of research necessary to bring together and to reason upon figures embracing such a wide range. The important facts and arguments advanced were all the more valuable as replying fully to statements which had been brought forward in that room by gentlemen of the Manchester school of politics, impugning the utility of colonies to this country. Such a mass of useful information had been compressed into Mr. Robinson's paper, much of which he had necessarily to pass over in reading it briefly, that few present had been able to give it that calm consideration which its merits deserved. But it was after publication in extenso, in the Society's *Journal*, that its importance would become apparent, when it would be widely diffused and quoted from, and commented on by the members and others, through the length and breadth of the land, as well as far and wide on the Continent of Europe, where the *Journal* circulated. The matters set forth in this paper showed that we might well be proud of our colonies. The British race were,

after all, the only true colonisers. Other nations might found colonies, but few maintained them, or made any progress. The French, Spanish, or Dutch, had little to boast of or point to in successful colonisation. Mr. Robinson had done well to commence his record of the progress of the British colonies with the period before the gold discoveries and the first International Exhibition, for it was really since that date that they had made and maintained those gigantic strides in commercial progress which had drawn upon them the attention of Europe. With respect to the omission of area of territory and population of protected states in India and elsewhere, alluded to by Mr. Clarke, the figures of the inquiry might well be limited to colonies proper, without stretching into the boundaries of Arctic or Asiatic countries, which could never be settled by colonies of the Anglo-Saxon race. The progress of the arts, manufactures, and commerce in most of our principal colonies had been well represented at all the great international exhibitions at London, Dublin, and Paris, where the products and articles shown attracted general attention, and commanded the highest awards of the jurors. More especially was this the case with the display made by the British colonies at Paris, where the wonderful advance made in all points was remarkable. Not only were raw materials, natural history, and manufactures well represented, but even in the fine arts, where less was to be expected from them, there was high ground for the commendations passed on the paintings and photographs from Canada, Victoria, New South Wales, Adelaide, and other colonies. At present our colonies were the mainstay of the supply of the principal raw materials for our great industries in wool, cotton, hides, &c.; and they would, ere long, furnish us with most of our flax and silk. They were also becoming great food producers and exporters of grain, meat, and colonial produce. Another point had been hinted at, that there were undeveloped resources in indigenous wealth and untried raw materials, which would some day come in to the aid of the wants of the mother country. With intelligent naturalists and skilled botanists, and experienced geologists at work, in nearly all, beneficial results must ensue. As one who had given some attention to colonial subjects, and who had been closely identified with their products and manufactures, and had had ocular evidence of their varied products at the several Great Exhibitions, and being also pretty well informed on all their statistics, he might be permitted to express heartily the great pleasure it had afforded him to listen to the very comprehensive and able paper with which Mr. Robinson had favoured the Society.

Mr. Botly said they must all feel indebted to Mr. Robinson for the admirable paper which had been read. He had stated that in the colonies, by a slight outlay and by personal exertion, an indisputable title might be gained to a breadth of soil almost as large as a small principality. He (Mr. Botly) could confirm this from several instances which came under his own knowledge, of persons who had emigrated with their families, and had taken high positions in the colonies, such as they never could have aspired to in this country. He mentioned this to show that a spirit of enterprise, such as that mentioned in the very excellent paper they had heard, was that which would increase the prosperity of the colonies, and benefit our redundant population.

The Chairman said that it now became his agreeable duty to propose that the thanks of the meeting be given to Mr. Robinson for the very able and deeply interesting paper which they had heard, and, with their permission, he would avail himself of the opportunity to say a few words on the paper, which related to a subject in which, in point of fact, he had almost from his childhood taken the deepest interest. He would allude to one or two points which, he thought, Mr. Robinson had not, perhaps, quite sufficiently brought forward. One point which was altogether overlooked in this country was this—that at the present moment England was, to a certain extent the arbiter of the destinies of a large portion of mankind. In this respect, if Great Britain were to renounce her control over all her colonies, or if she were to allow them, or encourage them unadvisedly, to separate from the mother country, the gravest difficulties would unquestionably take place between a large number of these colonies. The most delicate points would arise, such as the question of boundaries, the collection of customs duties, and other matters of a similar kind. With regard to those boundaries, it would be almost inevitable that within a very short period of time difficulties, perhaps ending in war, must arise between Victoria and New South Wales, Queensland and South Australia. Other colonies probably would be dragged into similar difficulties. At present every one of those colonies unhesitatingly and cheerfully submitted to the decision of Great Britain upon any such question. In point of fact, if England were to allow such a thing, and wars of that kind were to prevail, it would be permitting the human race to go backward instead of forward; it would be allowing her own commerce to be injured, and entailing great calamities upon herself as well as upon the rest of mankind. Then the question with regard to the expense of keeping troops in the colonies had been very much overrated in England. In point of fact, British troops in the colonies cost Great Britain much less than they would if they were all assembled in England. Provisions were cheaper in the colonies, clothing was cheaper, and barracks were now ready, or nearly ready, and in a thousand ways the colonies helped to relieve Great Britain of a large portion of the military expenditure of the nation. Another important question was this, that the British troops, employed, as they were, in various parts of the world, were trained in every kind of discipline, and prepared for every duty they might have to undertake. British regiments might have been seen in South Africa, for instance, marched off to the most distant portions of our African settlements, perhaps a thousand miles from Cape Town, taking a measured pace, the same number of inches to the step, and steps to the minute, undergoing the severest training, and all this tending ultimately to support British rule in India, at a moment when it appeared to be on the point of annihilation. That man would be a bold one who would say that it was not this training which enabled them to discharge their duties in a manner which they could not have done if they had been simply trained in garrison towns at home. Our troops were distributed throughout the world in such a manner as to enable a force to be at once collected at any threatened point. Then there was this further point to be considered. Would any one say, if the whole British army was withdrawn from the colonies into Great Britain, that we should submit patiently and quietly to such an unconstitutional proceeding as to find some hundred thousand troops permanently quartered in the country? He believed a cry would be raised that the army should be reduced, and if it were reduced, it would be difficult to create it again when the necessity arose. The confederation in Canada had been alluded to. He would just mention that the very first confederation took place in New Zealand, in the year 1848 or 1849, and was entirely devised by himself and friends of his. They got British statesmen to listen favourably to the proposal, and in fact the speech then made by the Secretary of State in Parliament embodied the substance of a despatch written by himself in New Zealand. That proposal obtained the acquiescence of Parliament, and the principle was afterwards extended to Canada. In devising that plan they believed it would be ultimately possible to unite the whole English speaking race into one great and mighty confederation, each colony having a Congress of its own, each preserving its own institutions. In such a confederation each might have its own difficulties adjusted, and by their united power they might prevent the necessity of going to war, and thus practically give the law to mankind throughout the whole habitable globe. In

such a Congress as that he believed that every one of the colonies would gladly contribute their help to the expense of the requisite army and navy. One other point he would just touch upon, and that was, that a home was offered in the colonies to the discontented population which, in a country like ours, was always found. There were always large numbers dissatisfied with the existing state of things, and those individuals, cooped up within an island like our own, must ultimately be the cause of disturbances, whereas a home was offered to them in the colonies, and an opportunity for the display of their energies. Then it might be said, with reference to Canada, that if we gave up our colonies such persons would pass to the United States, and with the present feeling of the United States towards Great Britain, which he feared would increase, he believed that by sending such persons to the United States, instead of encouraging them to go to the colonies, great trouble would be caused to England hereafter. Then, with reference to the government of the colonies, every man had been allowed a share in the government of the country he had gone to, and everybody who had witnessed the result of that could not fail to agree that it was possible thus to raise up as loyal a population as any in the world. As to the results which Mr. Robinson had spoken of, of the colonies affording an opportunity of acquiring statesmanship, he would refer to the case of Mr. Robinson himself, who went to Natal when he was eleven years old, was there educated, and from the advantages he there received had achieved so high a position. In his own experience he could name a large number of persons who had become governors, and a still larger number who had become distinguished judges of colonial courts, and barristers in large practice, realising fortunes they never could have gained in England. The number of legislators and of statesmen administering public affairs satisfactorily, he might say eminently well, in the colonies was very great, many of them springing from what would here be called the lower orders, none of whom could have obtained the high position they had were it not for the colonies; and he felt convinced that all this must have been reflected back on England, and must have benefited her in proportion. With these few remarks he would propose a cordial vote of thanks to Mr. Robinson for his most able and interesting paper, evincing as it did a deep knowledge of the subject.

The motion was carried unanimously.

Mr. ROBINSON said that he felt it extremely difficult to express the feelings he entertained at that moment, and his deep sense of the kind and altogether too complimentary manner in which his paper had been received. It was true that its preparation had been to him a labour of love, because he had long looked forward to such a meeting as that, affording him an opportunity of putting before so influential a Society, representing as it did so important a section of his countrymen, the facts which were so little known with regard to our colonial possessions. He might perhaps be permitted to say that he quite coincided with what Mr. Hyde Clarke suggested with reference to the justice of including in any calculation the territories under British protection. In an article he published a month ago, he did include them within the estimate then given, but he thought that in preparing this paper it was highly desirable to fortify himself by figures which were contained in Parliamentary papers, and about the authenticity of which there there could be no doubt whatever. With reference to the remark as to the expediency of establishing some kind of confederation, under which the colonies should contribute something towards the Imperial fund, which should be appropriated to their defence, he believed there would be none who would not be willing to contribute to such a fund, but, at the same time, he thought that, in the case of certain of them, it would be quite impossible for them to contribute more than they did towards the expenses of local government. It had given him the greatest possible pleasure to listen to the enlightened and admirable remarks of Sir George Grey, whom he had known, in a public capacity in South Africa, for so many years. He could only say that the experience in South Africa of his administration was such as to make them all anxious to receive him again. He believed there was no better authority on this important subject, and as to the concluding idea which he threw out with regard to the importance of consolidating in one grand union all English speaking men throughout the globe, it seemed to be a magnificent conception if only the people of this country would rise to a larger and fuller appreciation of what the colonial empire was. If in any of the remarks which he had made a somewhat dogmatical tone had been assumed, or opinions expressed in too emphatic a manner, he could only regret that it should be so, but it was a subject upon which he felt very warmly. He thought that the interest of the mother country in the colonies would be found to be a growing one, and that at some day in the future—and, probably, nearer than many imagined—the idea of a grand confederation of English speaking states would be carried out, and that our country would then be in a position to be the arbiter of the destinies of the world.

Professor TENNANT exhibited diamonds frem the Cape, with diagrams of the crystalline forms, also a chart of the diamond district near Hope Town, and a number of rock specimens sent by Dr. Atherstone and Mr. Green, civil commissioner, Colesberg. Rich specimens of cinnabar, recently found in Borneo, were also shown.

ADMINISTRATION OF EDUCATIONAL FUNDS —PENSIONS TO AGED SCHOOL TEACHERS.

On Saturday, the 8th inst., Earl de Grey and the Right Hon. W. E. Forster received a numerous deputation of school teachers, of Dissenters as well as of the Church of England, to present memorials from all parts of the country in favour of a scheme for granting annuitiesto aged teachers. The memorials were in the following terms:—

"Your memorialists venture respecfully to submit that the establishment by government of a fund, out of which retiring pensions or annuities could be granted to teachers, after a certain length of service, would not only be a great boon to teachers as a body, but would be conducive to the improvement of education generally. They think, also, that such a fund might be maintained by a small per-centage, deducted from all grants to schools and training colleges. They would also submit that, except in special cases, no annuity should be granted to any teacher who has not taught twenty years in an elementary school under government inspection. Your memorialists think also that the amount of the annuity should depend upon length of service, but that a service of thirty years should entitle a teacher to the maximum annuity granted."

The deputation was introduced by Mr. Akroyd, M.P., and by Mr. Whitwell, M.P., who referred to Mr. Chadwick to speak generally on the subject, from the special consideration he had given to elementary education.

Mr. EDWIN CHADWICK—In supporting the proposition in the memorial, it is impossible to overlook the fact that it is opposed to a policy which has recently been adopted in this Department, of entirely ignoring all official connection with the school-teacher, all concern as to his status, and leaving him entirely to the care of irresponsible and changing school-managers. But it is a duty to submit that, to the continuance of that or the like policy, there stands opposed disastrous experience, attested by school inspectors, of the wide-spread desertion to less discouraging conditions of the most valuable skilled elementary teachers, reductions of the numbers of pupil teachers, ruinous to the training colleges, a reduction of the quality of the supply of service, and injury to the quality of the teaching of the children of the wage-

classes of the country. Anyone who has studied educational administration, who has visited schools, and observed various modes of teaching, and traced the outcome of schools, will have observed that the subject matters of instruction being much alike, there is often the greatest difference of result, and he will be deeply impressed, as I have been, with the aphorism, that "as is the teacher, so is the school," and would be anxiously concerned at the reckless ignorance of a policy of discouragement, and would feel the need of an opposite policy of encouragement, to obtain the best manner of men practicable for raising the lowest of the population. Looking at the qualities desirable and necessary in teachers, and knowing the prices obtainable for those same qualities in the open labour-market, it will be perceived that, at the very best, educational administration is put to a serious disadvantage to obtain fitting teachers. Now, in my experience of local administration, security of position and freedom from worry during good behaviour, are cheap means of obtaining good service at a lower price than it would otherwise be obtained for the public. I have known men give up private service, and the conflict of the open labour-market, and take the public positions at one-third less of salary, for the sake of the comparative independence of the public status, and that, too, without any dereliction of the principle of complete responsibility to a competent and impartial authority. I proposed this principle as applied to poor-law administration, and so far as it has been adopted—and it has been adopted so far as relates to the independence of their position during good behaviour, leaving the question of retiring pensions, which I expect will eventually have to be conceded—it has produced a large number of officers well qualified to undertake, with advantage to the public, the chief responsibility of executive action. Entire dependence on changing school-managers, commonly unlearned in teaching, and often incompetent, and mostly irresponsible, is to many minds a very repulsive condition. School teachers may take a position under school managers, where there will often be zeal, if it be without skill or competency to deal with the subject. But much of the lukewarmness and some opposition to the Scotch Parochial Schools Bill is due to uncertainty, such as that which prevails here amongst schoolmasters, as to their position under it, and to a repugnance to the vestral element in the local boards, the members of which may be destitute of zeal, as well as of skill or competency to judge of service. Some opposition to the proposal of school rates arises from the feeling that under such local authority, as it is apprehended the provision for rating may bring, the teachers will be even worse off than they now are. Securities may be provided to relieve them from that ground of apprehension. The measure now proposed by the memorialists would, I submit, cost nothing to the Government but its superintendence. The acceptance of the measure would be a return to a policy of justice and security, and of encouragement to competent school teachers, which I have profound conviction is necessary to be pursued for the advancement of the elementary education of the people.

Mr. Lawson, the secretary of the London Association of Church Schoolmasters, stated that a detailed scheme drawn up by Mr. Hill, the master of the British Schools at Kendal, estimated that a deduction of one per cent. from the annual government grants would provide pensions of £30 a-year each for about 200 disabled teachers, which was a larger number than was likely to require them, at all events, at present.

Mr. Mansfield, the Secretary of the Wesleyan Training College, having spoken,

Mr. Day presented a memorial from the north-eastern district, and other members of the deputation handed in similar memorials from other localities.

In reply to questions put by Earl de Grey and Ripon and Mr. Forster, it was stated that the teachers did not contemplate any claim to pension until after twenty years' service in one or more elementary schools, and were prepared to sacrifice the slight deduction that might be made from their salaries during service if the full period of twenty years should not be completed. It was anticipated that the number of claims would for some years be so limited that a reserve might be formed out of the surplus sufficient to provide amply for any increase that might arise hereafter.

Mr. Forster asked the schoolmasters whether they thought it likely that managers would reduce their salaries by the amount of the pension? In answer, the deputation stated that some might, but not many.

Mr. Forster next asked whether, if such reductions were made, they would nevertheless desire this measure. The unanimous answer given was that they would.

Earl de Grey could not hold out any hope that this question would be taken up separately from that of education generally, in respect to which the views of the government would, he hoped, be laid before Parliament next year. He, however, promised, on behalf of himself and his right hon. friend, the Vice-President, the most careful consideration of the representations made to them by the memorialists and the gentlemen who had addressed them. The deputation, having thanked his lordship, withdrew.

EDUCATION IN PRUSSIA.

The following letter appeared in the *Times* of the 19th inst.:—

Sir,—There exists in Prussia, as well as in England, a law which exposes parents or guardians who neglect the bodily wants of their children to punishment; but as domestic animals likewise are protected by law against starvation or ill-treatment, the legislators of Prussia, thinking that a child is superior to a cow or a horse, added that not only the body but the mind likewise must be cared for, and if a neglect of the former can be punished, it naturally followed that neglect of the latter was punishable too. The so-called "compulsory education" in Prussia is, therefore, as little an interference with the liberty of individuals as the law which forbids a child to be starved. But it must be said, for the honour of humanity, that parents will not wait for the compulsion of law before giving their children food, and they are only too glad in Prussia to avail themselves of opportunities for educating their offspring, if the means be placed within their reach. Parents who are so unnatural as to neglect the culture of mind or body are criminals, and deserve the severest punishment. The laws of civilised nations do not leave parents at liberty to starve their children, nor do they provide cheaper food or clothing; but the Prussian legislators very properly aid them in obeying the law to provide education, by bringing it to the door of the lowest cottager by making it cheap. The law is, then, that every town, or community in town or country, must maintain a school supported by the taxes, and administered by the local authorities, who are elected by the citizens, and called Aldermen or Town Councillors.

All parents are compelled to send their children to one of these so-called elementary schools, whether they can pay the charge of a penny a-week in villages, or a shilling per month in towns, or not. This money goes towards maintaining the schools, and any deficiency is made up from the local taxes. No compulsion exists in reference to a higher educational institution than elementary schools, but parents who send more than one child to any school supported by the community have a reduction made in the charge, and a limited number of pupils, whose parents cannot afford to pay the full rate, enjoy either this reduction or are admitted entirely free, at the discretion of the authorities. Thus the higher schools, as the commercial, or colleges, are not established merely for the rich, but are likewise open to the poorest, the fee being 15s. a-quarter, terms not too high for a well-to-do artisan, while reductions are made, as before,

to large families or poor persons who cannot afford to pay the full sum.

The Prussian schools are divided as follows—firstly, elementary, embracing village or town schools; secondly, higher-citizen schools; thirdly, real school, or one where languages, arts, and sciences are taught; fourthly, seminaries, or one for training elementary schoolmasters; fifthly, colleges; sixthly, industrial; seventhly, school of architects; eighth, mines; ninth, agricultural; tenth, veterinary; and eleventh, the university.

The difference between the elementary schools of the villages and those of towns consists in the greater variety of subjects. In the former, reading and writing in German characters are taught, with geography and history of Germany, and the four first rules of arithmetic; in the latter, writing in Roman characters, general geography, history of the world, fractions, rule of three, and the chain-rule are added.

The higher-citizen schools, adapted for the wants of tradespeople, teach likewise mathematics, Latin, and French, to a certain extent. The real school is divided, like the colleges, into six or seven classes, and every pupil must pass an examination before rising to another class. No pupil can belong to one class in one subject, and to another in a higher one, but must in all subjects be in one and the same class. The proficiency is decided by the number of errors made, and not by value of points, as in England, which is a gross deception, as a student may get 800 out of 2,000 marks allotted to any subject, which may sound very satisfactory to his friends, who learn that he has passed with 1,200 marks in that branch, but none but those behind the scenes know what a large number of gross mistakes have been made. The last examination at the real school and college corresponds to the university B.A. examination, but gives no right in Prussia to a degree. With this examination the general education ends, and the study of the profession chosen by the student then commences. The B.A. examination at college alone entitles one to enter as a student at the Universities; the same test at the real school does not give that right.

Latin and Greek are more taught at the college than at the real school, while the living languages, chemistry, and natural philosophy are the more prevalent branches of instruction at the latter. Those who have passed the B.A. examination at the real school can afterwards go into the industrial schools,—*i.e.*, engineering, telegraphing, &c., or to those of architecture, or veterinary art, or become chemists or apothecaries.

They who have passed the B.A. examination at the college can enter the mining, coal, salt, or metal offices, or go into the Post or Custom departments, with the right of promotion in turn, as these appointments are confined to those who have passed that examination. Those who wish to study philosophy, medicine, law, philology, theology, &c., must go to the University.

The English Universities correspond nearly with the German college, as any institution like the German university is unknown in England. Every German student has already passed, when entering his university, an examination equal to the English B.A., conferred only at the close of the academic course. Every student must study philosophy for one year, and pass an examination called the Philosophicum, after which he attends only the lectures of his particular branch of study. There exists a doctor's examination in every branch, though students of law or divinity are not compelled to pass it, while those of philosophy, philology, or medicine must do so. The doctor's diploma is the only degree conferred by the university, but does not give a right to practise as a medical man, for which another, called the State examination, is required. The studies at the university last about four years, at an expense of £15 a-year for the lectures. No student lives in the university, which is used solely for lectures. The universities are maintained and administered by the government, while all the other scholastic institutions are supported by the community under control of government; thus a uniform system of education is insured. Poor students can have the expenses of the lectures debited to them, to be repaid when they are employed in any remunerative work. There are, likewise, *stipendia*, or assistance in money, attached to each university, left by charitable people for needy students, and administered according to the condition of the will. No student who is able to pay can receive a *stipendium*, therefore no Fellowships exist in Germany as they do in England. The teachers at the elementary schools are educated at the seminaries, to which schools are attached where they can instruct children, and are thus practically initiated into the art of teaching and of maintaining proper discipline. They are then "certificated," as in England. The teachers of the higher educational establishments are doctors of philosophy or philology, and each takes only that branch in which he has passed his best examination, which his certificate declares. No one can be a teacher in any public school without passing the requisite examination, and possessing the necessary certificate. Private schools can only be kept by licensed and duly-authorised persons; these never give a higher education than the "citizen school," and are generally merely elementary. Governesses at young ladies' schools must likewise have passed an examination, without which they dare not teach anything except needlework, or the German language to foreigners. The governess's examination is not confined merely to that class which has chosen teaching as a profession, but the daughters of the best families are as proud of having passed it as their brothers are of having obtained their doctor's degree.

I am, &c., A Prussian.

Fine Arts.

Ingres Museum at Montauban.—The museum at Montauban, the birthplace of the late painter Ingres, was opened to the public on the 17th of the past month of April. In one room is exhibited the last production of the late artist's pencil, "Christ amongst the Doctors." Another room contains sculptures by the father of the painter, and also the personal relics of the latter, such as his bureau, arm-chair, palette, colour-box, easel, books, violin, and portraits of his family and friends. Nine hundred drawings and sketches, selected from three thousand bequeathed to the museum by the late artist, are exhibited in two rooms, in order to illustrate the growth and complete development of his talent. In the same rooms are glass cases, containing models in terra-cotta, medals, engravings, Greek vases, and other objects of art; while another room is devoted to sculpture and curiosities, the gem of the collection being the statue of "Cupid," attributed by Visconti to Praxiteles, and presented to the museum by Ingres. Few artists have had such a monument raised to them by their contemporaries as the Ingres Museum of Montauban.

Manufactures.

Sugar for Brewing.—The *Produce Markets Review* says:—"We are informed that the Excise authorities are again making difficulties about the use of concrete (or brewers' bastards) by the brewers. We presume that this is done to pacify the farmers and maltsters, but it is really time to protest against the sacrifice of one branch of trade to another, because it happens to be a powerful interest. The restrictions on the use of sugar in breweries, and the prohibition of the use of molasses for brewing, are simply a disguised protection to the barley growers; and now that the duty on foreign corn is to be repealed, a little activity on the refiners' part would perhaps obtain

them more favourable terms. We are at a loss to know why foreign molasses should be prohibited for brewing purposes, for the question of the duty to be added to put it on an equal footing with malt is a mere question of detail. With regard to refiners' treacle, no question of the kind ought to arise, as it is the refuse of sugar which has paid the full duty, and ought, therefore, to be treated in the brewery simply as sugar, and charged the extra rate of 3s. 8d. only. Molasses must clearly be a worse substance than sugar for brewing, as it contains so much moisture, and it seems illogical to prohibit the use of the weaker material while that of the stronger is allowed. The objections to brewers' concrete on the part of the Excise arise from the proportion of molasses it contains, but the concrete is clearly sugar, as it is assessed at the Custom-house at the 8s. duty, and the Act, we are told, simply prescribes the use of molasses. The Excise authorities, however, will not allow to be used in refineries any concrete which does not contain fifty-seven of what they call 'crystallised sugar.' It would be well for the refiners to ascertain by what law this restriction is enforced."

Commerce.

Soap and Candles in Holland.—There are in Holland about 36 soap manufactories, viz., two at Breda, each producing annually 10,000 kilos. of hard soap, and 200,000 of soft or green soap; four at Amsterdam, producing yearly 121,000 kilos. of hard and 1,000,000 kilos. of soft soap; one at Enkhinzen, producing 50,000 kilos. of soft soap, and one at Hoorn, producing 109,000 kilos. of soft soap. At Amsterdam there is a candle factory which ships annually 12,000,000 of candles, 300,000 kilos. of oleine, and 60,000 kilos. of glycerine. It works night and day, employing 200 workmen, and makes only for shipment. It has four boilers and steam engines of 111 horse power, four distilling apparatus, and many hydraulic presses.

Colonies.

Manufacture of Safes in Victoria.—Large premises have been fitted up in this colony for the manufacture of colonial safes, which are actually stated, by a colonial paper, to be superior to those of English make. There is a large demand for them in the colony, and it is said they can be made 20 per cent. cheaper than the English article.

Cultivation of Sugar in Queensland.—A Brisbane paper says:—'In the cultivation of the sugar-cane the great drawback hitherto has been the probable difficulty of getting it crushed, but this difficulty, when fairly taken in hand, appears to be vanishing quickly, and we hear of the breadth of land under sugar being increased on all sides. The initiation of small machinery, although not so economically worked as mills of greater power and capability, will go far towards dissipating those groundless fears which have hitherto had possession of the farmers' minds. Information of the successful working of these mills will be hailed with great satisfaction by many who, while unable to procure the expensive machinery heretofore considered necessary, may be able to procure an arrangement costing about one-tenth of the amount. There are already two mills worked by horse-power, and two other mills are to be erected in time for next season's crop, both of much larger size than those previously mentioned, and to be worked by steam-power. In every district in the colony where agriculture is carried on, the breadth under sugar is increasing, so fully satisfied are those interested that the success of sugar cultivation is a certainty. The cost of manufacturing has been £5 7s. 6d. per ton, including cutting, carting, and shipment. Other machinery of moderate steam-power is shortly expected, and it will be of the most perfect description, and include all the latest improvements. That it will be the evident necessity of every planter of twenty acres and upwards to supply himself with a mill is certain, for the distance between the various plantations will, in most cases, be considerable, and the heavy carriage an insurmountable difficulty; but there are many other reasons besides the cost of carriage to induce the planter to bend all his energies to the procuring of machinery for manufacturing his own crop, notwithstanding that theorists, and even some practical men, have declared in favour of large contract factories."

Obituary.

Sir C. Wentworth Dilke, Bart., died suddenly, on Monday, the 10th instant, aged 59, at St. Petersburg, to which capital he had been invited as the representative of England at the forthcoming Exhibition of the Russian Horticultural Societies. He was the only son of Mr. Charles Wentworth Dilke, and was born on the 18th February, 1810; his mother was Maria, daughter of Mr. E. Walker. His father was chief proprietor and some time editor of the *Athenæum* newspaper, and well known as connected with the *Daily News*, and with him the subject of the present memoir was associated in the conduct of that paper, which at one period, under their joint management, was published at two-pence halfpenny, being the first attempt to bring out a daily paper in London at a reduced price, the charge for the regular daily papers of that period being fivepence. Considering that at that time the paper duty was in full force, and also the compulsory stamp, the price was virtually that of a penny paper at the present day. He was educated at Westminster School, and at Trinity Hall, Cambridge, where he took his degree in law. He was elected a member of the Society of Arts in 1845, and took much interest in its proceedings. He was a member of the Society's Committee for promoting the Great Exhibition of 1851, and was named in the Royal Commission as one of the five members of the Executive Committee of that Exhibition. On the conclusion of that brilliant success, he was loaded with the favours of foreign countries and sovereigns, and was offered by our Queen the honour of knighthood, and by the Royal Commission a large pecuniary reward. Both of these he declined, desiring that his labours should be honorary. Her Majesty, however, expressed her high appreciation of his services by sending Mrs. Dilke a diamond bracelet. In 1853, he was appointed by the Crown one of the Commissioners to represent this country at the American Industrial Exhibition in New York. A special report which he prepared was presented to the House of Commons, and ordered to be printed in the following year. As in the case of his previous labours, he declined any compensation. In 1857, he was elected Chairman of the Council of the Society of Arts, an office which he held till June, 1859. During this period, the International Exhibition of 1862 (which, it will be remembered, was originally intended to have been held in 1861) was proposed, and preliminary steps taken towards its realisation. When that Exhibition was finally decided upon, Mr. Dilke was one of the five executive Commissioners nominated by the Society of Arts, and appointed by Her Majesty in the charter for conducting it, and, on the lamented death of the Prince Consort, the Queen conferred a baronetcy upon him, in recognition of his public services, and of the esteem and regard in which he was held by the Prince. Sir Wentworth Dilke entered Parliament in 1865, as member for Wallingford. He was a Justice of the Peace for the County of Middlesex, a Fellow of the Society of

Antiquaries, a Fellow of the Royal Geographical Society, a trustee of the Soane Museum, and an active member of many other public and learned bodies, especially of the Horticultural Society, the present position of which is in no small degree due to his exertions. He also took a very active part in promoting the International Horticultural Exhibition held in 1863, which, it will be remembered, was highly successful. He married, in 1840, Mary, daughter of Captain Chatfield, of the Madras Cavalry, by whom he has left two sons, Charles Wentworth and Ashton Wentworth—the former of whom (who was returned at the last election as one of the members for the new borough of Chelsea) succeeds to his honours. His indefatigable zeal and energy in promoting the various objects of the Society of Arts, tempered by a peculiarly high sense of honour, and an unswerving rectitude of purpose, will ever make his memory revered by all those who had the happiness to be associated with him, and especially by the members of the Council and officers of the Society.

Notes.

REMOVAL OF THE OBSERVATORY AT PARIS.—The Academy of Sciences, after a careful examination of the question, has determined, by a majority of 53 to 1, that the Astronomical Observatory shall be removed from the site which it has so long occupied, at the end of the gardens of the Luxembourg, and placed within a large enclosed space of ground without, but near to the limits of the city, in order to secure the astronomers from the inconveniences caused by the neighbouring buildings, railways, roads, &c. The working of the observatory is to be entirely independent of the new one for metereological observations, which is now being erected on Montrouge, but both will be under the direction of the Minister of Public Instruction.

Correspondence.

VENTILATION OF DRAINS AND SEWERS.—SIR,—One of our great capitalists, when once applied to for a subscription to improve London city, is reported to have answered, "You had better pull it down and rebuild it." So in regard to any proposition for ventilating and trapping drains and sewers the best answer would be, "Keep out of them all matters liable to fermentation and the production of foul air, and in such case they would need no ventilation, and all trapping and repairs of trapping might be dispensed with." Could we add up together in one sum the prime cost of all the sewers and drains, and the mechanism of steam-engines and water-closets, public and private, take the annual interest thereon, and add it to the annual repairs, in superintendence, material, and labour, we should be startled at the amount, and find, possibly, that an enormous saving might accrue by dispensing with scientific appliances, and resorting to hand-labour instead. For the production of foul gas from putrefiable matter, warmth and moisture are required. If the warmth and moisture be applied, as in the river in warm weather, the foul gas ascends into the upper atmosphere and is neutralised. The same warmth and moisture in sewers and drains act as in a long retort, in which the surplus moisture drains downwards, and the resultant gas as infallibly drains upwards, finding its way into every crevice, and so to our dwellings, when shut in from street gratings. Even were we to erect tall chimneys at every thousand yards apart, that would not help the evil, for every rising sink or closet drain between the chimneys would serve as a supply pocket, constantly ready to leak through traps. To stop it out is almost an impossibility, when in perfect repair; to prevent uncleanness and accident is an absolute impossibility; for the whole area of the drains and sewers is lined with fermenting matter, and it is a struggle against nature to keep out the foul gas. The gas is trying to fulfil the purpose of nature—direct vertical escape—and we try to prevent it. The only remedy is to prevent the fermentation, by depositing the material under the earth before fermentation commences, carrying away every night the production of every day, carefully preventing any unnecessary increase of bulk by preventing all access of water. The cost of removal would be largely diminished by the diminution of bulk, and the value would be largely increased by the most valuable portion ceasing to be converted into gases, and lost. It would thus be of more proportional value than the guano we bring from Peru round Cape Horn. The non-production of sewer-gas is the only process for preventing its gaining access to our dwellings; and it is a very certain thing, that if the dry manure manufacturers could make a profit under the old system of wasteful cesspools with several years' stores, *à fortiori* a larger profit would be made from a nightly delivery. This is not an objection to the main sewers, which are a needful means of carrying off storm waters, but only a protest against their abuse. We have ceased to produce refuse in manufactories, by the modern practice of converting every refuse to uses, and we require to carry the process still further with the refuse of our dwellings.—I am, &c., W. BRIDGES ADAMS.

THE VENTILATION OF DRAINS.—SIR,—In the discussion on Mr. Lovegrove's able paper, in your *Journal* of May 14th, I am reported as advocating ventilating shafts with "disinfecting agents." I did not allude to the latter (unless fires in the shafts are meant as such), for, by a general system of sewer ventilation such as I indicated, neither "disinfecting agents" nor "traps" would be required, because a constant flow of air inwards would be as free as that of water. "Foul air" could not return any more than "filthy sewage." This appears to me to be the proper principle to prevent all nuisance from sinks, water-closets, gullies, and other openings for drains and sewers.—I am, &c., WM. GLASS, F.C.S.

37, Princes-street, Stamford-street, S.E. May 15, 1869.

DIAMONDS AT THE CAPE.—SIR,—On the 11th inst., there appeared in the *Times* a letter (not bearing the writer's name) which expresses disbelief in the genuineness of the diamond discoveries at the Cape. As I, some months since, also questioned, through the medium of your columns, the truth of the then reported discoveries, it might very naturally be inferred that I am the writer of the letter above mentioned; but as my opinions on the subject have recently been materially altered by the evidence lately brought to my knowledge, through the kind intermediary of a gentleman of high official position at the Cape, I am very anxious to state that there no longer exists any doubt in my mind as to the Cape Colony being a "diamond-producing country." That diamonds should have been found there under such novel conditions, occurring in a soil which (according to Mr. Gregory's report and that of other geological authorities) differs considerably from that of all previously known diamond-producing districts, is no doubt startling; but it would be utterly unreasonable to set up geological precedents against patent facts, such as the finding of a diamond of the important size of 83½ carats, and others of large dimensions, the well-authenticated existence of which destroys all suspicion of trickery or imposition.—I am, &c., HARRY EMANUEL.

18, New Bond-street, May 13th, 1869.

MEETINGS FOR THE ENSUING WEEK.

MON.....Social Science Assoc., 8. Discussion on the Report of the Judicature Commission. To be opened by Mr. Chisholm Anstey.
R. Geographical, 1. Annual Meeting.
British Architects, 8.
Victoria Inst., 4. Annual Meeting.

TUES ...R. Medical and Chirurgical, 8½.
Civil Engineers, 8.
Ethnological, 4. Annual Meeting.
Royal Inst., 2. Prof. Grant, "Stellar Astronomy."

WED ...Geological, 8. 1. Mr. A. Rattray, "On the Geology of Cape York." Communicated by the President. 2. Messrs. H. W. Bristow and W. Whitaker, "On the Formation of the Chesil Bank." 3. Mr. W. Whitaker, "On a raised Beach at Portland Bill." 4. Mr. J. W. Hulke, "On a large Saurian Humerus from the Kimmeridge Clay." 5. Prof. Huxley, "On a new form of Labyrinthodont," with Notes on its Locality and Stratigraphical Position by Mr. Louis C. Miall. 6. Prof. Huxley, "On the Upper Jaw of *Megalosaurus*."
Archæological Assoc., 8.

THUR ...Royal, 8½.
Antiquaries, 8½.
Zoological, 8½.
Philosophical Club, 6.
Royal Inst. Prof. Tyndall, "On Light."
Society of Fine Arts, 8. Exhibition of the Designs of the Art Union."

FRI .....Society of Arts, 8. Indian Conference on "Trade with Central Asia, Thibet, and South-Western China."
Royal Inst., 8. Mr. Lockyer, "On Recent Discoveries in Solar Physics."
Masonic Archæological Inst., Freemasons' Hall, 8. Mr. Hyde Clarke, "On French Freemasonry."
Quekett Club, 8.

SAT .....Royal Inst., 3. Mr. Emanuel Deutsch, "Semitic Culture."

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb.

Delivered on 11th May, 1869.

189. National Portrait Gallery—Twelfth Report.
192. Foreign Sugar—Return.
Fortifications—Report.

Delivered on 12th May, 1869.

166. Harbours of Refuge—Quarterly Reports.
196. Canada (Dockyard Artisans)—Official Communications.
Public Petitions—Twentieth Report.

Delivered on 13th May, 1869.

65. Bill—Life Assurance Companies (amended).
115. ,, Endowed Schools (amended by the Select Committee).
120. ,, Lands Clauses Consolidation Act Amendment (amended by the Lords).
172. Fire Insurances—Account.
195. New Courts of Justice—Return.
198. Income Tax—Return.

SESSION 1868.

433. (9) Endowed Charities—General Digest.
497. Local Taxation—Returns.

Patents.

From Commissioners of Patents' Journal, May 14.

GRANTS OF PROVISIONAL PROTECTION.

Agricultural implements—1363—E. Thomas, sen., E. Thomas, jun., and J. Morris.
Artificial stone—1383—H. Highton.
Atmospheric railways—1015—D. J. Hoare.
Auto-dynamic carbonic acid gas apparatus—1370—W. E. Gedge.
Basso-relievos, &c., apparatus for enlarging and reducing—1390—H. E. Newton.
Bobbins—1343—J. Wilson.
Boots and shoes, apparatus for manufacturing heels for—1355—S. H. Hodges.
Boxes, &c., cutting joints for—1341—T. Greenwood.
Braces—1400—G. T. Bousfield.
Cable stoppers and controllers—1351—R. Saunders.
Carding engines, apparatus for cleaning the cards of—1392—J. Tolson.
Cartridges, &c.—1379—G. Clark.
Cattle food—1380—W. MacKean.
Cooking ranges, &c.—1349—W. Broughton and T. Steven.
Door springs, &c.—1357—J. B. Nimmo.
Driving bands—1325—J. G. F. and G. W. Blow.
Engines to be used as motors, &c.—1374—W. E. Newton.
Explosive compounds—1143—P. A. Blake.
Explosive compounds—1193—J. Horsley.
Fabrics, &c., apparatus for printing upon textile—903—E. Peyton.
Felt, &c.—1328—W. Spence.
Fire-arms, breech-loading—1342—J. Mackie.
Flax, &c., separating the woody part from the fibre of—1360—F. W. Kaselowsky.
Furnaces—1361—P. Southern.
Furnaces—1362—W. Seed.
Gas engines—1375—A. C. F. Franklin and E. Dubois.
Harrows—1336—H. J. Seels.
Hemp, &c., spinning—1358—B. Hunt.
Hollow walls—1339—E. Tutte.
Horse rakes—1335—J. R. Jefferies.
Kilns for manufacturing lime, &c.—1327—R. Elsdon.
Lamps—1359—D. P. Wright and C. Butler.
Lavatories—1329—J. Broadfoot.
Levels—1334—R. F. Bigot.
Looms—871—M. Sigler.
Meat, cases for the conveyance of fresh—1368—R. Fennelly.
Meat, &c., apparatus for preserving—1381—E. H. Richmond.
Metallic sheets, &c., bending, &c.—1372—J. Tall and A. Williams.
Mincing machines—1364—C. Topham.
Mortising, tenoning, and sawing machines—1378—J. F. Kent.
Motive-power—902—W. J. Cunningham and A. P. McCarthy.
Ovens—1338—R. Ward.
Oxygenated charcoal, applying for curative and other purposes—1388—T. Welton.
Printing machines—1353—P. Barry.
Railway carriage wheels—1373—A. V. Newton.
Railway trains, communication in—1340—J. Smith.
Railway trains, communication in—1396—W. Galloway.
Reaping and mowing machines—1369—T. Perkins.
Reaping and mowing machines—1387—R. H. Ray.
Refrigerators—1398—G. Kent.
Road engines—1345—E. and T. Waltham.
Sandwiches, &c., apparatus for cutting—1283—J. Cunningham.
Screw propellers—1384—C. Moore.
Sewing machines—1270—P. Jensen.
Sewing machines, &c.—1386—J. E. Phillips.
Steam engines—1330—J. Jamieson and T. Holt.
Steam engines—1385—C. J. Galloway and J. H. Beckwith.
Steam engines, &c.—1377—D. Adamson.
Steam, utilising exhaust—1354—J. Shackleton.
Stop hinges—1348—G. Ritchie.
Syringes or hand pumps—1344—W. B. Robins.
Towing apparatus—1221—B. Picard.
Velocipedes—1347—J. B. Blake.
Velocipedes—1356—H. Williams.
Velocipedes—1376—T. Sibley.
Velocipedes, &c.—1009—E. Wilson.
Ventilating apparatus—1382—A. Cocke.
Warping or beaming machines—1367—J. Bullough.
White lead—1260—J. Major, W. Wright, and G. H. Jones.
Window sashes, hanging—1366—T. Cockcroft.
Wool, &c., combing—1394—I. and G. Battinson and T. Whitehead.
Worsted spinning frames—1346—J. P. Balm and R. Newton.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

Bronze ordnance—1430—W. R. Lake.
Metals, casting under pressure—1443—B. J. B. Mills.
Steam and other enginery—1444—J. A. Marden.

PATENTS SEALED.

3493. J. E. H. Harris and T. Lumley.	3523. J. McGlashan.
3499. C. Richardson.	3524. J. D. Hopkins.
3506. A. McDougall.	3541. C. E. Brooman.
3507. A. W. Drayson.	3545. F. W. Webb.
3510. W. T. Bassett.	3553. C. Crabtree and J. Stell.
3513. S. Crighton and J. Taft.	3554. B. and B. T. Newnham.
3514. W. Thompson.	3593. N. D. Spartali.
3519. D. Jones and J. Jackson.	3761. W. S. Jackson.
3521. J. Green.	439. H. B. Binko.
	919. H. A. Bonneville.

From Commissioners of Patents' Journal, May 18.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

1351. W. Austin.	1435. P. J. Messent.
1358. B. Nicoll.	1402. J. Beale.
1361. T. Hunt.	1501. W. R. Pape.
1379. G. Haseltine.	1442. J. J. Marçais.
1365. A. P. Price.	

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

1424. H. Cartwright.	1450. C. T. Porter.
1467. J. Dicker.	1466. J. P. Jouvin.

Registered Designs.

5016—April 1—Lever for washing cradles—J. Crooks, Dublin.
5017—April 6—Needle case—J. W. Lewis, Birmingham.
5018—April 16—Automaton sponge—F. Walton, Wolverhampton.
5019—April 17—Nut for screw rivet—Sampson and Co., Wolverhampton.
5020—April 19—Hydraulic lift—Wood and Cairns, Edinburgh.
5021—April 23—The Imperial saloon cabin lamp—G. H. May and Co., High-street, Isle of Wight.
5022—May 3—Holdfast safety envelope—Parkins and Gotto, Oxford-street, W.
5023—May 4—Ice cup or jug—W. Spurrier, Birmingham.
5024—May 6—Garden weeder—Frederick K. Barclay, Bury-hill, Dorking, Surrey.
5025—May 7—Collet for the stones of articles of jewellery—Robottam and Pendleton, Birmingham.
5026—May 11—Wheel for reaping machines—R. Wallace, Whitletts-by-Ayr.

Journal of the Society of Arts.

FRIDAY, MAY 28, 1869.

Announcements by the Council.

Committee on India.

Conferences are now in course of being held for the discussion of various subjects connected with India.

The following arrangements have been made for the last conference :—

This Evening (Friday), May 28.—"Trade with Central Asia, Thibet, and South-Western China." On this evening the chair will be taken by Lord William Hay.

At this Meeting the chair will be taken at 8 o'clock.

Members of the Society interested in Indian questions are invited to attend.

Cab Reform.

The Council will appoint an early day for discussing any practical measures for improving the cab system in the metropolis.

Any persons who may desire to submit proposals for discussion are requested to communicate them in writing to the Secretary on or before to-morrow (Saturday), the 29th inst.

Conversazione.

The Council have arranged for a Conversazione at the South Kensington Museum on Wednesday evening, the 23rd of June. Cards of invitation will be issued in due course.

Annual Conference.

The Eighteenth Annual Conference between the Council and the Representatives of the Institutions in Union and Local Boards will be held on Wednesday, the 23rd June, at Twelve o'clock, noon.

Secretaries of Institutions and Local Boards are requested to send, as soon as possible, the names of the Representatives appointed to attend the Conference, and early notice should be given of any subjects which Institutions or Local Boards may desire their Representatives to introduce to the notice of the Conference.

Secretaries of Institutions are requested to forward *at once*, by book post, copies of the last Annual Reports of their Institutions.

Representatives of Institutions and Local Boards will be invited to the Society's Conversazione, which will take place on the same evening, at the South Kensington Museum.

Subscriptions.

The Lady-day subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Members Proposed.

The following candidates have been proposed for election as Members of the Society, and will be balloted for at a special meeting, to be held after the Annual General Meeting, on the 30th June.

Churchill, James D., 531, Oxford-street, W.
Douglas-Hamilton, A., 34, St. George's-road, S.W.
Edwards, W. J., 21, Elmore-street, Islington, N.
Farrow, Morley, 23, Clifton-gardens, W.
Fell, William H., 73, Wenlock-street, New North-road, N.
Gannell, Henry, 34, Sydney-street, Brompton, S.W.
Haines, Frederick, 413, Edgware-road, W.
Haly, Col., 12, St. Stephen's-road, Shepherd's-bush, W.
Haly, J. Standish, 15, Cockspur-street, S.W.
Harrison, Charles Fisher, 1, Malden-crescent, Haverstock-hill, N.W.
Harrison, William, Addingham-house, Quadrant-road south, Highbury New-park, N.
Henry, Mitchell, Stratheden-house, Hyde-park, S.W.
Kell, Thomas, 8, Castle-street, Holborn, E.C.
Irons, Rev. W. J., D.D., Michael's-grove, Brompton, S.W.
Jackson, Charles W., 9, The Grove, South Lambeth, S.W.
Jago, George J., 19, Cheyne-walk, Chelsea, S.W.
Jervis, Rev. W. Henley, M.A., 28, Holland-park, Kensington, W.
Kalisch, Marcus, Ph.D., 3, Clifton-road, St. John's-wood, N.W.
Lara, D. Laurent de, 3, Torrington-square, W.C.
Lawlor, John, 233, Stanhope-st., Hampstead-road, N.W.
Lawson, George Anderson, 139, Gloucester-road, Regent's-park, N.W.
Macgeorge, W., 1, Castle-court, Birchin-lane, E.C.
Maguire, John Thomas, The Vale, Chelsea, S.W.
Manning, John, 6, Lothbury, E.C.
Marshall, Rev. Charles, M.A., 9, South-street, Finsbury-square, E.C.
Martin, Sir James Ranald, C.B., F.R.S., 37, Upper Brook-street, W.
Mason, Matthew, 21, Doughty-street, W.C.
Maudslay, Thomas Henry, Knight's-hill, Norwood, S.E.
Mc Kerrall, Robert, 45, Inverness-terrace, W.
Napier, John, 1A, Fitzroy-square, W., and Glasgow.
Nettlefield, Frederick, 20, York-terrace, Regent's-park, N.W.
Nevett, William Charles, 17, Huntingdon-street, Barnsbury, N.
Parry, John Humffreys, 20, Upper Gloucester-place, Dorset-square, N.W.
Quilter, William, 3, Moorgate-street, E.C.
Radford, Edward, 6, Abingdon-villas west, Kensington, W.
Radford, James, 16, Sheffield-terrace, Campden-hill, Kensington, W.
Rahn, Charles, 80, Brook-street, W.
Ravenscroft, H., Powis-lodge, Haverstock-hill, N.W.
Rawlings, James, 184, Belsize-road, St. John's-wood, N.W.
Rawlinson, Major-General Sir Henry Creswick, K.C.B., F.R.S., 2, Hill-street, Berkeley-square, W.
Rayment, Samuel J., 79, Leighton-road, Kentish-town, N.W.
Samuel, John, 32, Park-lane, W.
Sanderson, Richard Manners, 65, Wimpole-street, W.

Sang, Frederick, 24, Sackville-street, Piccadilly, W.
Tapernoux, Paul E., 58, Park-walk, Chelsea, S.W.
Underwood, W. Elphinstone, 3, St. Stephen's-crescent, Westbourne-park, W.
Valentine, John S., 11, Park-street, Westminster, S.W.
Ware, Thomas, Manor-house, 182, Mare-street, Hackney, N.E.
Watkins, Wynne W., 67, Claverton-street, South Belgravia, S.W.
Watts, Thomas, British Museum, W.C.

Proceedings of the Society.

India Committee.

The fifth conference on Indian subjects was held on Friday evening, the 14th inst., W. S. Fitzwilliam, Esq., in the chair. The paper read was—

WASTE LANDS IN INDIA.

By George Campbell, Esq.

I must warn you against the expectation that, in undertaking this subject, I am prepared to place before you an extremely sanguine view of Indian waste lands. I have only undertaken, in default of anyone prepared to do greater justice to the subject, to try to state the actual facts. It must be evident that in a country which, though very large, has been settled and cultivated by a teeming population for several thousand years, and which may now be said to be occupied by 200,000,000 of industrious people, chiefly agriculturists, the greater part of the lands best fitted for the indigenous productions have been already occupied, and there cannot be the same vastness of choice and the same facility for fresh settlements which form the chief attractions of America and Australia. On the other hand, it is undoubtedly the fact that in the 100 years before our rule in India, war, and famine, and extreme insecurity, external and internal, had reduced the population, and still more the cultivation, in a considerable degree, and the great progress in the extension of cultivation which has been made before our eyes is practical proof that we have acquired territories capable of much development in this respect. The consideration which is most important, perhaps, to the members of this Society is that, in a country so varied in many respects and especially varied in the elevation of its different regions, there exist considerable tracts which are not the best fitted for indigenous products, but which are very well fitted for certain products introduced by European enterprise—products of great value, requiring conditions of climate and position somewhat rare in the world, viz., a considerable but not excessive elevation within tropical or semi-tropical latitudes. No class of products have led, of recent years, to greater development or greater wealth, and it is in the fact of the existence in India of unoccupied lands fulfilling these conditions that we find encouragement for European settlement and colonisation. In this way the subject of waste lands is intimately connected—I may say identified—with that of colonisation, recently discussed by the Society.

When we speak of colonisation, we do not put it in exactly the same sense as an ordinary colonisation of unoccupied countries. Probably we shall never colonise in India in such a way as to be independent of native labour; but in the facility for drawing, by discreet management, cheap native labour from neighbouring parts of India in which it is abundant, lies the great advantage of the intelligent European colonist of India possessed of a little money and a good supply of tact and temper. In this respect he is much more advantageously placed than the same class of settler in sparsely inhabited countries. We may hope then that a superior class of settlers may occupy parts of India, and that others, aided by the state, in the capacity of military colonists, may find useful employment as their coadjutors and assistants. The great question is, how far land is available in conditions sufficiently favourable to attract European settlers, and to offer to native labourers employment so healthy and remunerative as to attract them. To that question I shall presently apply myself.

I must first, however, clear the ground by touching on one or two preliminary points.

The first question which it is necessary in some degree to solve is this—What is waste land? That point is by no means so simple as it may at first sight appear.

I do not think it can be said that all uncultivated land is waste land. It must be borne in mind that the keeping of cattle enters very largely into Indian habits and Indian agriculture. The plough and the cart are almost exclusively drawn by bullocks and buffaloes, and milk and butter form a large proportion of the nourishment of the population, to say nothing of the supply of beef and mutton to our troops and European residents, and to some sections of the native population. Now, in India we do not at present cultivate artificial grasses. For the very large amount of grazing required we trust entirely to the natural grasses of the uncultivated lands. A portion of untilled grazing ground is, therefore, a necessary complement to every Indian agricultural community. I know parts of the country in which land will let quite as high for grazing as for cultivation. And it is an undoubted evil, with which we are now contending, that, as agriculture extends, not only do bullocks become dearer and farther to seek, but the breed seems to degenerate, owing to paucity of food. One of the most interesting and practical problems of the day is, I think, to remedy this evil by the discovery of artificial foods fitted for India. Meantime, we have the fact that much uncultivated land is not properly waste, but grazing land. We have in every thriving and complete village area a portion of the soil reserved for grazing, on conditions precisely similar to those of our old English commons. Further, there is this additional case, which particularly came to my notice in the Central Provinces, that there are some districts where the herbage altogether fails in the dry season, and the villagers have always been accustomed at that time to drive their herds away to certain other more remote and uncultivated tracts good for grazing. They have no right of individual property there, and pay to government certain grazing dues on their cattle, but still they have a sort of custom of resorting to these grounds—it is a necessary and indispensable part of their agricultural system; and when it has been desired to take up their grazing lands for forest enclosures or other purposes, I have had from them very strong remonstrances and complaints, which I could not but admit to have very considerable foundation. I think, then, one may say generally that lands which are profitably occupied for grazing purposes cannot be considered to be waste.

Next comes the question of private property in uncultivated lands. You are aware that there is much uncertainty regarding the degree to which private property in land prevailed in India before our time. I take a stronger view than some people of the rights existing in cultivated land; but as respects large tracts of uncultivated land, beyond the immediate requirements of the cultivating communities, I decidedly think that there was no private property beyond a general right of the neighbouring villagers to a reasonable supply of grass, wood, and water. Still, at the present day, this question is not so much one of theory as of fact. The faith of the British Government has been pledged by certain settlements fully establishing proprietary rights. The right to a supply of grass, wood, and water is a very vague one; it has been very differently construed by different officers in different districts. The result is, that in some districts the villagers have been allowed to divide among themselves the whole waste, even when

the quantity is excessive. This has been felt in some places to be an evil, but it is, I fear, now irremediable. In the Central Provinces the system pursued has been to compromise the indefinite rights of each village, by assigning to them in absolute right a liberal allowance of the waste, in proportion to their cultivated area, while the rest is separately demarcated as government property. The consequence is that we have in that country a large proportion of available land.

Besides the claims of the villagers, there is another form of proprietary claim, which, perhaps, more seriously affects the prospects of European colonisation.

I have said that there was an uncertainty about private rights in land. The question was, whether the government was not in a great degree the owner of the rent, even when individuals occupied the lands. Now, rajahs and chiefs may be said, in some sense, to represent the old Hindoo governments; and although they have ceased to be independent, still it has happened that in the more remote, uncultivated, and inaccessible tracts, the superior governments—the Mahommedans before us, and we in like manner—have not found it pay to assume a very direct management, and have allowed hill rajahs and such people to collect what they can get in the way of taxes on jungle produce, and dues on grazing and on the scanty temporary cultivation of the aboriginal inhabitants, paying to us only a moderate quit-rent in a lump sum. Eventually, when we came to settle the question of proprietorship, and brought to bear our English ideas of landed property, we have converted these vague collections into a right of property in the whole soil; and, it unfortunately happens that some of the tracts, formerly considered worthless, but now the most valuable for European settlement, are owned in this form by rajahs claiming hundreds of square miles, and by no means inclined to encourage anything that may interfere with their ancient habits.

Thus, then, we must not only limit the use of the term waste, but we must still farther limit what may be called the available waste.

In considering how we may best deal with the available wastes, I would draw a distinction between lands fitted for ordinary native settlement and those fitted for European settlement. As respects the former, the old system I think was quite good and successful. The native has not much idea of what we call freehold; he thinks it the natural function of land to pay the dues of the government, and the interest of money being very high, he would rather pay a moderate annual sum than pay a lump sum down. Accordingly, the practice has always been to encourage the extension of cultivation by granting clearance-leases on very favourable terms, on condition of clearance and settlement. The settler pays nothing for some years, then a very small rent, then one somewhat larger, but still moderate, and eventually, on fulfilling the conditions of clearance, he becomes owner, subject to the moderate dues reserved by the government. Some Europeans have taken lands in the plains on these terms, with the view of cultivating them through ryots, in the ordinary native fashion, and in some cases they have succeeded well. But to succeed it is necessary that a man should settle himself down in the country, in a way which few Europeans like, in the tropical plains. He must have the most complete knowledge of the native character, and his temper and tact must be nearly perfect. I do not think that, as a rule, Europeans will in this way hold their own against natives; the few most excellent men who succeed must be exceptions. I am inclined to think that they often prefer the old system of clearance leases to the new freehold system; and, in the proper native parts of the country, I do not think that there is sufficient ground for altering the land rules, otherwise advantageous, for the encouragement of native settlement.

As respects the natives, I am free to confess that I prefer to the new waste land rules the old system which I have described, or that which still prevails in Madras or Bombay, where the waste lands are marked out, a small annual assessment is fixed on each plot, and the first comer is free to take possession and become owner on the prescribed terms.

I am inclined to think that we have gone too far in applying our English freehold rules to the native tracts. Owing to the high interest of money, we can only alienate the future dues of government at a rate quite out of proportion to the capital received. A native would rather pay annually a sum equal to 12 per cent. than pay a lump sum; and if he rarely and unwillingly pays the lump sum, it is because he expects that he will gain, at the expense of government, much more than that rate. If he does so, and enjoys the land without payment to the state, there is a disagreeable contrast to the position of his fellows, who pay heavy dues.

In the Central Provinces we have an enormous extent of waste lands; and we suffer from fever, which may possibly, in some degree, be due to the jungle. It is therefore, a great object to promote cultivation. At the same time, I have grave doubts whether we are right in offering freeholds in some districts as low as one shilling per acre. A good deal is taken up in this way by native speculators. But my fear is, that they may be doing what I heard an Australian call "taking the eyes out of the land"—that is, in some cases selecting the best bits for grazing and forest produce, taking them at this merely nominal price without condition of clearance, and so, perhaps, rather obstructing than promoting agricultural settlement. I would prefer to give clearance leases on terms amounting to a mere peppercorn-rent, for a generation at least.

I am not prepared to advocate any interference with the rights of property which have been already recognised in the native tracts, but would leave the natives who have acquired such rights to settle the land in their own way.

I now come to the tracts fitted for European settlement, which I would treat exceptionally, and with a distinct view to European habits, predilections, and institutions. An English colonist likes a freehold above all things. He can generally command a little money. He prefers to pay a lump sum, rather than to be subject to future payments, or to be harassed with permanent conditions, the exaction of which has often been found difficult. He seeks to utilise lands which have hitherto paid next to nothing to government, and where there will scarcely exist any contrast with natives under different rules. His settlement would be a great political gain. I am, then, entirely in favour of marking off and treating specially and exceptionally, with a view to European colonisation, all the elevated tracts of available waste land fitted for European settlement. I would even go further, and would say that the public object involved is so great, that where we find large tracts of land specially fitted for such purposes in the proprietory possession of barbarous hill chiefs, we should be justified in taking them up by special enactment, as for a public purpose, compensating the chief most liberally and fully for his pecuniary loss, and providing him with so much land as he can actually use. No substantial injustice would be done, and great economical and political objects might be gained.

Here we must enter on particulars with respect to the districts where land available for such settlements may be found, and that, I fear, is the most difficult portion of my subject.

First, I will take the whole length of the Himalayan range. I have, on a former occasion, noted the fact that there and elsewhere our recent policy in regard to native states shuts us out from much of the land which we might have gained. We can only look to British districts, and for these I refer to the map. The quantity of land available in the Hazareh and Rawul Pindee districts on the frontier is not large, and the tract is so near to a dangerous frontier that it cannot be much recommended, unless arrangements could be

made for planting a military colony there. The Sikhs did something of the kind, and we might perhaps follow their example, but we must be careful not to press hardly on tribes jealous of their rights. We have no more British territory till we come to the Kangra district, a very fine one, and mostly in British possession, but it is one of those in which almost the whole area has been included in the village boundaries, and has become the property of a fine and numerous population, with whom we can hardly break faith. The tea-gardens now existing are principally confined to one spot, left uncultivated in consequence of a local superstition, and but little land is available to settlers on a large scale. Small plots may probably be found. The Simla hills are now almost entirely under native chiefs, holding on the faith of treaties and political engagements from which we cannot depart. There are a few settlers in the small patches of British territory. About Mussooree we have but a very small hill territory. Gurwhal, which was to have been annexed, is now permanently established as a native state; but in the adjoining territory of Kumâon we have a large British hill district, where a good deal of land is available, and where several tea-plantations have been already established, which yield very superior tea. East of Kumâon the Nepalese have all the hill country and a strip of land at the foot of the hills. The area of our Darjeeling district is small, and I believe that most of the best land has been already taken up. East of Darjeeling savage tribes occupy the range, and, with the exception of some small portion of the outer hills taken from Bhootan we have no admittance there.

It will be seen, then, that the area available in the Himalayas is not very great, and on the whole question of Himalayan settlement we must bear in mind the extremely precipitous character of the country, and the fact that, excepting perhaps the eastern portion about Darjeeling, the range is already inhabited by an industrious Hindoo race. When one sees with what labour and care petty fields have been everywhere terraced out of the hill-sides, one's only wonder is that there should be any available land in a country where the natives have so much trouble in obtaining sufficient sites. And in truth the difficulty is that the best of the land in medium elevations, that is, high enough to be healthy, and not too high for irrigation, has been already taken up. There remains, here and there, a good deal of high, healthy forest-land, but the spaces are not large, and water is generally deficient.

Again, at the foot of the hills there are some tracts which look magnificent, but which are in fever range. Here we have in fact the circumstance that has led to great misconception regarding waste lands in India. People see about the foot of the Himalayas and elsewhere what seems to be very fine land, covered with virgin forest or with coarse grass, and they rush to the conclusion that they are in an under-populated country, where the waste ought to be utilised. But, in truth, the sub-Himalayan jungle tracts are within reach of a teeming population, most covetous of land, and who are in fact rapidly pushing back the jungle wherever it is possible to do so. The fever of that tract is a deadly enemy. You may see places where there has been for generations a varying warfare between men pushing forward and the fever pushing them back. For a few years they make great advances, then come one or two years of unusual unhealthiness, and deserted fields testify to their defeat. Wherever you find in India good land lying uncultivated within a short distance of a large population, the probability is strong that there is some special reason for it. Still, there are strong evidences that at some remote period some of the most fever-stricken and forest-covered tracts were occupied and inhabited. Malaria still baffles our scientific knowledge, but we may hope that one day it will be overcome.

There is no Terai (as the moist jungle tract under the hills is called) in the Punjab.

Dhera Dhoon, which is so well-known a field for settlement, cannot be considered to be properly in the Himalayas; it is at the foot, only enclosed by what is called the Sewalie Hills, and in a semi-tropical climate. It may average about 2,000 feet above the sea, and not more than 1,000 above the neighbouring plains. It is a beautiful valley, but the causes to which I have alluded, as affecting many low tracts, have greatly retarded its prosperity. In fact much of it partakes of the nature of the Terai, and on that account the natives had not fully occupied it. Hence the difficulties of settlers and the disappointments which have occurred. Much land was taken up many years ago by enterprising men, who set up European sugar machinery, and by sugar and other products hoped to develope the valley and make their fortunes; that for the most part failed. Sir Vincent Eyre has told us of his most interesting attempt to establish a Christian colony. That also unfortunately fell through. Tea has been tried on a large scale, but the shares of the Dhera Tea Company are in an unhappy position in the market. Still, I am very hopeful about the Dhoon. There is already a considerable settlement in the town of Dhera, at the highest point of the valley and quite healthy. Mussoree and the new military stations (called, I think, Chukrata) are close by, and the mere supply of those stations would occupy settlers profitably. Taken in connection with the adjoining hills, and seeing the clearances and canals which are made or in progress, it is one of our most promising settlements. I have merely stated the difficulties to illustrate those which occur to a greater degree in low Terai locations. Once thoroughly cleared and cultivated, the Mussooree hills and Dhoon will be a delightful settlement.

The Terai extends all along the north of Rohilcund, Oude, and Goruchpore. Some enterprising grantees in Goruchpore have done much, but they have had great difficulties in Oude, and some of the grants taken by companies, which have been chiefly known in the Insolvent Court, were in fact taken to sell. In the north of Bengal, the Nepalese have, I believe, the whole of the Terai, but, again, to the east, in the Dooars, taken from Bhootan, we have a considerable sub-mountain tract of which something may be made.

Of the whole Himalayan country I would say this, that I believe there is sufficient land and sufficiently good prospect to give a good opening to the industrious settler on a moderate scale, but that your financiers, and land jobbers, and speculative getters up of companies, had better look elsewhere.

The tea districts of Assam and Cachar are so well known, that I need say little of them. The main point, however, to be borne in mind is this, that already many persons have taken up more land than they can cultivate, and hence much of the unfortunate reaction which has taken place. There is plenty of land. The difficulties are, a certain degree of unhealthiness, and the want of local labour. Still, an article of great profit may well afford to pay comparatively high for imported labour, and rates that we call high in India, would be thought extraordinarily cheap elsewhere. I believe that tea will never pay to absentees, who give very high prices for the land, cultivate through agents, and expect a very high percentage. But the unhealthiness is not excessive; there is good hope that it is being overcome by clearance, and there is the best prospect for *bonâ-fide* settlers, who take the land cheap, in small blocks, and cultivate it themselves.

In the Central Provinces we have hundreds of square miles of waste land, at elevations of 2,000 to 3,000 feet above the sea, and offered at a nominal price. Some of the highest lands, unfortunately, belong to aboriginal hill rajahs, but there is very much available for settlers. Tea and coffee have not yet been attempted, but both grow freely in the gardens at Jubbulpore, and both or either might probably succeed. The fever is, in most places, not excessive, and there is the best reason to hope that clearance might extirpate it. In fact,

the cleared stations, Seonee, Chindwara, &c., are already quite sought as sanitaria for the Central Provinces. I hope that European troops will be stationed on these plateaux, and it would be a good site for a military colony. In that case, some of the native rights might, perhaps, be commuted and compensated.

In the Bombay Presidency there are no extensive tracts offered under the waste land rules; but, on the high lands, immediately behind the Ghâts, are many eligible small sites available to all comers, under the Bombay assessment system, and where, if there was a demand, freehold sites for European settlement might be carved out. My impression is that, as railways and the Suez Canal are opened out, this part of India must become more and more the basis of our European strength, and that, both for the location of our troops and European governing populations, for military colonies, and for the European settlers who would supply the European community, no part of India offers so great advantages.

Coorg and the Wynaad may be described as already coffee settlements, and I trust that they have a most prosperous future before them. The Neilgherries, and especially the Pulneys, offer higher and healthier sites. The whole of the high lands of Southern India offer great opportunities for settlement, and I hope there are gentlemen here who will give us particulars regarding them. I will not make this paper longer by going into details with which others are more competent to deal.

All that I have here said has chiefly reference to lands fitted for exotic plants introduced by Europeans. I do not think that they are likely to succeed in cultivating the native cotton on waste land, because cotton is an indigenous product requiring high cultivation. The best cotton lands have long ago been taken up, and where the natives have (for instance in Oude) found that they cannot profitably cultivate the plant, I do not think that Europeans will succeed. But there is this to be borne in mind, that the American cotton plant is a different plant, requiring a different soil and climate, and it may be quite possible that Europeans might succeed in cultivating the more valuable exotic in spots not so well fitted for native cotton, say in the higher waste lands of the Central Provinces, or in the Bhootan Dooars.

One word on the mode of dealing with the waste lands offered to the public. I have already expressed my opinion with respect to what I call the native parts of the country, and I have said that in the parts fitted for European settlement a different system may properly be followed. Now on the whole subject I will further say this emphatically, that no one can justly accuse the government of backwardness in offering facilities for the acquisition of waste land. On the contrary, if there has been a fault, I say it has been in offering too great facilities to take up large grants in a country in which the supply of suitable land is limited. I have lately attended several meetings at which land questions have been discussed from a colonial point of view, and I have been very much impressed with the unanimity of opinion which seems to prevail among those who have most experience of such matters, that nothing is more injurious, or more tends to retard a colony, than a system which permits land jobbers to monopolise very large tracts of land at a very low price, and some people even to do what is called "getting into the way in order to be paid for getting out of it." In my opinion, in regard to such large tracts sold absolutely without conditions, the offer of the land to the highest bidder above the upset price was a just and necessary, if in some cases not an altogether effectual precaution. If it had been otherwise all the best of the land which, from special causes, was available in the hands of government, might have been secured by jobbers to sell at a profit, as has been the case in some of our colonies. On the other hand, I think that the rule of sale by auction would now fall hard on a *bona-fide* settler, who, at great trouble and expense, had found a suitable piece of land. To meet the case of such settlers—and these are the settlers whom I would most encourage—I would advocate something like the American homestead law, allowing any man of good character to select from the waste a limited quantity of land (and when considerable capital is put down the quantity might be increased) on easy or almost nominal terms, on condition of actual settlement and clearance. I would not make such grants transferable till a certain cultivation was actually effected, but that done, the land would become absolute freehold.

Before I sit down I would like to explain what I was reported to have said, on a former occasion, regarding the projected railway from Calcutta to the Darjeeling hills. I think it was rightly postponed to Lord Dalhousie's trunk lines, but I do not say that it should be postponed altogether. I do not think that either the use of Darjeeling, as a sanitarium for Calcutta, or the traffic in tea, &c., of the Darjeeling hills, would alone justify the expenditure. The question must depend on a consideration which has not, I think, been mentioned in these discussions, viz.—Whether the local traffic of the productive and populous districts through which the line will pass may be expected, with the aid of the Calcutta-Darjeeling traffic, to make the line pay, or nearly pay. I do not think that I over estimated the cost. The shortest line, by Caragola, runs right across the watershed of a very watery country, and would be very expensive. The other line, in connection with the Eastern Bengal Railway, would run more parallel with the water-flow and would open up some rich districts, but it would be longer—not, I think, longer (or scarcely longer) from Calcutta to Darjeeling, but a longer new line from an existing railway must be made. My impression is, that if a line can be made at a moderate rate, say £6,000 to £8,000 per mile, it will pay, and should be made.

Finally, with regard to the general prospects of European settlement in our elevated waste lands in India, I will say this, that notwithstanding the several difficulties and discouragements which we have encountered (and how many successful enterprises have at first encountered difficulties and discouragements), I have not the slightest doubt that our Anglo-Saxon vigour, and wealth, and resources would long ere this have overcome all difficulties, and established large colonies in India, if the nation had been pressed for outlets, and there had not been agricultural, and woollen, and golden Eldorados in America and Australia to attract emigrants, ever since India was open to Europeans. There are signs that these Eldorados have yielded their most brilliant returns. In America, heavy taxation, and the great dearness of all necessaries, much detract from the advantages heretofore offered. The same causes begin to operate in Australia, where there is not the same unlimited stretch of fine country in the interior, and where gold-digging is no longer a profession for any but very rough labourers. In India we have still that cheapness which is so wanting in the colonies, and I have very great hopes that, the first bloom, as it were, being taken off the colonies, unless we annex Africa and open up a new field there, a stream of the many superior and educated men, with a little money in their hands, who are continually hiving off from this country, may begin to flow towards India, and may profitably occupy the waste lands there, with the aid of native labour.

DISCUSSION.

Mr. Fitzgerald inquired what was the value of the produce of coffee per acre?

Mr. G. Campbell was unable to answer that question; but it was no doubt very large.

Mr. Fitzgerald was struck with the amount of resources afforded for the cultivation of coffee, and it depended a great deal upon what the value of the product per acre was.

Mr. G. Campbell believed the value per acre was very large, and that the rent of the land was very trifling.

The Chairman said he had known the yield of coffee to be as high as £40 per acre, and in some instances higher than that.

Dr. Archibald Campbell read the following communication: — Mr. Campbell has given us a most valuable paper, and has with great clearness shown us the position of waste lands all over India. As regards the Himalaya, the portion I am best acquainted with, I consider the statements very accurate. Speaking in this country, to the people to which the Canadas, the United States, and Australia offer an unbounded extent of waste land, it may be said that the Himalaya, shut out as we are from Cashmere and Nepaul, offers us but a small outlet, comparatively speaking, still it is a good deal and of great importance. As Mr. Campbell has touched upon the Darjeeling Railway, which I have on previous occasions brought to the notice of this Society, I will only just now say that I am quite sensible of the difficulties which lie on the line from Caragola, through Purnea, in consequence of the number of rivers to be bridged; but, looking to the success of the engineers in bridging the affluents of the Ganges on its southern side, I have no doubt they would equally succeed on the northern bank. But it is not necessary that we should stick to the Caragola line, for, as I have said before, there is the line from Rajmahal, which, after crossing the Mahanuddi river, can be taken all the way to Dinajpore, without crossing any river. I shall, however, give fuller particulars on this subject at our next meeting. On the matter of waste lands, I shall confine my remarks to the district of Darjeeling, which is the only British territory in which I have had a practical experience of this subject. Experience gained in the independent state of Nepaul, in which there is more waste land than in all parts of British Himalaya put together, cannot be turned to any good account here. The total area of the hill-portion of Darjeeling is about 282,000 acres, the elevation of which varies from 1,000 to 10,000 feet above the level of the sea. The whole of this, I may say, was waste land when it was ceded to us by the Sikim Rajah, as there were not fifty families of the natives in the whole tract; and the custom of these people was, to occupy portions of land in the forest for two or three years only, and then move to clear and cultivate fresh places. In these circumstances, and following the usages of the neighbouring countries, we assumed a proprietary right in the soil, and rules for assigning and granting lands were issued. The first considerations were, to bring a native population into the new territory, and to facilitate and encourage the resort of European invalids and settlers. The ridges of the hills, at elevations from 5,000 to 7,000 feet above the sea, were reserved for building sites; and allotments, of not less than 200 yards square, were granted and leased at 50 rupees, or £5 per annum, to all applicants. Lands for agricultural purposes were assigned to applicants, on leases of not less than 30 years, with an exemption of five years' payment of rent on uncleared places, after which rent, at 2 rupees, or 4s., per acre per annum was leviable. In cases where no clearance or occupation was effected within five years, the lessee forfeited his tenure, and the land was resumed by government. The exemption for five years was designed for the encouragement of Europeans, with reference to the difficulties of starting in a new country and to the expense of clearing off the heavy forest. To show the difficulty of meeting the requirements of people of different races and usages, I will mention a curious circumstance. In explaining the new waste land rules, I asked the natives assembled for the purpose what they thought of the 30 years' leases, with exemption of rent for five years. There was a general titter at the question, and then an old man came forward and said that five years' rent free was quite suitable, for no one cared what rate was asked afterwards, as they rarely stayed more than three years in any one place. This led to a modification of the rules to suit these erratic people, whom we were anxious to attract to us for labour; and applicants were furnished with written permission to clear and cultivate in the forest for three years, on a payment of eight annas, or one shilling, per house per annum, and on condition of their attending annually, when called upon, to clear the mountain paths of jungle, receiving the current rate of wages when so employed. When the cultivation of tea was introduced, about 1856, waste land was assigned to Europeans at ten rupees, or £1 per acre, payable in ten instalments of one rupee per acre per annum, a freehold tenure to be granted on payment of the last instalment. These terms were considered favourable, and many freeholds were acquired under them. Up to July, 1859, I reckoned that 80,000 acres had been assigned, and that 200,000 acres were still waste. In October, 1861, Lord Canning's celebrated resolution on the disposal of waste lands all over India was promulgated. It was received with universal satisfaction by all the commercial and planting classes. It provided for the sale of waste lands to applicants in lots, comprising not more than 3,000 acres, at fixed rates, varying according to circumstances, from 5s., or 2 rupees 8 annas, to 10s. per acre, to the best of my recollection, for I have mislaid my copy of the resolution. Lord Canning, however, was not supported from the India Office; the Secretary of State altered his liberal and well-devised resolution, and sales of waste land by auction became the rule. By this system persons who have not taken any pains or who have not gone to any expense to ascertain the qualities of land, are put on the same footing for purchase as those who have, by their skill and perseverance, selected allotments and set their minds and plans on securing them. Up to the end of 1861, large assignments of land were made to Europeans for tea-cultivation, but I cannot state to what extent, nor can I say what is the extent now available, although I believe it is still considerable. I have recently heard that 25,000 acres were resumed by the government at the request of grantees, who were allowed to commute their payments by instalments, on portions of their grants, to ensure freehold tenures of the remainder. The extent of waste land in the Terai, or lowlands at the foot of the hills, in 1859, was about 50,000 acres; since that date some of it has been taken up for tea, and the experiment is successful. The elevation of the Terai land varies from 500 to 1,000 feet above the level of the sea, and it is fitted for cotton also. Unlike any other hill-district I know of, the whole, or almost the whole, of the land is held by Europeans, and this has fortunately occurred in a very satisfactory manner, without any feeling of usurpation or unjust displacement being entertained by the native races. Every facility was given from the beginning to the natives to become land-holders, and when the avidity of Europeans to procure lands for tea-cultivation became prevalent, I took every opportunity of urging on them the propriety of retaining their lands, and not to be tempted to part with them for sums of ready money, which I knew they would certainly spend at once. It was of no avail. One after another yielded to the temptation freely offered by the planters, and sold their lands, soon spent the purchase-money, and generally became the tenants of the purchasers, in their own houses. This is but a fresh instance of the giving way of aboriginal people to the spread of the irrepressible Anglo-Saxon; but it is pleasant to know that it is quite free from the miseries and bad blood which accompany it elsewhere. One of the rules for the sale and grant of waste lands at Darjeeling is objectionable, I think. The purchase-money is payable either in full, at the time of purchase, or by instalments running over ten years at not less than ten per cent. per annum. In the latter case, however, interest at ten per cent. is charged on the unpaid portion of the purchase-money, the whole grant remaining hypothecated to government until the whole

amount in principal and interest is paid up at the end of ten years. The rate of ten per cent. interest is double that paid by government on its loans, and is a heavy pull on the planter. A reduction of the rate to five per cent. might be made justly in the interests of government, and to the benefit of settlers. So far as I can at present ascertain, the European settlers and tea-planters at Darjeeling are well satisfied with their land tenures, and do not complain of any shortcomings by government, except as regards the want of a railway to Calcutta, to enable them to send their tea and other produce to market, and to get up their stores, machinery, &c., from the same place. This drawback goes very far indeed to neutralise the favourable circumstances they are otherwise placed in, and I wish once more to impress on this Society the importance of railway extension to the Darjeeling hills, for the benefit of all classes of Europeans in Bengal, and for the full development of the resources of a productive district in a climate admirably suited to the European constitution. There is no difference of opinion now among the friends of India as to the importance of European settlers in all parts of the country, as a means of strengthening the hands of government, and of securing the attachment of the natives to our rule. Every argument in favour of this settlement in the plains must have double force when applied to the hills, and I do not know of any project for the advancement of our interests in India more worthy of the support of government, than the extension of the present railways to all the accessible parts of the Himalaya, and I hope that our Committee may be induced to give its serious attention to the subject.

Lord William Hay said he came with no intention of taking part in the discussion. Mr. Campbell's paper was, as he anticipated, a very exhaustive communication on the subject. There was only one point on which he wished to offer a few remarks, that was with regard to the assistance which the government had given to the settlement of lands by Europeans in India. Mr. Campbell seemed to think that the government had given all the assistance which it could be expected to give. He (Lord W. Hay) was inclined to think all had not been done that might have been expected, considering the importance of the subject, and the immense strength which a large number of Europeans spread over the country would give—a strength out of all proportion to the expense which would be incurred by the government in facilitating their settlement. The rules relating to waste lands were open to great objection. Not that he thought Lord Canning's rules could have been approved by Lord Halifax. They contained provisions which could not be sanctioned. There was one, for instance, which enabled government to dispose of land to a would-be settler, and no person who had a claim upon that land could make it after the expiry of one month. Now, considering the natives often left their homes for six months, it was possible that land, under that rule, might be sold over their heads, and when they came back they would have no power to regain it. For that and other reasons it was found impossible to maintain Lord Canning's rule. The rules as they exist now had the fault of differing in every district of India. He had a thick volume at home containing the rules with regard to waste lands in India, and he ventured to say that every province had a different set, so that a person who had mastered the rules of one province, on going into another would find himself at sea. The rule to which reference was made by Dr. Campbell, viz., that which required the sale of waste lands by auction, was a most objectionable one. A European went to India at great cost. On arriving there he hunted about for a place suitable for his purpose, and having found one, he was liable to have the land bought over his head by some rich native. That seemed to him a hardship. Then, with regard to information respecting waste lands in India, he defied any person to obtain it. If he had a personal friend who was anxious to go out and settle in India, and who wished to obtain as much information as he could, he (Lord W. Hay) really did not know where to refer him to. It could not be got at the India-office, for the government could not tell the extent of waste lands available in Bombay or Madras; he had himself made the inquiry and could get no information. It seemed to him the first duty of the government, if they were anxious about the matter —and he believed they were anxious to see Europeans settle in India—was to obtain all the information possible for the benefit of intending settlers. He had already alluded to the great expense entailed upon those who went out to India. There was another reason why waste lands should be offered on terms more advantageous to Europeans than to natives. At present both were placed on the same footing; but when they considered the European had to go out to India at a heavy expense, to a climate by no means agreeable, even in the hills, it seemed to him (Lord William Hay) they should offer terms more advantageous to Europeans than to natives, especially when they further considered the affection which the former had for freehold tenure. He would unhesitatingly offer to Europeans freehold tenure wherever they desired it. The natives themselves did not care about it. If the rent which they paid for the land was less than they would get as interest for their money, they would rather pay rent than obtain the land on a freehold tenure. With regard to the Himalayas, they discussed the amount of waste land available there at such length at a previous conference, that it was not necessary for him to offer any further remarks upon it. He was surprised to learn that there was so little waste land in the Hazara district. He had been informed that was the only part of the Himalayas where there was any real extent of land for the purpose. He doubted after all whether we should ever see in India many European settlers. India was a great field for men of good character, competent to act as agents and superintendents of native labour. The natives, as they knew, were extremely clever; there was nothing which they could not imitate, and there were very remarkable examples of their ability in acquiring knowledge. Only the other day, out of those who passed competitive examinations, there were no fewer than three natives, of whom one passed second or third. Their ability was scarcely inferior to that of the Anglo-Saxon, but when they came to the character of the man, they found a great difference. That was a point in which Europeans excelled, and which gave them a value in India in relation to the mass of population which they did not possess to an equal extent in any other part of the world; therefore India, of all places, was a country where Europeans, not rich men, but men of good character, would obtain a reward equal to their deserts. Every day Europeans were being employed in the Himalayas, on small tea-plantations, on railways, and other works; they received large salaries, and he believed they could make considerable profits. In that way he believed the field of employment for Europeans in India was almost unlimited.

Major-General J. Clarke communicated the following, restricting his remarks to the Upper Provinces of India, including the Punjab:—An opinion was once, and is still more or less prevalent, that applicants for waste lands meet with needless difficulties from government. I think, on examination, it will be found that many at least of these difficulties are owing to the very nature of the case. In a country which is not thickly peopled, where the extent of land exceeds the want, boundaries, although tacitly recognised, are not at all rigidly defined. This is an interesting and important point, and is thoroughly illustrated by the history of the clan feuds and bloody affrays or faction-fights of the north-west—happily now infrequent, owing to the careful and scientific demarcation of boundaries. Added to this, let us remember that, in the anarchy which always was chronic in one or more districts, under native administrators, whole estates, or portions of them, sometimes

lapsed into jungle, and it is frequently very difficult, after a long interval of abandonment, to decide on State and individual claims on such lands. When we know that, even in this law-directed country, boundary disputes still come before our courts, as in the recent case of Lord St. Leonard's claim and the contention as to the proprietary interests in Tooting-common—a spot within six or seven miles of this—I say that, on examination, it will be found that the difficulties, where they exist, are not ordinarily of government creation. By the term "waste lands," I understand all such lands as are at the disposal of government, whether in the hills or the plains, and which the government desire to bring under tillage or to otherwise improve. It is well known that a large party in England have frequently urged the great encouragement that a freehold tenure would offer to European settlers, and on the importance of encouraging the European element there is entire unanimity of opinion; and in stating, as Lord William Hay has done, the most valuable class to be Europeans of character, holding situations of control, superintendence, and inspection, I most thoroughly concur. I do not look for any colony of European settlers in the sense that we understand settlements in Australia and Canada, but I see no reason whatever why Englishmen should not hold profitably ordinary agricultural estates in India. It was the strong desire for freeholds that I presume originated the Government of India Resolution of October, 1861, authorizing "the sale of waste lands in perpetuity, discharged from all prospective demand on account of land revenue." This raised the hopes of some European gentlemen to such an extent that they saw themselves in their mind's eye, the lords and owners of magnificent estates, and the government also looked for substantial benefits both to India and to England, but I believe I am safe in stating that the results have been, with a few exceptions, where the lands possessed special advantages of soil or position, disappointing both to the purchasers and to government, the vendors. One plain reason for this is, in my opinion, as stated by Dr. A. Campbell, the rate of interest (10 per cent. per annum) charged on unpaid instalments of the purchase-money, nine-tenths of which, under the resolution of October, 1861, might be spread over ten years. This condition was probably intended to repress undue speculation, but it really encouraged it. Be that as it may, I say confidently, that interest on the instalments should be altogether remitted, if it be desired to give men who may be men of character, of good constitution, and of good courage, but who have but very small means, a chance of succeeding in the reclamation of their purchases, while to men who could pay down the purchase-money at once, an abatement of 25 per cent. should be made. I am supposing the policy of the sale of waste lands, to which I am opposed, to be continued. Another reason for the failure of purchasers' success is that, as a rule, they personally had no agricultural or local knowledge, and that they did not rightly appreciate the difficulties of reclamation, which, though profitable, is a slow operation, and thus, as is often the case in first attempts, much money has been lost. Experience will, no doubt, modify the first lines. European energy will find it necessary, if not to adopt at least not to ignore native systems and customs of culture; they will, in my judgment, be more successful in attempting to improve existing practices than in introducing new and foreign ones, and above all, I would caution them against the indiscriminate clearance of forest waste, what we should call woods in this country. I especially refer to this, because many gentlemen, both official and non-official, seem to think that the one mode of dealing with waste lands is to bring them under tillage, whereas this really must depend on circumstances, and in many cases they are best reserved for fuel-yielding and grass-producing tracts. Illustrative of this is the following extract from the "Lahore District Land Revenue Settlement Report":—"There are 108 government rukhs, or grass preserves, area 236,507 acres; of these 69 are old rukhs, formed under the Sikh rule, and 39 were formed in the Choonian Pergunnah. These rukhs produce about 32,426 rupees yearly, of which sum 9,628 rupees are derived from land cultivation within them, and the remainder by leasing the grass in them from year to year. Besides this, a large sum may be obtained by the sale of the wood every five or six years, so that I consider it will be more advantageous to government to retain the rukhs on their present footing than to make them over to Zemindars, who would not be able to pay the sums now realised from city contractors by the annual sale of the grass." I entirely concur in this, for supposing these tracts to be treated as waste lands, saleable at 2 rupees 8 annas per acre, they would fetch about, say, £53,000, while they in their present condition yield to government a revenue of about £3,000 per annum, besides what may be received for the sale of wood. The settlement officer, Mr. R. Egerton, states that nearly one-half of the area of the villages in the district is uncultivated. Reference to this would, if followed up, lead to the question of how far these wastes should be included in village areas; but I cannot detain you with that. Having stated that the vendors and the purchasers have alike been disappointed at the results arrived at under the present sale rules, I may now state that I am entirely opposed to the policy of the resolution of 1861, so far as relates to the sale of the fee-simple by government of waste lands, because, if successful as to reclamation, it creates an exceptional tenure, chiefly held by a dominant class, thereby exciting a false impression of the action of government. I, therefore, strongly advocate the retention, however modified or improved, of native usage as a basis. Instead of the government selling the fee simple of waste lands, I consider it would be infinitely preferable, in the interests of the government and also of intending planters, to grant leases of the lands, as free as possible from any but actually necessary conditions. The first of these conditions might be, that the lessor should pay, for the term of years which the conversion or improvement may be estimated to occupy, such an annual rent as they are worth at the time of the lease for grazing or fuel-yielding purposes. Timber-trees, during this lease, to be cut under local rates. The second condition might be that, on the expiry of this term, should the estate have reached a condition capable of bearing an average assessment, a lease for fifty years should be granted, renewable thereafter, and a given proportion enrolled as exempt from land revenue, being, in fact, a bounty from government for the service rendered. This exemption would, of course, remain as long as, but no longer than, the reclaimed lands should be revenue paying. Probably instead of using the term average assessment, it would be better to assume the average at the time of the coming lease, and state it. On the second condition coming into operation, I would permit timber trees to be cut without restriction or interference by government. I need not explain to gentlemen of Indian experience that the tenure I advocate as above is heritable and transferable, and, for all practical purposes, is a freehold estate paying a quit rent, which, though variable, has recognized limits, the discussion of which would take me too much into detail. I consider the conditions would work fairly for government, as preserving to it valuable land revenue prospectively and to some extent immediately, and for settlers, who, if at the end of their pioneering term of occupancy, so to say, or before it possibly, might, without much loss to themselves, throw up their lease, or renew it on modified terms, if they did not see their way to success, and if they did succeed they would hold on, and benefit themselves and the State. I have proposed the exemption of a fixed portion of the land. I would fix it at from 15 to 25 per cent. This proposal is in entire conformity with native usage as to the principle, and quite compatible with general tenures, and is common under the terms "enam," "narkar," "seer," &c. I may add, to say nothing of the dissatisfaction which revenue-paying landlords must feel

at exempted lands lying contiguous to their own, the fact of these revenue-exempted landlords being able to afford labourers and cultivators greater advantages acts detrimentally and unfairly on the assessed lands; and, as may often have been observed by revenue officers (jageer), exempted lands flourish, while neighbouring lands, of as good quality and as well managed, are in some difficulties. Finally, I may say that I am confident that capitalists who would be satisfied with six or seven per cent. could realise that by the purchase of ordinary landed estates in India. I am not giving an opinion on the advisability of thus investing money, but I say to those who desire it, it can be safely done, and they had far better, in my judgment, thus invest their money than in purchasing waste lands, unless they can begin the work when young, strong, and supported by the encouragement and credit of friends. Indeed, I may say that the proper position of the European who is a gentleman connected with land, is either that of a landowner or of manager, not that of a simple tenant or even proprietary farmer.

Mr. Edwin Chadwick—On such information as I have derived from others, I should doubt whether India generally furnishes fields for the Anglo-Saxon settler to go forth singly, as he has gone forth into the American backwoods, relying on his own axe, or pick and shovel, and for self-protection on his own rifle. I apprehend that, apart from other enemies and obstacles, the more rife causes of tropical fever are commonly too many for his unaided individual effort, or even for associated effort like his own—as by land companies—unguided by sanitary combined with engineering science. But it is proved by the example of what has lately been done in Algeria, to which I have before adverted, and which I must protest against being set aside, that such obstacles are not too many for governmental effort, guided by special engineering and agricultural science, combined with sound practical sanitary science. On plains where men making unscientific effort had been thrice driven back by fever, and the colonists had been swept away—on those same plains, by governmental efforts, by the *corps de genie*, guided by sanitary experience, fever was subdued and extirpated. The course indicated by such examples would be one by means of special surveys and special works, directed by competent engineers, for the drainage of marshes, the clearance of jungles, and the sources of malaria, rendering reclaimed wastes both cultivable and fever-proof, and healthily habitable, and to the government profitable by increased rentals. On such sound Indian testimony as I have cited, the Algerian example is widely applicable to India. But I may also cite a great particular example from India itself as applicable to India generally. I cite it not on my own authority, but on the authority of my late lamented friend, Colonel Baird Smith, who was wont to dwell upon it with great satisfaction. It is but little known in India. I have met with members of the Indian government who have never heard of it, and it may be said to be not at all known in England. It was what was done by the late Col. Dixon, of the Indian scientific corps, who was sent with a brigade of troops to repress, or keep in check, a robber population occupying the Mairwarra, a tract of hill country (about the size of the Highlands of Scotland), extending from the frontiers of Goojerat, through the middle of Rajpootana, to the neighbourhood of Delhi. He found the condition of that population to be one in which, from the regular failure of their crops at particular seasons from the failure of water, they were obliged to rob, by forays upon the lowlands to obtain subsistence. He designed works for the storage of water, and borrowed money to execute those works by the labour of that predatory population. He set them to clear away jungles, and to reclaim wastes, and when those wastes were cleared he settled cultivators on the land. He founded one hundred and thirty new villages for their habitation. A market was required for the sale of their produce, and with the market he founded a town. He succeeded so well in reclaiming the predatory population as well as the land, that he took some of the worst, whom poverty and ignorance had made robbers, out of the gaol, to convert them into thrifty and useful subjects—and he succeeded. He achieved the grand administrative result of so employing these thieves that they could not afford to thieve, and hence they became honest, settled, law-abiding men. The general result of his labour in the application of engineering science to culture, and of administrative skill to the service of the population was, that instead of expending a revenue upon them, he raised a revenue from them—instead of occupying a brigade of force upon them, he raised a brigade from them, and that brigade was faithful to us during the mutiny. Here was the *lignum* of which governors and governor-generals ought to be made! Here was the true mode in which our dominions might be sustained! To the observation of to-night as to men pushing forward as settlers, and fever pushing them back again, and malaria still baffling men of science, I answer, Yes, to men of imperfect science, who are ignorant of sanitary science, it is so. Whilst irrigation has been so conducted in some districts as to improve the climate, it has been so conducted in large tracts as to create marsh surfaces and generate malaria, and it has been found that the proximity to such works is denoted by the external size of the spleen of the people who have the misfortune to live near them. But I was interested to learn that Colonel Dixon had so conducted his works of water-distribution as to adjust it to the absorbent power of the soil and of the crops so as to avoid this evil, and that children were reared, and population increased the range of his work. It is a matter of congratulation that we have less pessimism to-night on this subject, and that it is admitted, or implied, that the Anglo-Saxon, who, it was dogmatically asserted, could not thrive or have succession anywhere in India, may thrive and settle somewhere there. I was glad, in conversation with Dr. Campbell, to learn from him that, in the conditions which he has described as attained in Darjeeling, children live and prosper.

Dr. Campbell—Yes; a more hearty population, I believe, does not exist, and they are now in the second generation, in excellent health.

Mr. Chadwick—Then we may confidently anticipate that, in the continuance of those conditions, there will be generations for time to come. I deem it important to observe that, by governmental arrangements, or by competent sanitary and scientific direction, the sacrifice of life, so common and general in tropical climates, in the reclamation of waste lands and opening them up for cultivation, is preventible. It is now prevented in the government preparations for settlement in Algeria. It is prevented there by sanitary care, as to the times and seasons, and prevalent winds, for opening up the soil, so as to avoid the diffusion of the products of decomposition by exposure during the day, and as to the lodging of the labourers at a sufficient distance from them during the night. On the whole, I had the assurance of the wide experience and observation of Colonel Baird Smith, that operations like those of Colonel Dixon would—under good government—be available for the greater part of India; and it will be obvious, on consideration, that it could be available for new British settlers as well as for old native populations. The full account of the achievements, engineering, and administration of Colonel Dixon are of the highest interest and importance for India and for civilisation. A copy of it ought to have been given to every young engineer, officer, and administrator, for his study and imitation. But he died, and passed away unnoticed and unhonoured, except by the people whom he had benefited, and who loved, and were disposed to deify him. Other heroic men there have been amongst the most successful of Indian administrators of whom this country may be proud, who, having subjugated or received in charge savage hordes subjugated by arms, elevated them by administrative art and science, and put

them in progress of peaceful civilisation, and achieved by those arts victories over barbarism greater than victories in war. These are the brightest stars of India, admired by the people, but yet they had no decorations, but, like Colonel Dixon, were mostly passed over by high-seated apathy, but were contented that their beneficent labours were not interrupted by powerful antipathy.

Mr. Spencer Price believed that these conferences would have the effect of drawing a large share of public attention to the development of the resources of India, in which the utilisation of the waste lands must be regarded as an important feature. On this subject of waste lands, he would ask whether they were to be regarded as waste lands which could be readily utilised for the benefit of the country and those who occupied them, or whether they were mere desert wastes, sources of malaria and the abode of wild animals? It was very desirable that they should have information from those acquainted with India as to what extent these lands might be utilised, more especially with regard to the article of cotton. They knew that cotton was already cultivated to a great extent in India, and it was of importance to know whether these waste lands would be available for the increased production of that article.

Mr. Hyde Clarke having moved the adjournment of the conference,

Mr. George Campbell said that, as he probably could not be present at an adjourned meeting, he would like to offer a few explanations with reference to the remarks which had been made by several speakers. With respect to a Darjeeling railway, he by no means undertook to advocate one line or the other; he merely pointed out the disadvantage of crossing the drainage, and submitted that it was an engineering and commercial question—an engineering question to find the cheapest line, a commercial question to select the line which would afford most traffic. He had not before heard of the Rajmahal route, suggested by Dr. Campbell; very possibly it might be the best. On the whole question he would only say, examine the country well; make the line, if there is a reasonable prospect of remunerative traffic; and select the line which will pay best. One point adverted to by Dr. Campbell, and alluded to by other speakers, he wished to dwell on a little, because it was a matter which had attracted considerable attention, he meant the method of giving lands to applicants at a fixed price, as distinguished from selling them to the highest bidder. An idea was very widely spread—he had found it to be entertained by many in this country, members of Parliament, commercial men, and others—that Lord Canning had passed very liberal land rules, and that Sir Charles Wood had cancelled them, and substituted very illiberal rules. Dr. Campbell seemed to support that view, alluding to transactions in which he (Dr. Campbell) was concerned, in which, as representing government, he had made grants of lands under Lord Canning's rules, which had been subsequently cancelled in accordance with other rules. Now he (Mr. Campbell) wished distinctly to take issue on this point. There was some ambiguity in Lord Canning's rules, but, rightly construed, they were in essentials very nearly the same as those subsequently passed to clear up the doubts which had arisen. He could state with the utmost confidence, that the grants made by Dr. Campbell and subsequently cancelled were not made in accordance with Lord Canning's rules, but contrary to Lord Canning's rules; for the matter had been brought to judicial decision, and it had been decided by the highest court that Dr. Campbell's grants were void, as being contrary to Lord Canning's rules, under which both grantor and grantees were acting. After this decision, he asserted that it was quite a fallacy to say that Sir Charles Wood had very essentially altered Lord Canning's rules. The truth was, that Lord Canning's rules, just as much as those which were subsequently published, made it necessary that when more than one person was willing to take the same land at the fixed price, it should be put up to the highest bidder. Whatever might be the case now, at that time, when the rules were first promulgated, that system was absolutely necessary, to prevent jobbery and great injury. He would explain the reason why. At that time, no such rules having been hitherto in force, there were in the hands of government certain limited tracts of very valuable land which for special reasons had not been cultivated, but which were really worth almost as much as cultivated land, either for grazing purposes, or because they were situated in the heart of the cultivated and populated country. There were some such tracts in the Punjab and in Oude—land which had been preserved for grass or for sport, or as the parks round the castles of barons of Oude. To give such lands unconditionally to the first comers, or to those whom the officials most favoured, when they were really worth ten times the fixed prices, would have been most unfair. He had heard of a case in the Punjab where a man came, and was very nearly getting a tract of most valuable land at a very low price, because he said he was going to get up a company and breed horses, but the natives in the neighbourhood at once offered to pay annually as rent about as much as the other man offered for the fee simple. The case of Darjeeling was also very much in point. He had no doubt whatever that Dr. Campbell was actuated by the purest motives, but what were the facts? Darjeeling was one of the very few districts in which there was good waste land available in a perfectly healthy climate; the quantity of that land was very limited, and it was in no out-of-the-way unknown region, but in the immediate neighbourhood of the great European station of Darjeeling. Of course there was a rush to secure this tit-bit of waste land, and when it was put up to auction it sold for eight or ten times the fixed minimum price. If, then, this land had been given away finally at the fixed price, it would simply have been to put so much money in the pockets of a few individuals. He would by no means object to grants of land in small portions, on condition of actual settlement and clearance, but to give away large tracts unconditionally, far below their real value, would merely be to favour land-jobbing. Lord William Hay had truly said that, if we wished to get European settlers, we must attract them by favourable terms. Lord W. Hay went so far as to say that even in the plains he would give land to Europeans on more favourable terms than to natives. He (Mr. Campbell) must differ on this last point, because, if in the thickly settled native country, you give land, on unconditional freehold tenure, to Europeans for less than its real value, they may, and probably will, sell it to natives, pocket the money, and go off. This had actually happened in Oude. After the Mutiny, some confiscated estates being in the hands of government, it was thought desirable to encourage European settlers, and allotments of these estates were made to a number of meritorious European gentlemen. What had happened? Why, almost without exception, they had sold the estates for high prices to natives, and gone off. He had met two or three of them in this country, with money in both pockets. Perhaps they well deserved it, but the object of European settlement was certainly not attained. Lord W. Hay had, perhaps, somewhat misapprehended him in regard to government assistance to European settlement. He only meant that the government had gone far enough in the one particular of giving facility for the acquisition of waste land. At a meeting of the Colonial Society the other day, he heard one of the most enterprising planters, Mr. Williams, state that, whatever might be the faults of government, they could not be said to be wanting in this particular; on the contrary, Mr. Williams found himself with a hundred thousand acres on his hands, which he would be most happy to surrender to any gentleman on the most moderate terms. In truth, the great object of the planters now was not to get more land, but to get government to let them off the bargains for large tracts, which

they had been in too great a hurry to make. His view still was that, in parts of the country already fully occupied by the natives, Europeans could not have land on more favourable terms than others, and the quantity of waste land really fitted for European settlement being limited, very large tracts ought not to be given away otherwise than to the highest bidders, but he most entirely agreed that (as he had already said) in the high waste lands fitted for Europeans small grants might be advantageously made, on distinct conditions of settlement, not at the highest to be got, but at a very low price; and he adhered to the view that, in suitable tracts marked off for European settlement, the government might—and if they would have settlement must—give much more active assistance than had hitherto been given. In such special settlements he would take upland for the purpose, would make special grants, pass special laws, give special institutions, afford special facilities in the way of roads, &c., and in every way foster and develop colonies, which would be excellent social centres of improvement, and a great political strength.

The adjourned discussion on the subject of "Waste Lands in India" took place on Friday evening, 21st May, Dr. Archibald Campbell in the chair.

The following communication from Mr. Charles Horne was read by the Secretary:—

The subject of waste lands is so vast in its various bearings, and so important, that I send this memorandum of my views on the subject, with reference to the remarks already made on the subject by various speakers.

I hold "waste" land, as under discussion, to mean cultivable land, relative to which government is under no engagements, and so has full power to dispose of. Of course a small proportion of uncultivable land must in most cases accompany it. In dealing with this, I hold that neither should "India for the English" or "India for the natives" be our principle, but "India for both" of these classes.

Lord William Hay held that, because the Englishman had been put to great expense, inconvenience, and trouble in coming to India, therefore he should be dealt with on more liberal terms than other applicants. Another gentleman remarked that, because scattered Anglo-Saxons in India added greatly to our strength, a similar course should be pursued. I regret that I cannot agree with these gentlemen, but hold with General Clarke that, in dealing with these lands, no absolute transfer of proprietary right should be made, and that the tenures of the country should be respected. We ought to deal with all alike, and perfect impartiality should be our rule.

Surely, if land were granted to pay a peppercorn rent for such a time as it was in course of being reclaimed, the said time to be fixed say from five to ten years, according to circumstances, and after that to be moderately assessed with government revenue, and the settler to be then recorded as the holder, rent-free in perpetuity, of say one-sixth of the said land, or of land of its value, it would be quite sufficient inducement for the enterprising Briton as well as for the native.

Why natives should not cultivate tea, coffee, and other products, just as well as Europeans, I could never understand, and, in fact, they do in many places, and I have seen many native indigo factories in the plains. The European, as noted by one speaker, has a great advantage over them, viz., his moral force of character, and strict adherence to truth in the contracts to which he must necessarily become a party.

I have never in India heard of any difficulty thrown in the way of applicants obtaining land. I can only say that, as far as I am aware, the present rules work very well. In the government "Gazette" (I believe, for I have not got it here to refer to) there are published lists of land available, and I know that such lists are to be found with the Commissioner of Kumâon, the province relative to which, I believe, I was expected to make some remarks,—and I know that this gentleman is ever ready to afford every information.

As I said on a former occasion, and as Mr. Campbell has so emphatically observed, there is certainly an opening for resolute men with a small capital to settle in that most healthy province, with every prospect of success. The plots of land are not large, and I quite think with Mr. Campbell, that the grants should not exceed from 200 to 300 acres at most, and the difficulties to be overcome, although great, are not more than in Canada or the more remote parts of Australia. Above all, I would show no favour to any; and I would wish to impress upon all, that healthy waste land in India is not so abundant as it is generally thought to be.

Kumaon has ever been a densely-populated province; and although we find everywhere traces of abandoned cultivation, it arises only from the people finding other occupation more profitable than cultivating these little terrace fields, as also from the opening out of the terai at the foot of the hills by means of irrigation. I am sorry that I can give no statistical details, and I trust yet to hear of many more settlers in Kumâon than at present.

Mr. Hyde Clarke said—I am very glad to have the opportunity of participating in this discussion, by having moved the adjournment of it, more particularly as it was commenced under favourable circumstances, in the presence of gentlemen who had taken an active part in India in the passage of the necessary measures. I can only regret the absence of the chairman of the last meeting—Mr. Fitzwilliam—because he did take a very considerable part, more than he acknowledged to, in carrying out those measures with Lord Canning, and I had hoped he would have been present on this evening, to have given us some further information with regard to the policy that dictated that measure. I regret that it is illness incurred in India which is the cause of his absence, and it is with the view of alleviating this suffering to Europeans in India, that many of us are so urgent to avail ourselves of the hill regions, a subject closely connected with this question of waste lands. If the waste lands in the hills and upland regions had been better taken up, there can be no question that it would have been followed by the transference of men and administrative establishments to those regions. It is only under such circumstances we can hope for the development of the government of India, and the proper treatment of the question which we have under consideration. How many valuable lives would have been saved; how many constitutions preserved from inroad, if proper advantage had been taken of the facilities which the varied climate of India presents. Mr. Horne, in his communication, has referred to the necessity of considering this question, not only in relation to Europeans or Englishmen, but also in relation to natives. It is with that view I got the question taken up by the Parliamentary Committee on Colonization in India, with a view particularly to benefit the natives, because I am sure the friends of India must be convinced that there can be no benefit accrue to Europeans in connection with India which must not to a much greater extent reach to the natives of India. The whole history of Englishmen in India has been to that effect. It would be trite indeed to recall to you the many operations of our fellow-countrymen—the many branches of trade and industry which by their development have given increased resources to the country, and greater happiness to the natives. I believe it was in consequence of that agitation of the waste lands question in that committee, and the evidence given on that subject by the several witnesses before that committee, that led, in October, 1861, to the issuing of those land-orders by Lord Canning. When,

however, we consider natives and Europeans, I think it is exceedingly desirable that we should by no means blink this question. It is not solely amongst philanthropists at home, but very prominently amongst civilians of India, and particularly the new class of civilians, we find a particular patronage of the natives of India. Now with regard to the natives, in one's experience in the East, European character is apt to be influenced by the submission which the natives show to Englishmen, and every one is apt to acquire the function of patron, and look upon the natives of the country as his clients. That is a motive greatly acted upon by the administrators of India, and I think it leads to false results in relation to ourselves; for whatever may be our desire to advance the natives of India, we must not hide from ourselves one great fact—viz., that we are in that country by the right of conquest. It is as conquerors that we are influencing the destinies of the people of that country; as conquerors we have assumed to ourselves their moral direction; and I say, as conquerors, it is our right to take our fair share of the labours and the produce of the country; and I do say these questions are not questions of equality of rights, but really and truly it is a question of the prerogatives of Europeans in India; and, if we start from that basis, and if we carry it out legitimately, we shall arrive at results which are for the benefit of the people of India. I cannot but be surprised when I hear, from the pen of a man of the standing and ability of Mr. Horne, such doctrines as are contained in that memorandum, for, after all, what do they come to—a depreciation of the European in comparison with the native of India. And there, again, is another point in reference to this patronage of the natives, which I conceive is doing a great deal of harm to the government of India. Not one of us will deny the natural ability of the native of India, but no one who has had political experience of the world, looking to that greater record of India than can be obtained by residents—looking at the records of history over centuries—no one can fail to see, with regard to India, as also to many other countries in the east and some in the west, that the natives of India are politically in a far inferior position to ourselves, and, if they are ever to be elevated, it must be by the free action of European intelligence and European experience upon them. But notwithstanding these, I may say, disparaging statements which have come before us, I cannot but regard the manner in which this question has been introduced in this room by Mr. Campbell as a very important stage in the progress of this question. For a long period we have had to encounter an absolute degree of apathy, not only on the part of the English public, but on the part of those engaged in the government of India, and I think we have now got to that period when that apathy has ceased, and when attention has been awakened to the demands of justice, and to the necessity of taking some early action. We have got over that stage of passive resistance. We have got over the stage of objection and prejudice; and though the period may not be immediate, the period will not be far distant when all those claims that have hitherto been regarded as wild and visionary will be realised by the administrators of India themselves. I look upon the way in which this question has been treated at the last meeting as pointing to our having reached a very important stage. When I heard the statesman-like speech of Mr. George Campbell, and the practical observations of Lord William Hay, bringing to bear his experience as an administrator in India, I could not but feel some congratulation that we had at length got so far. Mr. Campbell has justly stated that the question of waste lands is really and closely connected with that of the settlement of Europeans in India; but I rather regretted that he endeavoured to close this discussion on the last evening, because he said we had already devoted two evenings to the question of European settlement in India, and one to this subject, and he thought it was exhausted. I believe the statements of those gentlemen who are to follow me will show that this subject is far from being exhausted, and that practical evidence can be brought to bear confirming our case, and carrying it to a still greater length than Mr. Campbell is now willing to concede. I shall endeavour to follow out some of the objections of Mr. Campbell; but I particularly compliment him on the advocacy he sustained on the claims of Central India for occupation by Europeans. I think the manner in which he has brought forward the case of Central India is one of the strongest arguments on behalf of those who demand a better administration on this subject; and it is in fact, to a great extent, a complete answer to many of the objections raised by Mr. Campbell himself. Still I will endeavour to refer to those objections, because they have evidently influenced the mind of Mr. Horne and some other gentlemen. I particularly notice that the endeavour is now, as it was years ago, to convey the idea that the extent of waste land in India is inconsiderable. Every attempt is made to bring it into the smallest possible compass. I recollect being present in the House of Commons when the representative of the then Board of Control got up, and, supported by other members of experience, stated that there was not a spare piece of ground of 100 feet square in the hills. That was a statement made in the presence of the House of Commons; nevertheless we obtained the committee, and I think we proved something else, but still the object, down to this day, is to narrow the area of waste lands. One does not wish to impute motives, but it may be for the purpose of showing that what we are asking for is so small that it is not worth consideration, and that the government of India have done everything requisite on the subject. I am disposed to maintain that the waste lands of India, if properly considered in the true light, will be found to be much more considerable than we have yet had details, and evidence, and statistics to prove. You are obliged to use a term to define a subject of this kind. In this case we use the term "waste lands" simply to express those lands which are not at the present moment absolutely occupied by cultivation or by any exercise of industry; but it does not necessarily follow that, on the other hand, we should restrict it simply, as Mr. Horne has done, to lands susceptible of cultivation, under the various limitations put forward by Mr. Campbell and by Mr. Horne; and I believe, if the subject had been better considered, as it begins to be considered this year by means of the discussions that have taken place here, a great deal more attention would have been paid to it here, and by the legislature and authorities at home. Mr. Campbell thinks the neglect of India, as a field of enterprise, has been a great deal owing to the competition of the superior resources of our colonies, and particularly, as he said, of El Dorados. Now, I am by no means disposed to concur in that view, because I believe there are many parts of India which present far greater claims to the emigrant, far greater allurements than the majority of our colonies; and I conceive the great reason why India is neglected, is that India has never been brought before the public as many of our colonies have. The misfortune is that India is not known in England at all, and there never has been any organisation for the purpose of making its claims known in this respect. The organisations formed in periods long gone by, or even in recent times, have been for other objects. They have been for the purpose of advocating the claims of some particular class of planters; for altering the charter of the East India Company; for effecting the reform of the government; or, in later times, for advocating the claims of natives, but never for the real purpose of bringing the subject of India before the public at all. Mr. Campbell laid it down that land in India which had been abandoned cannot be considered as a proper field for the enterprise of Europeans, because in a long-settled country like India, land would

never be abandoned if it were susceptible of cultivation, and that the natives know best whether it is available or not; and it is because the land is not capable of cultivation, or because the district is affected by fever. I think we ought to take that view of the case with some degree of reserve, because how many districts are there ravaged by fever and abandoned, which are known in former periods to have been occupied by cultivation. Mr. Campbell alluded to some of these cases, and there is the instance of the Sunderbunds. Evidence is not wanting to show that they were occupied by cities and villages, and were in a prosperous condition at a period not so remote. Similar instances are to be found in the Maremme, Rome, and Tuscany, and we are not without hope that those districts will be restored. So in India, as cultivation increases malaria decreases, under proper arrangements. Then, with regard to ground that has been abandoned at some period of war and devastation, and not occupied at this period, it by no means follows that it is not susceptible of cultivation, although, from long neglect, it may require a heavy expenditure to prepare it for cultivation. Take the case of land for cotton and many other crops, it must be broken up, and the cost of clearing is very heavy indeed, often far beyond local resources, and this, to a certain extent, answers the inquiry made at the last meeting as to the bearing of the subject of waste land on the cultivation of cotton in India. I believe there is a good deal of land that could be brought under cotton cultivation, if European capital could be fairly applied. We have proof of this in the ground taken up in the Terai. Our chairman has shown by experiment that some of that land is particularly available for cotton cultivation, and there is land in other parts of India which, if cleared, would be useful for that purpose. Then Mr. Campbell says a good deal of land not under cultivation has proprietary rights over it; but that by no means affects the question, because Europeans may become purchasers of private property, as we have had example given by Dr. Campbell with regard to Darjeeling; and the value of property in India would be materially increased if there were freer land tenure in the country, so as to stimulate the employment of European capital. How is it that in Turkey the government have given a more liberal law as to tenure of land by Europeans, and endeavoured to increase the number of European holders? It is because they know the value of every estate held by natives will be increased in consequence. Now I believe a great deal of prejudice we have on the subject has regard to the question of rent in India. It is assumed that the government is the universal landlord of the country; and on every occasion when we have a plan brought forward, even for giving increased facilities to Europeans or natives, it has always been upon the quit-rent system—to let persons have land for a few years at a nominal rent, and then subjected to what they call rent. Nothwithstanding the time devoted to this subject in India by the many able men who have written upon it, and the complication of the subject, from the difference of circumstances in various parts of India, I think if we look at the subject more deeply, if we bring to bear the experience we have in other countries, we shall see that what is called rent in India is not properly rent at all, but partly rent and partly land-tax; and, if we look to some parts of Asia, we find a distinct difference between the part payable to the government and the part payable to the landlord. This is a subject worthy the consideration of every man connected with India, to get up evidence on that subject, and arrive at a clear distinction between those two portions; because, when once we get clear on that point, we then come to the question of freehold tenure. We were told the other evening that the natives of India are opposed to holding freeholds, and prefer land at a quit-rent, or without tax for a certain period, and then to come under tax. Now, for my own part, I place very little confidence in a statement made by natives to any government official, when he asks a direct question. I have been asked myself, when I have put questions, what was the object of the question, so that they may know what answer to give; but, if we look at the facts in connection with estates generally, we find they do prefer freehold tenure; and the moment you give an ownership in property you give a value to it, and a greater impulse to energy and industry in the country. I should like to say something with regard to land-jobbing. It has been held up as a great evil, but I am afraid it is like some of the minor evils which people attempt to extirpate, at the expense of suppressing the good that is to be derived; but if land be converted into a property and a commodity, it must be subjected not only to the benefits of commerce, but also to its evils and imperfections; and we have yet to learn, with regard to India, whether the jobbing has done an amount of evil in proportion to the benefit which the freer supply of land has had, in promoting the enterprise and industry of the country; and I trust we shall hear from practical men present some detailed information on that part of the subject. Then, again, Mr. Campbell has told us that land in native states is to be looked upon as wholly beyond our reach and control. I think, if we take proper measures in India, we shall be able to make a good deal of that land available. It is hinted that it is possible to obtain such interposition as may make some of those states more open to Europeans; and if Cashmere is made more open to Europeans, I am sure it would be a vast benefit to that district, and certainly of great advantage to the empire. I shall only refer briefly to the question of the railway to Darjeeling, because my friend Mr. Login, who is present this evening, knows first-hand what I know only second-hand with regard to it; but, before referring to that, I do say—for I felt it very strongly—that the government of India, in the last quarter of a century, during which I have taken part in these discussions, has shown itself commercially backward in reference to the whole matter of transport and communications in India. It appears to me as if the government of India had been asleep as to what is taking place in other parts of the world, but I believe they are now on the point of awaking to it. At the time when railway advantages were first needed in India, there was sufficient experience furnished in the United States of what railways could do in the development of the resources of a country. Now we have Russia, working upon that experience, approaching the gates of India, and I believe giving a lesson to the government. This question of transport is one of the great points in connection with the welfare and advancement of India; and it is to be regretted, on this subject, that the state and circumstances under which Europeans are placed in India do not admit of the study of this question on so wide a scale as it can be carried out at home; though it is one of the benefits which we get from improved communications from India that men are brought, from time to time, to get greater intimacy with public opinion in Europe, and to gain greater experience on this subject. I can say personally, during my own residence in the East, under more favourable circumstances than occur to most residents in India, I found my stock of political knowledge materially diminished when I compared it with that of my friends at home; and this is the case with every man in the East. If, however, European and American experience were brought to bear on the subject of transport and waste lands in India, we should have a greater state of development than we have now in those respects. With regard to the Darjeeling line, I can confirm what Dr. Campbell said at the last meeting, because I personally brought before the notice of the government here the line that had been surveyed by Mr. Thomas Login, as was communicated to us by his brother, Sir John Login. That line presents remarkable geographical features, which were well described by Dr. Campbell on

the last occasion, and if carried out from Rajmahal, as it might have been, we should have had direct communication from Calcutta to Darjeeling, and we should have been enjoying at this period the benefits of it. I say this much because, though I then took up the question as an advocate, I have now no personal interest in it whatever. In fact, I am hopeless as to the right line being carried; and I am afraid the history of the Darjeeling railway is one not very favourable to the government of India, either at home or out there. I say, with regard to the objections raised as to the utilisation of waste lands, as well as tea cultivation and other European operations in India, we must not be discouraged by failure. We must go on, because the history of India is notably one of progress, and if we continue on the same basis such must be the ultimate result. In order to carry out these measures to a practical result, it is indispensably necessary that there should be an adequate organisation in India and at home, by the establishment of land and emigration commissioners. It is only under such circumstances that such a practical plan as that of Mr. George Campbell for establishing European regions of occupation, and other like plans, could be effectually realised.

Mr. T. Login, C.E., said:—As the Darjeeling and Caragola road has been so often referred to in connection with my name, it is necessary for me to say a few words, though it is not a subject strictly belonging to a discussion on waste lands. Had the selection of the line remained with me, I would have adopted the one *viâ* Maldah, as marked on the map, which is some fifteen miles shorter, from Calcutta to Darjeeling, than the Caragola line, and not longer, as Mr. Campbell supposed. By this line, all the drainage from the Teesta to the Great Cossie is crossed at Maldah, where the Mahanuddee has a deep, well-defined channel; so the cost would be proportionately less, by avoiding cross drainage. I simply marked out the present line, and made the embankment, not the bridges; and I am happy to find that the views I entertained more than ten years ago are at last beginning to be approved of. Of the importance of a branch railway from Calcutta to Darjeeling I leave Dr. Campbell to speak at more length, so I must pass on to the subject under discussion. The reclamation of waste lands is an all-important question in developing the resources of India, for not only will it add to the prosperity of the natives of Hindostan, but of England and of the whole civilized world in some degree. That there are vast tracts of waste land in India no one can dispute, for even in Bengal, which is so thickly populated, there are hundreds and thousands of square miles, which only require European science, energy, and capital (I will not say labour, for that is already abundant and cheap, as I have already shown), to make the plains of India not only to supply food for her dense population, but to furnish Europe with many of the luxuries and necessaries of life. Labour being so cheap, it appears to me that it is out of the question to think of India as a field for colonists, in an American or Australian sense; and our "Raj" in India is neither simply to find lucrative appointments for our friends and relatives, nor settlements for the working classes. Our great end in India is to teach, enlighten, and instruct, by precept and example, an intelligent and industrious class of people, how to improve themselves morally and intellectually, so that in time they shall be able to govern themselves; and it is our duty, by the aid of science, to teach them how to make the rich plains of India to yield their increase; thus England will receive the raw produce, and, in return, she will send back her manufactures; and the question is, how is this best to be accomplished? On a former occasion I spoke of our crowded barracks in the plains, and the bad influence such sights must have on the minds of the native community. It is my belief, that if we were to level them all to the ground (only reserving small forts), and to turn our cantonments into model farms, we should do much towards reclaiming waste lands and improving the country, while at the same time our position in India would be more secure, by having our troops in a European climate among the hills, during the heat of summer. Now the question is, how shall waste lands be reclaimed (I speak as an engineer, and not as an agriculturist)? By regulating the moisture; and this is to be accomplished by embanking off floods and draining the land in Bengal, where water is often in excess, and by constructing irrigation-works where it is deficient, as in the north-west and the Punjaub (I speak only of the parts of India I know). The object of canals for irrigation in the north-western provinces of the Punjaub is quite different, for along the valley of the Ganges it is only during abnormal years that there is an outcry for water; so canals in the Doab are to regulate the irregularities of the seasons, and to save a large population from the ravages of famine, while in the Punjaub they are to reclaim waste lands, concerning which I shall make a few remarks. I hold in my hand a report, submitted four years ago, on the irrigation of the Rechna Doab, which I have permission to make public. The tract of country to be reclaimed has an area of no less than 5,000 square miles, 80 per cent. of which is said to be as rich a soil as is to be found in the Punjaub, and perhaps no other country is better adapted for irrigation, on account of the levels, or promises to yield better returns. I cannot go into details now, for it would occupy too much time, but I shall briefly state that, by my estimates, this tract of country will yield a revenue of £640,000 yearly—when at present the returns are only nominal—and that it will be able to support a population of some three millions. The river from which the water is to be drawn, the Chanab, has a minimum discharge of 6,000 cubic feet a second, or nearly four times the discharge of the Thames at Richmond, and the cost of the canal is estimated at £2,000,000. Now, I would venture to suggest that this tract of country might be made over, as an experiment, to a private company, who would send out trained farmers to start model farms, and thus teach the native agriculturists how to make the land to yield her increase; and it is my firm conviction that, if such a scheme were carried out with heart and good-will on the part of government and the shareholders, both parties would in time reap great benefits. I shall only refer to one, and that is the outlet this would afford to the overpopulated districts near the foot of the hills. Taking the district of Sealkote, for example, which has a population of 586 to the square mile, five-sixths of whom are Mahommedans, I leave it to the politician to consider what would be the advantage of having, in case of a war on the frontier, a plentiful supply of provisions so close in the rear, with a contented population, who knew that their lives depended on the canal; and let him at the same time bear in mind that an army invading India must pass through a country inhabited by a people of the same religion as the majority of the Punjabees. When we look at the matter in this light, there can be but one opinion as to the necessity of reclaiming the waste lands of the Punjaub. In my opinion, all the objections to private enterprise reclaiming waste lands by irrigation works disappear, as it is very different from irrigating a country already thickly populated, as in Orissa, Bengal, and the north-west, which should be done by government officials because there are so many vested interests to consider. With waste lands, on the other hand, the company become the zemindars, with all their rights and privileges; and as it would be for the interest of the company to improve their property, the cultivators are as sure of good treatment under a well-managed company as under any zemindars, while a private body could introduce improvements much more readily, by importing the proper class of men from England and Scotland to improve the agriculture on their estates. I have one more observation to make, that has only just come to my knowledge, and it is, that I heard

the other day that 50,000 of the Russian army are engaged on an undertaking which will go further to firmly establish the Russian rule in Central Asia, than all the fortifications built since the time of Peter the Great. In addition to making a tramway from the Black Sea to the Caspian, they are engaged, I am told, in constructing an irrigation canal that will irrigate four millions of acres, or half as much again as this waste land of the Rechna Doab, which I wish to see reclaimed; but a glance at the map will show that there are many more thousands of miles which only want water to make them as productive as any country in the world. When all this waste land is reclaimed, England will have accomplished the task which an All-wise Providence has given her to do, and then we can leave India to be governed by an enlightened, contented, and friendly race, whom it is hoped our posterity shall be able to call brother Christians.

Mr. Vesey Fitzgerald said—Having devoted a great deal of attention to colonisation in India and various Indian enterprises, and having been interested in them to a certain extent, I am desirous to make a few observations this evening. The first remark I would make is, that the sale of land by the government of India has been the turning point in the recent progress of legislation and administration, which has supervened upon the ancient traditional policy pursued since the conquest of India by the East India Company. There is difference of opinion as to the merits of that policy, and it would be of no advantage to enter into that subject now, but what I desire to call attention to is, that the sale of land in India has been the turning point on which that traditional policy was abandoned. It is needless to trace the exact steps and precise progress which brought about that result. There was one fact mentioned by Mr. Campbell at the last meeting which impressed me very much; it was that the wealth capable of being produced by coffee cultivation shows that, in rendering available the resources of improvable land between the low-lying districts and those elevations which are too high for the application of industry and science, the cultivation of those lands with coffee opened up a source of wealth in India to an indefinite and immense extent; and when that is the case it is no use going into figures and calculations. Of course that land is suitable for other things than coffee, but if it is capable of yielding large produce in coffee, that is a most satisfactory circumstance, even if it is not carried to further development than in that most important article. There is another circumstance glanced at, but not to the extent I desire, that is, that the improvement of the means of communication in India is in itself an increase of national wealth. The cultivation of land in wheat is not more an increase of national wealth than the increase of the means of communication; and I can name no country where the results of increased means of communication have been so striking as in India. Large districts are now available for the growth of cotton, which were totally unavailable previous to the opening of railway communication to the comparatively small extent it has yet been done. The land was worthless for cotton till the means existed of bringing the produce to the sea shore. The connection of railways and canals with waste lands is this—that a great deal of land might be rendered very valuable, provided good means of communication were opened, which are not valuable and not marketable unless such means are opened. I would mention one spot to which the remarks I have made on this subject are peculiarly applicable—that is the Neilgherry hills. Land there is useless for the cultivation of cotton, unless a little railway is made to bring it in communication with Madras, and that line is of vital importance to the development of the hill settlement of the Neilgherries. The principle is of universal application, and to an indefinite extent. There is one thing I have wished to get information about, and on that subject I have no doubt gentlemen present can give some facts, but I have never been able to ascertain to what extent facilities exist for increasing the production of indigo and sugar, in the low-lying districts, as well as cotton. Those are valuable products, and largely cultivated, but I have never been able to ascertain the amount of land available for that purpose.

The Chairman—It is not waste land anywhere. It is low-lying, and not waste in cultivable parts of the country. Indigo is grown in the most populous parts of India. As Mr. Fitzgerald has remarked, the turning point has been the sale of land by the government.

Mr. Edwin Chadwick—In consequence of the discussions which have been raised since our last conference, I beg leave to offer some further observations on the chief administrative principle which I then briefly propounded. It is to be borne in mind that the Indian government is distinct from our own and from other governments in being the general landlord, and I think it is well for the Indian masses that it should be so, and that it should be powerfully controlled by a distant, a competent, and impartial authority. I agree with Mr. Mill and others that a tax on land is of the wisest of taxes, and I believe that it is better for the people to have large capitalists as powerful and responsible landlords, than to have only small capitalists, small landlords, with small means of improvement. The same rule applies in the Manchester factories with regard to the economy of production on a large scale. The State then being in India, the questions which may be submitted for the public to consider is whether it shall be an unimproving and as it were an absentee landlord—caring for nothing but the receipt of revenue for placemen—a revenue mostly derived as rent, through barbarous and merciless middlemen, from a wretched population; or shall it be an improving landlord, whose chief function is to reclaim wastes, to clear away jungle, to drain marshes, to collect and distribute water into towns, to apply refuse to agricultural production, to improve the sanitary condition and working ability of the population, to perfect the means of intercommunication, to give security and convenience to the cultivators of the soil, and render money's worth of service to them in return for the rent they pay. It is a declared duty to extend to the East the civilisation of the West, and of this civilisation is that of good and improving landlords. Of these, examples have been furnished by the house of Bedford of landlords who have reclaimed wastes, and improved habitations, and drained marshes, and charged only moderate remunerative rents for what they did. The late Duke of Portland and the late Duke of Northumberland were, within my knowledge, landlords of this sort, who may be said to have deserved the greater part of their rents by doing much to earn them; and I might cite distinguished living examples of the like—of men who have doubled the yield of land, and have augmented the receipts from wages beyond those obtained by the small farmers who formerly "whistled after their plough. The Duke of Portland presented an example of large landlord power in the improvement of profitable arboriculture, especially in permanent plantations on a large scale, for which small landlords would be incompetent. When sub-soil land-drainage was first started in England by the late Mr. Smith, of Deanston (whom we employed as one of our inspectors at the General Board of Health), the Duke of Portland advanced money to his farmers, which he borrowed at four per cent., and lent it to them at five, to enable them to drain their farms. But it was found that their inexperience and ignorance in the new work exposed them to be misled by quackish pretenders, and that they frequently expended fruitlessly the money advanced to them, and it was found to be a relief to the tenantry, and better on the whole, that the improving landlord, the Duke, who had better means of knowing than they had, and might, from the interest he took in the work, pretend to a better judgment, should undertake the responsibility of doing for them what was required, they paying him a

remunerative rent for the outlay, and this course was successful. Large landlord power, under the guidance of science and practical art, is beneficent in proportion to its extent. I have been in a position to have some experience of this. Subsoil drainage, besides being a measure of production, is a great measure of sanitation, and I early wrote papers to point out to Sir Robert Peel, when he was Prime Minister, the obstacles to the drainage of settled estates that could only be removed by legislation and by government intervention. Other concurrent representations were probably made, and he adopted the plan of raising money on loan on the government terms, and lending it at a low rate of interest to land-owners at the cost of the service. The administration of these loans was confided to the Tithe Commutation and Commons Enclosure Commissioners. On the whole, the measure has worked well. It appeared to me, however, that authentic practical instructions were wanting, to excite and guide occupiers as well as owners; and, in the interests of sanitation, I bestowed great pains in obtaining, from the best sources, authentic information of what had been done in such works, with instructions to show what might be done, the probable expenditure, and the profit that might be expected. This was comprised in official minutes on the drainage of suburban lands, and comprised more information than any private occupier or proprietor could obtain, if he could obtain it all without aid and considerable labour. I compiled official minutes of information also on the drainage of houses and towns, and on the application of the sewage of towns to agricultural production. This work was impeded, and was not followed up as I consider it might and ought to have been; nevertheless, it occasioned much to be done by private or local enterprise that would not otherwise have been attempted. I know that the "Land Drainage Minutes" served as a manual for the direction of an expenditure at the rate of £20,000 per annum, for the drainage of the lands of the late Duke of Northumberland, and that two towns, of which he was the chief owner, were drained on the principles set forth in the other manual; and I am aware that the minutes of official information served to unite and guide other large works. The French government gives the assistance of its officers to projects for the reclamation of wastes and the improvement of lands, by owners or by private individuals. Now the Indian government, being more decidedly a great landlord, is, I submit, more decidedly bound to be an improving landlord, and to take a stronger initiative in land and town improvements than others. It has made one advance in great trunk line irrigation works; and, upon the examples given, it may be submitted that it ought to extend its services to the reclamation of waste lands, and generally to the improvement of cultivation by accepting and aiding all private initiation of promise, getting out surveys and plans of works if needed for them, borrowing and advancing money on loan, repayable by annual instalments of principal and interest. In India, which is poor, and where private capital is scarce, and private enterprise requires twenty per cent. interest, the Indian government, borrowing money, may well supply it, and, with a profit to itself, lend it at a cheap rate on landed security. Where private initiation fails, the the government may well encourage its officers to follow the example of Colonel Dixon in the Mairwarra, not, however, depending on the like heroic virtue, but remembering the maxim of Burke, that "ordinary service" must be secured by the motives to ordinary integrity. I do not hesitate to say that that state which lays its foundation in the heroic virtues will be sure to have its superstructure in the basest profligacy and corruption. It appears to me that, in this respect, we might well borrow a leaf from the Dutch, in their most successful pecuniary result, in their government of Java, where they give their officers a pecuniary interest in the culture and productions of the island, and pay them according to the net revenue derived from it. In Java, I am told that, despite the detraction of some of our Indian administrators, it works admirably, and has proved a means by which that has been made a highly paying colony. Under the action of this principle, "circumlocutory" and the "how-not-to-do-it" governmental action would vanish. It is, indeed, the great problem of administration everywhere to unite interest, individual interest, with duty, but in the most important points it is now separated, and really antagonistic. The legislature has accepted the principle —though from ignorance it has misapplied it, as reluctant and careless officers are apt to do—of paying schoolmasters for results, and why should you not pay administrators for results? You pay in war for results by prize money, and by life-pensions as well as peerages, and why should there not be payment for results in civil administration, and that, too, on the principle of a competitive examination of plans? Why should you not give to the officer who strikes out a plan of a good, paying reclamation and settlement of a waste territory the execution of the work, and allowing him to be seconded, as it is termed, whilst he is doing it—such work as Colonel Dixon's,—and giving a per-centage on the improved rental, or on the net revenue derived from it? Peace-work should not be excluded from honours; and where they are given, let it be specified what for. If stars are bestowed, will they not shine more brightly in the eyes of the natives of India if they be bestowed for achievements *for* them, like Colonel Dixon's, than for military achievements *against* them? It has been said that that instance occurred a long time ago, but I can give a more recent example. One afternoon, by an extraordinary cyclone, the sea rose and submerged the sea-coast city of Masulipatam, and out of 100,000 inhabitants, I believe, within two hours drowned some 30,000. The condition of the city as a swamp threatened the survivors with destruction from pestilence. The people and their native leaders were sitting howling in helpless despair over the ruins of the place, when the President of the Madras Sanitary Commission, Mr. Robert Ellis, without waiting for superior authority, went to the spot, took order, burned the dead, cleansed the city as it was probably never cleansed in its civic life before, brought in fresh water, and put it in a sanitary condition, in which it withstood an epidemic of cholera that ravaged other less-protected places, and would probably have destroyed as great a number of people as were destroyed by the cyclone. A civil achievement like this was calculated to have a higher moral effect than a military achievement of a great battle. The measures of the same officer stayed the repetition of devastating epidemics amongst the population at the great fair of Conjeveram. Yet no distinction has been bestowed for these exploits. It is proper to say that such neglect is not peculiar to the Indian government. Whilst those whose incompetency or neglect chiefly caused the loss of our first army in the Crimea were nearly all decorated, the civil sanitary officers, whose science and art it was declared by Lord Dalhousie, the then War Minister, had saved the second army, and put it in a state of health better than that of the home army, were passed over, as similar home services were passed over, without any notice whatsoever. Whilst making the observations I have felt called upon to do on sanitary administration in India, I do not overlook the fact that there are now, I believe, in its home service, and the local service in India, men of the most brilliant ability, as able and zealous administrators as any in the world; and I believe that the present government deserves confidence. The defaults we should seek to remedy are in the system.

Mr. E. L. Brandreth (Commissioner of Rawal Pindee) being called upon by the Chairman, said—I am here rather to receive than to endeavour to impart information. The subject is the question of waste lands, and the special interest in it felt by this Society evidently is with regard to how far these waste lands can be turned to account for colonisation by Europeans.

I was not present during the whole of the discussion at the former meeting, but I heard Lord Wm. Hay's speech, which seemed to meet with the approval of those present. His lordship dwelt specially on the backwardness of the government in affording information in regard to the waste lands available for Europeans. But there is one thing worse than no information, that is, bad information; and I doubt whether the government of India, or any other government, is in the position to take the initiative in putting forth manuals of information. Coming from that source, it is likely to mislead. There was a pressure put upon the government, to get them to take the initiative in this matter. It was supposed that there was no end of waste land available, which, through obstinacy or other causes, had not been made over; and Lord Canning's government, acting in accordance with instructions received from England, endeavoured to make inquiries on the subject. Instructions were issued throughout the whole of the Bengal presidency. Anyone acquainted with India knows the great difficulty of the government taking action in a matter of this kind. The government had to address the local commissioners, the commissioners had to address the revenue board, the revenue board had to address the district collectors, the district collectors had to address the sub-collectors, and the sub-collectors had to address the deputy-collectors, they in their turn had to address the sub-deputies, who, finally, had to address the village accountants. It came upon the latter functionaries to give a return of the waste lands of India. Then came the difficulty of the definition of "waste lands." One gentleman has said land capable of improvement by cultivation was waste land. What were these unfortunate village accountants to do? If they wanted a solution of that question they must have gone back through all these channels to obtain it. What was the principle they went upon? The greater part of the land of India is subject to what is called a settlement, and the land is included in village boundaries. That land is to a great extent cultivated, but it includes uncultivated land used for pasturage. All lands without those boundaries were returned as waste lands. That land was not cultivated it is true, but it was leased by the government for pasturage purposes, and a considerable revenue was derived therefrom, but no return was made on the subject of revenue; and upon the returns of so-called waste lands the government issued its rules, and ordered those lands to be sold at the upset price of one shilling per acre, without reference to the revenue that was derived from them. A good deal of land was sold without the government knowing about the revenue. I brought this fact before the government myself, and it was impossible to suppose the government was precisely informed. I mention this as an example of the difficulties which the government have in acting upon matters of this kind; but when you come to the question of the government giving assistance to individual settlers, I fully recognise their duty to give every posssible assistance, but taking the initiative is another matter. It is difficult to conceive why, if a great deal is to be done in the way of colonisation in India, it has not been done before, considering the immense number of Europeans of all sorts throughout the country who could give information. Take the case which has recently occurred in Sutherlandshire. The government gave no information; there were no plans of the country. The single individual who had been in Australia, and came from Sutherlandshire, remembered that the rocks round his native village were similar to those he met with in Australia; he returned home, set to work, and began digging out gold, doing his best to prevent other people knowing anything about it. It is not to be supposed, if there was much to be made in the way of colonisation, sufficient information to induce people to go out would not have been forthcoming. My own idea is, there is not much to be done in the way of colonisation in India, or we should have heard much more on the subject than we have done. Mr. Hyde Clarke has pointed to the Himalayas, and seems to think there is a great quantity of waste land there which required government aid to utilise. Judging by the map, there does appear to be a large tract of country in that district, but those who have travelled in those mountains are aware that in reality there is very little available waste land. There are valleys running between the hills with just sufficient space for a road or stream. Lord Canning, when he came from the hills after a three weeks' residence, stated that during the whole time he felt exactly as if he were living on a shelf; above him was a wall, and below him was an abyss; and I thought that was rather a good description of the kind of land to be found in the Himalayas. There is one account to which the Himalayas have been turned, not noticed by the previous speakers, that is the enormous extent of potato cultivation that has taken place, which has had the effect of completely changing the appearance of the country, and a very valuable article of food has been given to the people. If European colonists can live upon potatoes, there is field enough for them in the Himalayas.—[Mr. Chadwick—Would not Irish colonists do well there?]—What struck me most was to see an immense number of natives from the territory of Lucknow, who came up 500 miles to settle there. This convinced me how very enterprising the people were, and how ready they were in thickly-populated districts to seek every outlet that offered itself. That I think goes to show that there is not much available cultivable land in India, or the people in the most thickly-populated parts would have found it out. It is, however, quite another matter whether land cannot be made cultivable by engineering skill, by canals, and by reclamation, but these are beyond the power of the natives. I have no doubt there is a good deal to be done in that way, but even canals are not without their drawbacks. It is a question whether the old Jumna Canal does not do more harm than good. In the first place, the whole population of the district suffer from a spleen disease which is frightful to see, and the surface of the canal is covered with a highly pernicious saline matter. [Mr. Chadwick—That is the effect of bad drainage.] There are great difficulties in the way of canals. No doubt engineers are doing their best to overcome those difficulties, but it does not follow that these canals will do the very great good that is anticipated from them. Gentlemen best acquainted with India, wishing to be colonists, have gone to other places. Perhaps the most energetic of these was Mr. John Wilson, and he went to New Zealand, and Mr. Brunton, the most energetic of engineers, has followed in his steps. I am, therefore, afraid the prospects of colonisation, in a direct way, are not very favourable. With regard to the irrigation works spoken of by Mr. Login, we cannot suppose that a private company will come forward to carry them out, if the government does not assist them. The difficulty is to find the money. When that is found, I do not think the government will be backward in rendering all the facilities in their power for the encouragement of the undertaking.

Mr. Maxwell Turnbull—I will say a few words on the subject of waste land, as I happen to be personally acquainted with a small part of the case in Lower Bengal; and it seems to me, with regard to a large portion of jungle land, it is quite hopeless to ever think of bringing it into cultivation. It is free from inundations, and has not been cultivated for many centuries. I went into the jungle for many miles on an elephant, and I came to the conclusion that no amount of money that could be procured would bring that land into cultivation. Mr. Campbell, as it seems to me, hinted that Europeans were not so welcome as they ought to be in India, but I can give an illustration of the value of Europeans in that country. A near relative of mine took out to India £10,000 private fortune, and I will tell you exactly what took place. The Rances of Puttiah lived in the neigh-

bourhood; and the zemindars with whom we treated for the purchase of an estate, for which they paid the government 20,000 rupees per annum, demanded the sum of 40,000 rupees. They would not have given up the estate but for the fact that they were unable to collect the rents; and, if the ranees had not paid the rent, the government would have sold the estate in a short time. On our going to take possession of the property, the first thing we encountered was the inhabitants turning out to fight us, but, fortunately for us, there was in that district one of the most able servants the Crown ever possessed, viz., Sir George Yule, and when the people were told that Yule Sahib was coming they became quite quiet, and the consequence was they behaved exceedingly well for eight or nine months, by which time we had laid out a large amount of capital and made considerable progress. We said we would not take 10,000 rupees rent from them, if they would give us a small piece of land for indigo. They entered into the proposition in the most ready way; they thought they had made a good bargain for themselves, and we hoped things would go on smoothly; but the month of May came; the crop was on the ground; the Brahmapootra rose a foot an hour for twelve hours, and we lost everything. That is a proof of the danger of merchants of Calcutta advancing capital on the soil of India. The only title-deed is absolute possession. You cannot have it otherwise in a country where the whole source of justice is diluted and polluted by native agency—not by European. If you send a warrant to be executed, nothing is more common than for one person to be taken into custody instead of another.

The Chairman said—I was prevented by the adjournment of the discussion, on Friday last, from answering some questions put to me about the Bhootan Dooars by Mr. George Campbell, and from making a few remarks on what was said by Mr. Campbell and other speakers on the subject of waste lands, the railway to Darjeeling, cotton cultivation, &c. I shall do so now, and make some remarks afterwards on this evening's discussion. Lord William Hay said that, with a view to facilitate the settlement of Europeans with small capital in the hills, he thought it would be advisable to have separate rules for the assignment of land to them and to natives. My own opinion is against any difference being made between the two races. It was sedulously avoided at Darjeeling, and the result is very satisfactory. A way by which the plan could be met that occurs to me is this —small grants of land, at low fixed rates, might be reserved for persons who had served government for ten or fifteen years. The practical working of this would throw the grants into the hands of English soldiers, as no natives of the plains ever think of settling in the hills. Lord W. Hay also regretted the impossibility of procuring information in England about the present extent of available waste land, and the existing rules at different stations. It is no doubt very grievous, and it is impossible to imagine any good reason for it. From every other country the Foreign Office has annual reports from the secretaries of legation, consuls, or other officers, on the products, exports, imports, finances, population, &c., of the places they are accredited to, which are published here, while for India, with all its varied provinces, teeming with the most valuable products, and with its two hundred millions of quiet and industrious people, there is little communicated to the public, beyond a lump statement in millions of its export and import trade, its revenue and expenditure. This might easily be put right, by requiring every commissioner in our own provinces, and every political resident and agent in native states, to furnish a separate annual report on the agricultural and manufactured products, the exports, imports, population, course of trade, means of transit, hindrances and facilities to commerce and to settlement, in their respective divisions and territories; these reports to be published in England as soon as possible by the Secretary of State for India in Council. This would put the general public, and the commercial classes connected with India, on a better footing to discuss Indian subjects of this kind than they ever have been as yet, and could not possibly be in any way injurious to the interests of government. Mr. Campbell said that, in disapproving of the upsetting of Lord Canning's resolution of October, 1861, by which auction sales of waste lands were in all cases substituted for grants at fixed rates, I had joined an unjust outcry against the Secretary of State. This is not at all the case, for, long before the publication of the resolution, I was opposed to the system of auctions, and deliberately recorded my opinion to that effect. In March, 1859, the Secretary of State, in a despatch to the Governor-General, called for a return of waste lands, and of opinions as to how they should be disposed of. I was directed to report for Darjeeling, and on the question of making grants in perpetuity by auction sale at an upset price of ten rupees, or £1 per acre, I proposed, "with a view to increase the facilities for small capitalists to settle at Darjeeling, that, instead of auction sales at an upset price of ten rupees or £1 per acre, there should be an uniform price of five rupees, or 10s. per acre, to all applicants, auction sales being dispensed with, except in disputes about priority of application." That opinion I still retain. The instance brought forward by Mr. Campbell of a gentleman having 100,000 acres of waste land, which was not very marketable just now, shows that the auction system was at all events not calculated to prevent the undue accumulation of land in the hands of speculators, a result deprecated by Mr. Campbell himself, but not to be prevented in India or elsewhere under free trade principles of government. Mr. Campbell brought forward a matter which was not alluded to by me, viz., the assignment of waste land at Darjeeling under Lord Canning's rules, and he characterised it as illegal. As I acted under these rules, I wish to explain the matter, as far as I know the particulars, for they occurred after I left India. A grantee, holding under Lord Canning's rules, who had been in possession for two years or more, and had expended large sums of money on the land, lost his grant, under the Secretary of State's orders altering Lord Canning's rules. After an unsuccessful appeal for restitution of his grant, he sued the government, and the case came before the Supreme Court of Calcutta, in full bench of four judges. The judges were equally divided on the verdict, two being in favour of the plaintiff and two for the government. The usage of the court, however, in such cases was that the equal division of the judges should pass as a decision for the defendant. This was the law that it is said was contravened in assigning waste lands under Lord Canning's resolution. About the waste land in the Bhootan Dooars my information is not precise, as I have not been in that country since it was annexed. In annexing the Dooars, the Governor-General's proclamation, May, 1864, said:—"And so much of the hill territory, including the Fort of Dalimkote, Passaka or Buxa, and Dewangiri, as may be necessary to command the passes, and to prevent hostile or predatory incursions of Bhootanese into the Darjeeling district, or into the plains below." Taking up the line of frontier thus indicated, I reckon that the new territory extends for about 200 miles from east to west, with a varying breadth which I am not able to estimate correctly. Captain Pemberton, in his report on the Dooars, estimated their length at 220 miles, with a varying breadth of from 10 to 18 and 20 miles, giving an area of about 4,400 miles, exclusive of the lower ranges of hills. Taking the hill portion annexed to be about half the breadth of the Terai portion, which I do roughly from the map of Bhootan, we shall have an area of 6000 square miles as the extent of our new acquisition in this direction. A large portion of this, in hills and Terai, I believe to be waste. I also believe that a great part of the hill position is at healthy elevations for Europeans, and it is

probably suited for tea-cultivation. The Terai land is rich, well-watered, and suited for cotton, indigenous and foreign. The climate, although at present unhealthy for Europeans, is suited for growing cotton, on account of the early coming of the rainy season, with frequent showers in spring. Clearance and cultivation will there, as elsewhere in the Terai, render it healthy. Within the last few days, I have seen a gentleman just arrived from Darjeeling, and he informs me that the trial made of growing tea in that Terai has been most successful. The Europeans who superintend it are in excellent health. They have their houses at an elevation on the hills which is safe from malaria; and they daily go down to their gardens in the Terai without detriment to their health. Such is the effect of clearance in a locality which I myself found, twenty years ago, to be almost deadly for Europeans. Another gentleman writes to me by the last mail, and says, "I wish you could see our Terai tea-gardens now; they would, I think, put the hills into the shade in your estimation." The great drawback to the occupation of waste lands in the Bhootan Dooars is the want of roads. There are none beyond Titalya to the western ones; the access to the eastern ones is by the Brahmapootra river, which is very tedious from its rapidity, and from its banks to the Ruxa and Dewangiri hills there are no roads, unless they have been made very recently. On the Darjeeling Railway I shall take up as little time as possible. It has been said, and very truly, that Darjeeling is but a small place, and that much larger interests elsewhere have properly been attended to before it. Still, it is a place that has been raised, through European enterprise, from an impenetrable forest to be a very productive settlement, and it is a very important position to government in more ways than one. Its climate is more healthy for Europeans than that of any other hill station, and for their children it is safer, and more healthy than our native land. Not having a map on a large scale to show the features of the country between the East Indian Railway and the foot of the hills, you must be content with my description of it. Mr. Login, who has surveyed a great part of it, will be able to correct me. The East Indian Railway reaches the south bank of the Ganges at Rajmahal, at about 200 miles from Calcutta, and Sahibgunge, opposite Caragola, about 30 miles further west. The country between Caragola, on the northern bank of the Ganges, and Purnea is a raised plateau, or spur-like elevation, running for 40 miles, over which a railway may be laid without difficulty and cheaply. To pursue the line to Darjeeling from Purnea *viâ* Titalya would involve the bridging of two rivers, many large streams, and embankment work over a good deal of low-lying land, which is flooded in the rainy season. This line, although it would run through a very productive country requiring means of transport excessively, and would best serve people going from all places above Sahibgunge to Darjeeling, would probably be too expensive to be remunerative. From Caragola to the foot of the hills is 154 miles. The country on the north bank of the Ganges, immediately opposite Rajmahal, is low, and as far as Malda, 24 miles, would require embankment work and bridging. At or not far from Malda, the Mahanuddi river has to be crossed, and a steam ferry might suffice. From the Mahanuddi to Dinajpoor, about 60 miles, the country is favourable, and free from rivers. From Dinajpoor to the foot of the hills, 100 miles, the country is very favourable—the most favourable in Bengal I believe—and there are only two rivers, of no great length and with high banks. From Rajmahal to Darjeeling is 180 miles. So much for the lines by which Darjeeling could be most cheaply connected with the East Indian Railway, and which were proposed for survey and guarantee to the Court of Directors of the East India Company in 1857, but without success. The districts named are rich and populous, and with the neighbouring ones which would come within the influence of the railway, may be estimated to yield a revenue of 4½ millions sterling, and to have a population over 4,000,000; added to this would be the traffic, passenger and goods, of Darjeeling itself, with a good deal from Eastern Nipal, Sikim, and Bhootan. The other line for connecting Darjeeling with Calcutta is a continuation of the Eastern Bengal Railway, to cross the Ganges at Kooshtea, 100 miles east from Calcutta, I believe, and run on the northern side of the Ganges to Dinajpoor, and thence to the foot of the hills by the same route as the other line. You will see that both the lines proposed will pass through Dinajpoor, but to reach that place from Kooshtea will require a new line to be made for 150 miles or more, while from Rajmahal to Dinajpoor the distance does not exceed 90 miles. Both lines will equally suit for extensions to Rungpore and onwards into Assam, and the country proposed to be traversed, from Kooshtea to Dinajpoor, is not by any means, I believe, so rich and populous as that lying between the East Indian Railway and the same place. It is for the government to decide which of these lines shall be adopted. The railway is a crying necessity, and it is little short of cruelty to withhold it from the Europeans of Bengal, if it can be shown, as I believe it may, that for the line from Rajmahal the money could be procured for it at five per cent. guarantee, with a reasonable prospect of good eventual returns. Mr. Campbell made a suggestion for increasing our hill possessions, viz., to take every opportunity of purchasing the holdings of petty chiefs. It is applicable to the western hills only, where we have very little land of our own, and is a very good one I think. Coming now to the observations that have come before us this evening, I will say with regard to Mr. Horne's idea, that no difference should be made between natives and Europeans in the sale of land; I think it is impossible to do it and to secure the full value of the land. The only use of land is to lay out money upon it, or to get money from another person; and titles to land ought to be made as transferable as a bill of exchange, whereas they are generally loaded with all kinds of difficulties. To give land to Europeans, to be held by them exclusively, would be to shut them out from the native market, and that would be to shut them out from the most wealthy. Native capitalists are always ready to lend money to Europeans to effect land purchases, and I think it would be unwise to make any difference between natives and Europeans in the holding of land. Mr. Hyde Clarke, alluding to the question of land in the hills, thought it might be made more of. He thinks the government might by some means get access to land in Cashmere and Nepaul. I do not know that that could be done, but, without being able to get into those states the whole quantity of land is not great. The quantity in Darjeeling does not exceed 400 square miles; but there is the new land in Bhootan amounting to about 6,000 square miles, and that is a valuable acquisition, and if there was a railway to Darjeeling, roads would very easily be made to meet that railway. Mr. Login gave an account of the route by which he proposes to run the railway to Darjeeling by Rajmahal. I believe that is the best route, the shortest, and the cheapest, and that it might be made, probably, for about £5,000 a mile for a single line of railway. Mr. Fitzgerald was quite right in saying that the first sale of land was the turning point for Europeans in India. It may be called the Magna Charta of Europeans, because before that land could only be got under great difficulties. As Mr. Turnbull says, they can only get land on the peopled parts through the zemindars or landowners. You agree with a planter for so many acres, to cultivate under certain arrangements, and the planter cultivates that, but he holds entirely from the native landowner. There is difficulty in getting a lease, and still more difficulty in getting it renewed, because there may be competition, or the tenant may have incurred the displeasure of his principal, and after ten or fifteen years he may be cast aside. It is very difficult to

get a satisfactory tenure in the populous plains of Bengal. Mr. Fitzgerald also says the settling of Europeans may be called colonisation. Yes; but you must bear in mind it is through native labour alone that Europeans must thrive. They cannot work in the plains, and they will not work in the hills, where labour is not difficult to get. Mr. Brandreth's remarks as to the precipitous nature of the hills, I think, are more applicable to the north-west than to Darjeeling and the new territory of Bhootan. I have marched from the hills of Mussooree to Simla, and round Simla the hills were more precipitious than at Darjeeling, where they are more round, and there is less rock. The first 1,000 feet of elevation is exceedingly steep, and very little fit for cultivation, but as Europeans can only live at 3,000 feet elevation, to be properly healthy, there is but little loss on account of the steepness of the first ascent. The statement of Mr. Brandreth with regard to potatoes is very remarkable. In Nepaul they spread over the hills like a weed, the plant being devoid of tubers from the want of cultivation; excellent potatoes are grown in Darjeeling, but they cannot be sent to market for want of a railway. Potatoes were sold for 12 annas per maund, whereas if the means of transport to the great markets of India in a couple of days existed, they would fetch from 6 to 7 rupees per maund, which would make a difference in profit between 1s. 6d. and 12s. or 14s. per maund.

Correspondence.

Mr. Robinson's Paper.—Sir,—Will you kindly allow me to correct an error occurring in Mr. Robinson's paper, reported in your last number. Ruth is there called a Jewish maiden, but the following verse (Ruth, chap. 1, verse 4) will prove that she was a Moabitess:—"And they took them wives of the women of Moab; the name of the one was Orpah, and the name of the other Ruth, and they dwelled there about ten years."—I am, &c., Annie Davidson.

MEETINGS FOR THE ENSUING WEEK.

Mon.....Asiatic, 3. Annual Meeting.
R. United Service Inst., 8½. Lieut. Herbert Jekyll, R.E., "The Destruction of Wrecks under Water by means of Explosive Compounds."
Tues ...Anthropological, 8.
Syro-Egyptian, 7½.
Royal Inst., 3. Prof. Grant, "Astronomy."
Wed ...Obstetrical, 8.
Thur ...Royal, 8½.
Antiquaries, 8½.
Linnæan, 8. 1. Sir John Lubbock, "Notes on the *Thysanura*, Pt. 4." 2. Messrs. Brady, Parker, and Rupert Jones, "Monograph of the genus *Polymorphina*."
Chemical, 8.
Royal Society Club, 6.
Royal Inst. Prof. Tyndall, "On Light."
Society of Fine Arts, 8. Mr. G. W. Hind, "On the Voice as a Musical Instrument."
Fri .....Geologists' Assoc., 8.
Philological, 8¼.
Royal Inst., 8. Prof. Odling, "Simplest Organic Compounds."
Archæological, 4.
R. United Service Inst., 3. Mr. H. Baden Pritchard, "The Application of Photography to Military Purposes."
Sat .....Royal Inst., 3. Mr. Deutsch, "Semitic Culture."

Patents.

From Commissioners of Patents' Journal, May 21.

Grants of Provisional Protection.

Anchors, &c.—1460—F. R. A. Glover.
Biscuits manufactured from the cacao bean—1414—R. and G. Cadbury and J. M. Rendall.
Bottles, &c.—1416—A. B. Hawes.
Casks, cleansing—1402—R. Fennelly.
Cricket balls, &c.—1424—M. S. Wolfgang.
Envelopes, apparatus for manufacturing—1403—J. G. Tongue.
Explosive bullets—1259—E. M. Reilly.
Fabrics, apparatus for finishing woven—1410—W. Henderson.
Fire-arms—1436—J. Hall.
Fire-engines, &c.—1420—E. Field.
Furnaces, &c.—1432—H. Bessemer.
Iron, purifying molten—1418—H. R. Lumley.
Iron, treating—1434—H. Bessemer.
Lubricators—1331—F. Jackson and T. Corbett.
Metals, coating sheets of metal with other—1458—P. W. Flower, H. Nash, and R. Heathfield.
Millstones, dressing—1422—R. Blezard.
Paper, obtaining a water-mark on—1462—W. F. De la Rue.
Parquet flooring—1404—G. N. Mansfield.
Quartz, &c., crushing, &c.—1446—L. Wray.
Railway sidings, locking apparatus for—1233—J. Francis, J. Donaldson, and G. Reavely.
Railway signals—1208—R. C. Rapier.
Reaping and mowing machines—1406—A. J. Murray.
Saponaceous compound—1440—W. R. Lake.
Steel, manufacturing—1426—W. E. Newton.
Sugar refining—1450—J. Robey.
Tin plates, &c., producing impressions upon—1452—P. W. and W. Flower.
Velocipedes—1438—C. Cross, A. Heywood, jun., and G. D. and T. B. Wilson.
Velocipedes, &c.—1216—W. F. Reynolds and J. A. Mays.
Velocipedes, &c.—1323—R. Griffith.
Ventilators for sewers—1442—B. Latham.
Watches, &c.—1428—W. B. Smith.
Wheels—1454—J. B. Handyside.

Invention with Complete Specification Filed.

Fire-arms, cartridges, &c.—1530—J. H. Johnson.

From Commissioners of Patents' Journal, May 25.

Patents Sealed.

3546. W. Inglis.
3549. W. La Penotière.
3551. E. T. Hughes.
3552. J. Howlison.
3555. W. H. Ibbett.
3568. W. G. Beattie.
3569. C. W. Siemens.
3572. W. Dinwoodie.
3578. J. Parry.
3582. T. Craig.
3584. W. R. Lake.
3585. S. Brook and C. Thompson.
3588. G. Baker, jun.
3590. W. E. Gedge.
3592. E. T. Van Hecke.
3602. A. M. Clark.
3611. J. H. Moreland and J. Conlong.
3613. E. Stevens.
3614. J. S. Templeton.
3615. A. C. Bamlett.
3620. J. H. Dales and J. F. Maygrove.
3621. A. M. Clark.
3642. A. M. Clark.
3646. W. MacLellan.
3672. P. Hooker.
3673. A. M. Clark.
3704. R. Girdwood.
3707. A. V. Newton.
3730. W. J. Thicthener.
3763. C. E. Brooman.
3800. T. Lynch.
3812. M. Lockhart.
3858. J. Edridge and J. Merrett.
3927. J. W. Wilson.
3984. D. Spill.
321. W. E. Newton.
443. A. V. Newton.
598. G. J. Hinde.
700. R. F. Piltz and T. H. Lee.
856. H. E. Newton.
966. T. Greenwood and J. Keats.
3606. A. Busche.
3607. E. T. Hughes.
3608. H. Pollack.
3612. A. Harris.
3616. T. G. Webb.
3618. T. and A. L. Dickins and H. Heywood.
3622. W. Tranter.
3623. J. Ingham & I. Butterfield.
3625. A. Wyllie and J. Latham.
3626. H. J. H. King.
3628. A. N. Burton.
3629. W. E. Gedge.
3633. J. L. Norton.
3638. L. Pfeiffer.
3669. S. C. Lister.
3683. R. Hornsby & J. E. Phillips.
3684. H. Kinsey.
3711. B. Fowler, D. Greig, and R. Burton.
3731. J. A. Farwig & C. Haynes.
3744. G. P. White.
3790. R. Norfolk.
3843. G. H. Benson and W. G. Valentin.
3861. T. Spencer.
422. J. A. F. Suter and T. C. Hinde.
597. J. A. F. Suter and T. C. Hinde.
859. W. R. Lake.
896. W. E. Newton.
904. W. R. Lake.
940. W. R. Lake.
941. W. R. Lake.
1004. S. K. Hoxsie.
1017. F. Boyd.
1029. C. Cairns.
1090. W. R. Lake.

Patents on which the Stamp Duty of £50 has been paid.

1410. J. Bernard.
1459. J. W. Evans.
1418. J. Brown.
1457. T. Green.
1602. J. Holloway.
1433. A. Crichton.
1452. T. Greenwood.
1481. G. Spencer.
1497. R. B. Boyman.
1551. E. Farmar.

Patents on which the Stamp Duty of £100 has been Paid.

1424. H. Cartwright.
1467. J. Dicker.
1505. E. J. Bridell.
1521. W. Naylor.
1639. G. Ermen and R. Smith.
1544. J. Needham.
1551. P. McGregor.

Journal of the Society of Arts.

FRIDAY, JUNE 4, 1869.

Announcements by the Council.

India Committee.

On Friday evening, June 18th, the seventh conference will be held, when the subject of "Cotton Cultivation and Supply" will be discussed. The chair will be taken at 8 o'clock. Members of the Society interested in Indian questions are invited to attend.

The London Cab System.

A meeting for discussing any practical measures that may be proposed for improving the cab system in the metropolis will be held at the Society's house, on Tuesday morning next, the 8th inst, at 11 a.m. Lord Henry G. Lennox, M.P., Chairman of the Council, will preside.

Persons having proposals to lay before the meeting may obtain cards of admission on application to the Secretary.

Members of the Society interested in the subject are invited to attend.

Conversazione.

The Conversazione originally fixed for the 23rd inst. is unavoidably postponed to a later date, which will be announced as soon as the arrangements are completed.

Members Proposed.

The following additional candidates have been proposed for election as Members of the Society, and will be balloted for at a special meeting, to be held after the Annual General Meeting, on the 30th June.

Davison, James W., 36, Tavistock-place, W.C.
De Bathe, Major-General Henry Percival, 3, Morpeth-terrace, S.W.
Dennison, William, 46, West-square, Southwark, S.E.
De Vahl, Arthur D. S., 1, Hyde-park-square, W.
Fairbrother, Rev. William, Hornsey-lane, N.
Hart, Arthur Marmaduke, 15, Campbell-road, Bow-road, E.
Hay, Frederick Rudolph, 35, Mornington-road, Regent's-park, N.W.
Henderson, James, 10, Whitehall, S.W.
Lawrence, Sir Trevor, Bart., 18, Whitehall-place, S.W.
Macpherson, Charles H., 23, Kingsdown-road, Upper Holloway, N.
Maguire, Henry Carlton, 2, Hargrave-park-road, Upper Holloway, N
Marx, Karl, Ph.D., 1, Modena-villas, Haverstock-hill, N.W.
Rawlins, Henry J. E., 99, Southampton-row, W.C.
Sassoon, R. D., 15, Leadenhall-street, E.C.

And as Honorary Corresponding Member.

Aymar-Bression, M., Directeur-Général de l'Academie Nationale, 41, Rue du Cardinal Fesch, Paris.

Proceedings of the Society.

India Committee.

The sixth conference was held on Friday, May 28th, Lord William Hay in the chair. The papers read were, on "Trade between Calcutta, Darjeeling, Bhootan, and Thibet," by Dr. Archibald Campbell, late Superintendent of Darjeeling; and on "Trade between Assam, Thibet, and Western China," by Col. Hopkinson, Commissioner of Assam. The discussion which followed was adjourned to this evening (Friday), the 4th instant. The proceedings of this conference will be given in next week's *Journal.*

PATENT LAW.

The following debate took place in the House of Commons, on Friday, the 28th ult. :—

Mr. Macfie rose to move the abolition of the patent law. The subject, he believed, had never been discussed in Parliament; it would, therefore, not be improper to devote some considerable portion of time to its introduction; but he proposed only to lay a general view of the subject before the House. In the first place, he asserted that legislation upon this subject should be based upon two principles—firstly, that the interests of inventors should not be considered before the interests of the nation at large; and, secondly, that there could be no property in ideas. The grant of a patent had always been a royal favour, and no inventor could claim as a right the exclusive privilege of manufacturing or selling any novel production he might have invented. An invention differed altogether from the literary work of an author, which he would continue to protect; and when he spoke of the interests of the nation at large, he referred to the obligation the House was under to do everything in its power to protect commercial interests from the evil consequences of the law of patent right. The present patent system differed *toto cœlo* from that which our forefathers, 250 years ago, thought tolerable. As to its inconvenience, he could produce witnesses to prove that it interfered very seriously and injuriously with trade, and one of the conditions upon which patents originally were to be granted was, that they should have no such effect. He held in his hand a paper which showed how many wrongs were inflicted by the present system on manufacturers, patentees, and vendors who were not patentees. One particular law plea in connexion with the defence of a patent had cost the parties £100,000. A Royal Commission on the subject was appointed in 1862, and their report was issued in 1865. Many eminent men were examined, and the result was that, though he believed the bulk of the Commissioners entered on the inquiry in the belief that the system could be remodelled so as to be made defensible, they ended by arriving at a very different conclusion. The report stated that the majority of the witnesses had decidedly affirmed the existence of practical inconvenience from the multiplicity of patents; and the Commissioners called special attention to the testimony given by the First Lord of the Admiralty and the various witnesses on behalf of the War Department, showing the embarrassment caused to the naval and military services by the multitude of patents taken out for inventions in use in those departments. He believed the noble chairman of that Commission (Lord Stanley) had said that, before legislating on the subject, the first duty of the house was to inquire into the policy of patents. But though five or six years had elapsed since that time, nothing had been done, and he believed the next course

for the House to take was either to adopt his motion *simpliciter*, or to call upon the government to issue a Royal Commission, so that the question might no longer be postponed. There would then be an opportunity of examining some of the working men of the country, who had complained that none of their class had been called as witnesses before the Royal Commission of 1862. While, in 1650, the number of patents was naught, fifty years later it was two, fifty years afterwards seven, and so it went on until, in 1867, it was 2,292. Ireland, too, was a great sufferer by the present system, for whereas in 1800 there were only two patents in that country, now there were 2,292. That was one of the evils of the Union which he trusted that House would speedily redress. Having referred to the authority of Earl Granville, Sir James Graham, Mr. Cobden, M. Michel Chevalier, and others in support of his case, the hon. gentleman observed that the question was, whether they were to abolish patents *simpliciter*, or to adopt the system of Mr. Mill, who held that if they were to abolish patents they ought to grant compensation. There was this to be said in favour of that view, that whatever benefit was to be gained, if there was any, it would be the State, not the manufacturers, that would receive it. He begged to move, "That, in the opinion of this House, the time has arrived when the interests of trade and commerce, and the progress of the arts and sciences in this country, would be promoted by the abolition of patents for inventions."

Sir Roundell Palmer, in seconding the motion, said he had long felt convinced that this subject was one of great and growing importance, which it would be necessary at an early period to bring before the attention of the House. He rejoiced that it had been undertaken by a practical man, like the hon. member for Leith, who could speak upon it, not under the influence of any of the partial views which possibly those who looked at it from a lawyer's point of view might be thought by some to entertain, whether they were in favour of or against patents. He was glad to find that practical men like his hon. friend had arrived at conclusions which, in their broad principles, were substantially the same as those to which many members of the legal profession who had had a good deal of opportunity of observing that matter, had, in common with himself, come. He was bound to state that he thought the time had arrived rather for opening than for concluding the discussion of that subject; and, therefore, he hoped he should not be thought to do anything inconsistent with the duty he had undertaken in seconding his hon. friend's motion, when he said at once that, for his own part, he was inclined to go to the root of the matter, and abolish patents altogether, and not attempt to substitute even such a system—although it might probably be preferable in many respects to the present system—of rewards as his hon. friend had mentioned. Of course those who derived benefit—whether they were the public or were private individuals—from the discoveries that might be made, if patents ceased to exist, might always take into consideration the value they received, and pay for that benefit, as he believed the government now did, although it was not bound by patents, with respect to improvements which were useful to the public service. But that, he conceived, would be a very different thing from an organised system of rewards at all analogous to the present system of patents. He might mention, in passing, a third plan, which had found very able and authoritative advocates, and which he should also greatly prefer to the present system, although he thought total abolition would be better than that likewise. He referred to the plan of putting an end to the notion that every person who invented anything had a right to a patent, and recurring to what, he imagined, was originally the principle intended—namely, the giving of patents as a matter of grace and favour in well-selected and discriminated cases, in the exercise of a discretion by an authority entrusted with that discretion. But, as he had already said, he confessed that he himself was not for half-measures in that matter. He thought they had a right, as the motion proposed, to say that, at the period of progress in the history of the arts and of trade in this country at which they had arrived, they could do much better without these props. He called them props, because he thought they were meant to be so, but he believed that at present they were nothing but obstructions and hindrances to trade and the arts. Let him, in the first place, notice the principle on which the patent law was generally supported. Some persons imagined that there was a sort of either moral or natural right in inventors to some such protection as was given by patents, and the principle was sometimes expressed in this way, that a man had a right to the fruit of his brain. Now, he held that invention and discovery were essentially unlike copyright. Copyright applied to a creation. A man wrote a book; he thus brought into existence something which had no existence in the nature of things before. The rest of the world were not in the race with him to write that particular book. But in the case of inventions and discoveries, the facts with which they were concerned lay in nature itself, and all mankind who were engaged in pursuits which gave them an interest in the investigation, for practical purposes, of the laws of nature, had an equal right of access to the knowledge of those laws, and might be equally in the track for obtaining it. All who were engaged in particular arts and manufactures were actually upon the track which led to the discovery of those laws, and the knowledge of them was the common stock and property of all mankind who were equally in pursuit of it. He could not allow that the man who was first in the race of discovery could claim, for 14 years or any other term, an exclusive property in a portion of the common stock of knowledge which was accessible to all who used the proper means of discovering it. It could not be said that, on considerations of public advantage and expediency, the man who made the first discovery of a law of nature, or the right mode of applying it, had an exclusive right to apply that discovery for a certain period. It was said that patents were useful to the public, either as stimulating invention or as insuring the publication of useful discoveries; and he did not venture to say that the time might not have been when they answered both of those purposes. Bounties and premiums might be adapted to a rude state of the arts, and an early stage in the progress of commerce, but when a nation had reached so high a degree of progress in all ingenious arts and discoveries, and in trade and commerce, as we had, he thought that in this department as well as in others, the system of bounties and premiums was much more likely to be mischievous than useful. But of course one could not demonstrate that point by resting merely on an abstract proposition, and therefore he would ask the House to look at two or three things which it seemed to him would put the matter in a strong practical light. Patents might be divided into those which might be popularly called meritorious, and those which were not meritorious. The former class were certainly not one in a hundred of the total number of patents, and the latter class were very numerous in every year. How, then, did the system work as regarded meritorious patents? He supposed it would be admitted that among the most meritorious discoveries of recent times were the steam-engine, the electric telegraph, and the screw propeller for ships. These cases furnished excellent illustrations of the way in which the patent system worked. Take the electric telegraph. According to the evidence on the subject, it was not possible, even for those who best understood the matter, to say who was entitled to the merit of that invention, so gradual and imperceptible was the natural growth and progress of knowledge and discovery in reference to it. But about 400 or 500 patents had been taken out as marking different steps in the investigation of that subject. As to the screw-propeller, he had seen a book which represented the collected patents of one company as being 90 or 100; and he understood

that the case was very much the same in regard to the steam-engine. They were not dealing, in the case of the most meritorious inventions, with a true discovery by a single inventor, but with an important branch of practical knowledge at which many men were working at the same time, and in regard to which each step attained indicated the next step that was to follow, and many persons together were on the road. Well, but if they were on the road, the public would get the benefit of the discovery, and the question was whether, by enabling each person on the road to stop up the road at his particular point, they were not really retarding the progress of discovery, and throwing difficulties in the way of even the most valuable inventions. There was no one better acquainted with that subject than a friend of his—a gentleman very eminent both in science and in the law. He meant Mr. Grove; and those members of the legal profession who had to encounter Mr. Grove in a patent case knew they had a very difficult task indeed before them. Now, here were the words of Mr. Grove in reference to that subject:—"Always when a discovery has been made, when the public has reaped the fruits of it, there is no case, and never was a case, either in the history of pure science or in the history of practical discovery, where it is not alleged, 'If you look at such a book and such another book, you will find that so and so has been done, and you will find that it has been anticipated.' That is partly true and partly false. There are in all such cases approximate anticipations. The difference is, that one man gets at the points, hits the real thing which will do it, and the reason why it will; whereas other people, although they may have got the thing, have not acquired an accurate knowledge which will enable them with certainty to produce it." That showed the House that the race was often so close that even the man who had hit the thing might be shut out by somebody else who did it a trifle better. Nothing could be more true than that. Would the House allow him to quote the example of a very important patent, which he thought would make the matter clear, and indicate how much they might lose by a system of that description. For a very long time the distillation of oils from shale and coal had been a matter of the common knowledge—aye, and of the common practice, of mankind. Early in the present, or towards the end of the last century, it was practised by means precisely similar in all points to those which the present patentees used in this country. But it was not known commercially that there was such a thing as paraffin, nor was it known commercially how to distil it. The oil was, indeed, obtained in a rough way, and without that nicety of discrimination which afterwards resulted from scientific knowledge of the article itself. All chemists knew that in order to distill these oils it was necessary to keep the temperature as low as possible. This was the state of knowledge when a great German chemist discovered that by operating on wood, tar, and other substances, he could produce paraffin in small quantities. He also said it could be got from coals in precisely the same way, as was subsequently done by patentees in this country. But still the German chemist's experiments were of a scientific and not of a commercial character. He neither produced it commercially, nor did he hit upon the material from which it could be commercially produced. The same oil could be produced from shale. Only the other day there was discovered in Scotland a new kind of mineral, as to which the scientific world were at variance whether it was coal or shale. Patents had been already taken out for distilling oil from shale, and, therefore, if the newly-discovered substance were shale, oil could not be obtained from it without an infringement of those patents. But a patent was taken out by a gentleman, who stated that his object was to use bituminous coals for the purpose of distilling paraffin. In point of fact, he hit upon a mineral which was in *ambiguum* whether it was coal or shale, but which the authorities ultimately pronounced to be coal. From this substance the oil could be produced in large quantities. This gentleman took out his patent, notwithstanding all the previous knowledge on the subject, and notwithstanding the fact to which the learned judge, who decided the case in one of its branches, referred, in the following terms:—"There is ample evidence that the attention of practical chemists was, previously to the date of Young's patent, laboriously directed to discover the proper material and the proper means of producing these articles in sufficiently large quantities for common purposes." The public literally had in their hands all the necessary elements of knowledge belonging to the subject, and yet the first person who found that this particular coal was more bituminous than others excluded the rest of the world from that manufacture for fourteen years, and of course amassed a large fortune. Substantially, the test in the courts of law was whether a man had made money and brought the manufacture into use. If so, the courts assumed that all previous knowledge was inadequate and useless, and the man who was successful in the manufacture was regarded as the discoverer. Was it not quite clear, however, that the public were so far on the road to this discovery that it would have assuredly been found out and enjoyed by the public at large if the path had not been obstructed by the patent? He would now mention another case. In the days of our youth mills were much infested with flour flying about in them. All the millers, both in this country and abroad, wanted to get rid of this nuisance, and they were possessed of the scientific principle and the mechanical means by which this desirable object would be accomplished. They tried experiments with fans, which created a draught to draw the air from the millstones, and everything depended on the adjustment of a plan to draw just sufficient air and no more. People were actually on the road, and were doing the thing in an imperfect way, but in such a way that, if they had continued after the granting of the patent, would have made them infringers of it. But the man who proposed to do just enough, and no more, was held to be entitled to a patent, whereupon all the millers in England combined to go into litigation in order to defend themselves. Lawsuits of the most enormous and oppressive magnitude resulted, simply from the circumstance that a man had been allowed to step in and prevent the millers from carrying on their business in the best way. That they would have found it out was certain. That was certainly the impression on his mind. He thought it was almost certain that the discovery, being in the direction of their necessity, and depending on the application of a known principle and of known mechanical means, was a discovery which could not in the course of nature have been long delayed. Having said thus much about those patents which were meritorious, he would make a few remarks on those which were not. A great number of patents were simply frivolous, and related to practical nothings, but still nothings affecting trades, and standing like lions in the path to frighten tradespeople, and to expose them to risk, litigation, and annoyance if they manufactured those articles which they ought to be at liberty to manufacture. Then there were other patents of a less frivolous nature; they related to some little combination of a kind which really was so plainly in the open path, that everybody ought to be at liberty to use it. These, however, furnished the staple of the great majority of patents, which, though they did no practical good, operated to a great extent in hindering subsequent inventors in effecting further improvements, because these patents covered almost the whole ground of everything that could be possibly done. An inventor, unless he paid a tax to the owners of prior useless patents, was exposed to litigation, and even if he were willing to pay the tax, the owners of the prior useless patent might refuse to grant him a licence. Thus, for the space of fourteen years, these useless patents might not only do no good to the public, but might actually stop the road to all further improvement during that long period. On

this subject evidence had been given by three persons of eminence—Mr. Scott Russell, Sir William Armstrong, and Mr. Platt. These gentlemen agreed in saying that the useless patents to which he had just referred were a practical nuisance, and it was obvious from their number that they must be a very great nuisance. Mr. Scott Russell said:—"There are a great many patents of this kind (practically useless, but not appearing so on the face of them) taken out for boilers of steam-engines, and boilers of steam-engines admit of very enormous variety of shape and proportions, without damaging their efficiency. The consequence is, that it is hardly possible at this moment for a man having to scheme a boiler for a new situation or new circumstances to avoid putting his foot, in so doing, into a trap which somebody has previously set for boilers. . . Nearly the whole of the patents for the boilers of steam-engines at this moment are of no practical value to inventors or to the public; but they are continually getting every man who makes a boiler into a scrape with some patentee, because almost every conceivable form of boiler having been previously patented, and bit of a boiler, one cannot make any sort of boiler without infringing some man's patent." He said precisely the same thing of screws. Then Mr. Platt, a well-known machine-maker, said:—"I think that there is scarcely a week, certainly not a month, that passes, but what we have a notice of some kind or other of things that we have never heard of in any way, and do not know of in the least, that we are infringing upon them; and the difficulty is to get at any knowledge. We may be now infringing, and may have been infringing for years, and a person may have been watching us all the time, and when he thinks that we have made a sufficient number he may come down upon us, and there is no record. If a thing is entirely new, there is a record by getting a description; but what I mean by a description is this—a very large number of patents are now taken out for what is termed a combination of known things for the same purpose, and the descriptions of those patents are generally so bad, that it is impossible to tell the parts that are actually patented. It is only when you come into court, or after making some compromise rather than go to that expense, that you ascertain that fact, and very likely they themselves in many cases do not know the parts that they have actually claimed. It appears to me that, as to that question of combination, the granting of patents for things to do precisely the same work in the same machine, with the addition, perhaps, of a chain or a couple of bolts, or the form of the lever changed, a straight lever made into a compound one, in matters of that kind it has become a very serious question as to conducting a large business." These were examples which it would be very easy indeed to multiply, and if the objections he had urged against the meritorious patents were well founded, what could be said in favour of the large proportion of patents which were simply obstructing the trade and commerce of the country? Could any one doubt that, in this advanced era of knowledge, the public would gain, on the whole, by the abolition of the patent laws? Before he left that part of the subject, he wished to mention one very pregnant fact. There was in this country a powerful consumer—he meant the government—which, with respect to fire-arms, cannon, ships, and things of that sort, would be placed in a very singular position indeed if it were subject to the patent laws. During the time he had the honour of being a law-officer of the Crown, an extensive war was, as the House was aware, unfortunately raging, and a large number of patents had come under his consideration, in connexion with so-called improvements in ordnance and ships. It would be seen from the evidence to which his hon. friend had referred, that the authorities at the War-office and the Admiralty had patentees swarming like hornets about their ears, and that the public service seemed, in consequence, likely to be obstructed to a very inconvenient extent. The question was then tried whether the Crown was bound by patents at all, and a decision was obtained to the effect that it was not. But, while the Crown was free, it should be remembered that the people at large were subject to the law as it stood, and if in the case of the government the claims of patentees were found to be monstrously inconvenient, it might not be difficult to believe that they operated in the same way in the case of the rest of the world also. He should not enter into the minor details of the improvements which had been recommended by the Commission, but there was another point to which he wished briefly to advert before he sat down; he alluded to the question of the protection of the public against invalid and bad patents. The whole argument in favour of patents proceeded on the supposition that the public were likely to be really benefited by some discovery which was worth the price of all the inconvenience and obstruction to which they were exposed under the present system. But if they said that they gained nothing by the patent, and that they only wanted to be set free, what was the position in which they stood in reference to the cardinal point of protection against bad patents? Was there really any protection in that respect in the duties which were discharged by the law-officers of the Crown? It was impossible for the law-officers of the Crown, acting on the mere statement of the patentee, to know with certainty whether a so-called discovery was new or not. They could only examine into the question whether an alleged invention, as described on the face of it, was or was not satisfactory; but they could in no way protect the public against having an old thing put forward as a new, or a useless as a useful invention. Indeed, the attempt by means of any sort of preliminary investigation to establish the utility or inutility of a patent must, in his opinion, necessarily fail, so long as the granting of patents was a matter of right and not of discretion. And what was the result when a patent came to be disputed in a court of law? Everybody was aware that such litigation had acquired a reputation infamous beyond every other. In the Paraffin Oil Company's case, which had been referred to, the time occupied before Vice-Chancellor Stuart was not less than thirty whole days. Why was so large an amount of time consumed in those cases? Because it was necessary to enter into the whole history of the discovery in all its numerous stages, and to beat up witnesses all over the country, so that a voluminous mass of scientific evidence had to be produced. That was the reason why the expense in those cases was so enormous, while the public were, in every point of view, placed at an immense disadvantage, for the presumption was in favour of the patentee, who, if he happened to have succeeded in an action against another person, was entitled to have the fact put in evidence in the case, and might subject his opponent to extra costs. But that was not all. In a case, he believed, of a patent for the purifying of gas by the use of metallic oxide of iron, it came out that there were two kinds of oxide, the hydrous and the anhydrous, and that the one would effect the object while the other would not; but, because the terms were general, although everybody who tried the experiment might arrive at the result desired, the patent was held to be bad, and another person who took out a patent for the hydrate had his patent made good. Lord Westbury, who was as well acquainted with the subject as anybody who had in recent times occupied the woolsack, said, in 1862, in speaking on that point:—"To vitiate a patent by prior publication, whether in a prior specification or in a published book, &c., the antecedent statement must be such that a person of ordinary knowledge of the subject would at once perceive, understand, and be able practically to apply the discovery without the necessity of making further experiments, and made useful. If anything remains to be ascertained which is necessary for the useful application of the discovery, that affords sufficient room for another valid patent." It would be seen, he thought, from what he had stated, that the public were placed at a great disadvantage in

the contest. In dealing with patent cases in a court of law, there was generally a vast array of witnesses to be examined, consisting of mechanics, chemists, and scientific men of all sorts, on one side and the other. Then there were the jury, who knew nothing of the subject, and the judge, who was placed in a worse position, because he imagined he understood all about it when he did not. He did not, of course, mean to say that the judge did not sometimes understand it, but it might very easily happen that an ingenious professional witness might so argue the case, under the form of giving evidence, as to lead the judge to think that he really knew all about it, when such was not in reality the fact. Then the bias being in favour of the patentee, the result of such trials almost invariably was, that if the matter happened to be of any practical importance, the public were defeated, after having endeavoured to protect themselves at an enormous expense. He would not enter into minute details, but probably he had said enough to show that a great practical evil arose out of patent laws, and that for this evil there was little or no corresponding benefit. He did not think that we should lose really valuable discoveries if the patent laws were abolished. There might be some rare instances in which particular circumstances might give to particular inventors motives for suppressing and facilities for suppressing discoveries which were not patented. But, assuming that to be possible in some cases, it operated even now, for it was well known that patents were bought up for the purpose of being suppressed, and it was understood also that inventors were the persons who derived the least advantage from their inventions. His conclusion, therefore, upon the whole mattter was that the time had at last arrived—even if it had not arrived some time ago—at which the public interest would be promoted by the entire abolition of the present system of monopoly.

Lord Stanley said that, agreeing substantially in the arguments of the hon. and learned gentleman who had just sat down, he should not have troubled the House if it had not been for the circumstance that he was chairman of the Royal Commission which sat upon the question of the administration of the patent law some years ago, and he thought, therefore, that it might be expedient he should state what was the result which that inquiry produced upon his mind. There was no doubt that, quite apart from the principle of the law, the details of the law, as at present administered, were not satisfactory; and, if the law were to continue in any form, he believed that, in the report of that Commission various suggestions would be found, by which the most prominent objections might be removed, and fair trial might be given to the principle itself. But it was impossible to carry on an inquiry of that kind, even limited as it was—it was impossible, at least for him, and he believed he was not the only one in that position—without finding a doubt raised in one's mind whether any patent law could be framed in such a manner as not, upon the whole, upon the balance of good and evil, to do more harm than good. That conclusion, he was bound to say, was totally opposed to his earliest impressions upon the subject. He resisted it for some time, but the more he had to look into this matter—the more he had to consider how great were the practical abuses and inconveniences of the existing system, and how difficult it would be to remedy them—the more clearly it appeared to him that the evil was really irremediable, being inherent in the principle itself. On this subject of patents there had been a certain amount of prejudice, particularly in the minds of literary men, who appeared to think that copyright was only a modification of the same principle, and that if patents were abolished copyright would follow. The analogy seemed a plausible one, but he thought that, on being looked into, it would not hold water. The difference was simply this. He did not rest it on any abstract ground as to the distinction between invention and discovery, but on the obvious fact that no two men ever did or ever would write, independently of one another, exactly the same book; each book, be it good or bad' would stand alone; whereas it might happen, and often did happen, that two or three men, quite independently of one another, would hit upon the same invention. That alone established a distinction between the two cases. He was not disposed to place the objection which he entertained to the system of patents upon the ground of any abstract impropriety in giving a man a property in ideas. To a certain extent you did, in the case of copyright, recognise a certain qualified and temporary property in ideas; and if it could be shown that a man's ideas had been of a nature to add greatly to the wealth of the country, he did not think that any abstract conditions of the kind mentioned by the hon. member (Mr. Macfie) would induce anybody to grudge to such a man any reward to which he might fairly be entitled, provided that that reward could be given in a manner free from objection on other grounds. The objections which he felt to the principle of patents were threefold. In the first place, you can hardly ever secure the reward going to the right man. In the next place, you could not establish any proportion between the public service rendered, and the value of the reward received nominally for that service. And, thirdly, you could not, by any arrangement that he had been able to discover, prevent very great inconvenience and injury being inflicted upon third parties. With regard to the first point—the difficulty of securing that the reward should go to the right man—it must be remembered that a patent did not, as some people supposed, bring to the holder of it an immediate pecuniary right. All that it did was to give him a right to prevent any one else from using his invention without paying for it, and if that patent were infringed he was entitled to take legal proceedings. But everybody knew that the law was costly, and that patent suits were the most costly of all. It was notorious that patents were continually infringed by persons who well knew they were infringing them, but relied upon the inability of the inventor to incur the expense of defending his property. If a poor inventor took out a patent, and the patent promised to be productive, in nine cases out of ten he was obliged to sell it to some one who could command capital enough to defend it in a court of law. If the patent remained in his own hands, it was quite sure to be infringed, and then he would probably be crushed by the law expenses. He did not know whether it would be possible to obtain accurate information upon this point, but he really did not think he should be exaggerating if he said that, in nine cases out of ten—probably in 99 out of 100—the reward was obtained, not by inventors or their representatives, but by persons who had bought the patent on speculation, and at a very low rate. He said at a low rate, because there was a great deal of uncertainty about such property, and until a patent was tested by actual working, you could hardly say whether it was valuable or not. What was the practical effect of this? Why, that a few great firms in any branch of business, buying up at a low rate any new patent applicable to their business, and prepared to fight for it, could so hamper other competitors as to secure a practical monopoly. The reward, therefore, did not, as a rule, go to the men who, on the ground of the public service rendered by them, were intended to receive it. As to the second point—that the reward might be great and the public service very small—that had been dwelt upon by the hon. and learned gentleman opposite, and little need be added to what had been said by him. The merit and novelty of the invention might in many cases be almost nothing, and yet, however obvious it might be, however much it might lie, so to speak, in the high road of discovery, if it applied to any article of general use, the pecuniary reward derived from it might be absolutely out of proportion to the novelty or value of the invention. It would be easy to give instances, but he apprehended that the fact was familiar to everyone who had studied this question. Then, with regard to the injury to third

parties, it commonly happened that half-a-dozen men who were competing in the same line of business were upon the track of the same discovery. Each of these half-a-dozen men would probably have hit upon the invention which was wanted, independently and without communication with the other. But the first who hit upon it, and who took out a patent for it, was thereby entitled to exclude the general public and competitors from the use of that which, if he had never existed, they would probably have hit upon within a few weeks. A and B reached the same point, and one a week or a fortnight before the other, and A became entitled, perhaps by accident, to exclude B from a process which, a little later on, B would have hit upon for himself. Another case was that where the successful working of a process depended not upon one but upon several successive inventions. The first two or three, not leading to any immediate practical result, might not have been thought worth patenting. The last link in the chain gave to the whole their commercial value, and it was the person who took out the patent for the last invention who got the benefit of the whole, yet it might not be the most important invention in the series. He would say nothing of the inconvenience and prejudice to manufacturers in general. That was obvious enough, and the question was whether there was any counterbalancing advantage. These were the considerations which led him to the conclusion that it was impossible to defend our system of patent law as it stood. At the same time, he did not at all disguise from the House that there were certain inconveniences and difficulties in the way of abolishing patents altogether. You had to guard, in the first place, against the danger of encouraging inventors to keep their discoveries entirely to themselves. In some branches of business no doubt that would be possible, and the obvious effect might be to shut out the public, for a much longer period than would be the case if patents were allowed, from the use of some valuable invention. Then, it had been suggested by the hon. member who raised this debate that there might be a system of State rewards for the encouragement of really meritorious inventions. Without putting an absolute negative on that plan, he must observe that it was one which could only be established at great cost, and it would be a very difficult thing to apportion among inventors the rewards to which they might think themselves entitled. The distribution of the rewards would give rise to endless complaints, and would occasion, however unjustly, suspicions of jobbing and partiality. With regard to the suggestion thrown out by the hon. and learned gentleman, of the possibility of granting patents, not as a right, but as matter of discretion only, in certain limited and important cases, the Select Committee considered that point, and he was bound to say that the difficulty of carrying it out appeared to his mind almost insuperable. There would be found great difficulty in drawing the line, and it would not be an easy matter for anyone to exercise so large a discretionary power as to decide to what inventions patents should or not be granted. He did not know what tribunal would be fit to exercise so great an authority, and he was sure that none would be able to exercise it in a manner to give satisfaction to the public. The most fit persons to decide in such a case would, seeing the difficulty of the task, be sure to decline to undertake the duty. Under these circumstances it appeared that they were landed in great embarrassment. He was convinced that the patent laws did more harm than good, and if called on to say aye or no as to their continuance, he should certainly give his vote against them; but, as this was a matter which required a particular handling, he should be content to leave the question in the hands of the government, and he thought it was well worth consideration whether they could not, starting on the ground that the abolition of the patent laws wholly, or partially, was desirable, institute some inquiry with the view of discovering, if possible, the best substitute for them in certain cases.

Mr. J. Howard thought that many of the arguments which had been urged on the present occasion touched, not the principle of a patent law, but the existing law and its administration. The great objections to the patent laws arose from the sham examinations made upon application for patents. The hon. and learned member for Richmond said that it was impossible for the law officers of the Crown to institute a proper inquiry; but, seeing that they received about £16,000 a year for that duty, it was desirable to know why they could not perform it. The difficulty in trying patent cases arose from the fact that the specifications were allowed to be drawn so loosely that it was impossible to say what was new or old in them, and if patentees were bound to grant licences on reasonable terms, the objection to patents on the score of being monopolies would at once fall to the ground. He would ask the House whether it was likely that the inventions of the steam-engine, the electric telegraph, and the screw propeller, to which the hon. and learned member for Richmond alluded, would have reached the perfection they had attained, without the protection afforded by the patent laws? The hon. and learned gentleman had also alluded to the important invention in regard to the grinding of corn, and had jumped to the conclusion that it could not have long remained undiscovered, but the fact was that the world had gone on grinding corn for ages without making the discovery, until it was hit upon by a man of genius like Bovill, who was afterwards worried to death by litigation. He repeated that the arguments which had been used tended not so much to the conclusion that the patent laws should be abolished, but that they should be amended. In the present day the workmen and manufacturers of this country had powerful competitors in other countries, and it would not be wise, by abolishing the patent laws, to take away a strong stimulus to invention. Not only should the means of study and research be thrown open to the higher order of inventors, but to working men, many of whom had a scientific turn, as was made abundantly evident to all who had visited the industrial exhibitions of working-men in London and elsewhere. When in Washington, some years ago, no building had made such an impression on his mind as the Patent Museum. It was so superior to anything of the kind in England that he felt almost ashamed of his country. It was, in fact, a great educational establishment, to which inventors and the public resorted for information. Every patent for which the United States had granted letters was not only classified there, but chronologically arranged; while in another spacious and beautiful gallery were all the rejected inventions, so that any one could go into that museum and trace the progress of every invention step by step. He could not help thinking that a similar establishment in England, whether with or without a patent law, would have a great effect on the national weal. A somewhat subtle distinction had been attempted to be drawn between the production of a book and a machine or other invention, but both appeared to him to have a common origin, and the author of the one had as great a right to the protection of the State as the author of the other. The noble lord who drew a distinction between a book and a machine said no two men ever wrote the same book at the same time, but he frequently found that two authors conveyed exactly the same ideas, though not in the same words, writing almost simultaneously. If two men, however, invented the same machine simultaneously, it was never found that they treated the details in the same way. The argument of the honourable and learned member for Ripon was untenable. He said the laws of nature were the common right of mankind. That would be freely admitted; and the inventor made use of the laws of mechanics just as the author of a book availed himself of the common language of mankind. The honourable member who introduced this subject said he would not withhold compensation from a meritorious inventor; but who was to be the judge of the merit and value of an

invention? Hitherto the State had left this to be decided by a discerning and purchasing public, and he believed they would continue to do so. He should, as an inventor, feel it quite *infra dig.* to go, cap in hand, to the Chancellor of the Exchequer soliciting, or getting some powerful political friend to solicit him to recognise his claim for any invention. Inventors, from past experience, had quite enough to caution them against being left to any State department or official; they preferred to confide their claims for compensation to a discerning public. It was a scandal to former Parliaments that the patent laws had been allowed to remain unreformed. Inquiries had been made, and Royal Commissions had recommended certain reforms, but nothing, or next to nothing, had ever been done. We had the finest library of patented inventions in the world, and yet it was stowed away in a passage just 6 feet 3 inches wide. Could it be believed that such a state of things was allowed to exist, when there was so large a surplus of fees as £650,000, which ought not to be appropriated to the general revenue of the country, but to patent objects and the general advancement of science? He hoped, when the law-officers of the Crown did take this subject in hand, which he had some reason to believe they would next session, they would provide the means for a *bonâ fide* examination of all inventions before patents were granted. He would conclude by declaring his deliberate conviction that, if they wished to undermine the manufacturing and commercial greatness of England, they could not take any more effectual means of doing so than abolishing the patent laws.

Mr. Mundella wished the House to consider what would happen if the patent laws were abolished. He had been for 25 years connected with manufactures as an employer, and during that time he might say he had more than 20 patents, in every one of which he had a working-man in partnership with him. He had never made an invention in his life; he did not know in his neighbourhood of one invention made by an employer. Inventions were generally made by working men; and a working-man now received from his hon. friend the member for Bristol and himself a third share of the profits of a patent invention which produced to him a very considerable sum annually. He had himself gone into a garret, where he found a poor man working on a circular revolving machine which he had fixed on the bottom of a wooden chair—the only chair in the room. For years he had been patiently working at it. It was completed. It was patented. He purchased it. The poor man had his share, and was now in comfort and independence. No parties had a greater interest in the maintenance of the patent laws than working-men, who, if they received no protection here for their inventions, would soon carry them off to France or America. He did not say whether patent laws were right or wrong; but he could not discover the distinction which had been drawn by the hon. and learned member for Ripon between a book and an invention, both being the production of the author's brain, just as much as the speeches of learned counsel, for which they were paid before they were given to the public. Every civilised nation in the world except one had a patent law. That the present law stimulated to useful inventions was abundantly proved by the hosiery machinery in the town of Nottingham, which was unparalleled in the world, and which had been perfected by the working men of that town. It was a great mistake to say that patents inflicted a hardship on the public. Patentees had found out that to attempt to keep a patent to themselves was a mistake, and that it was much better to grant licenses with as small a royalty as possible, in order to get a large number of them in use, and to enhance the consumption of the article as much as possible. He was himself the part proprietor of a patent which reduced by about one-half the price of an important article of clothing. Who had the benefit of this? The public got more than nine-tenths of the reduction, and the other tenth was divided into three parts, between the inventor and the two proprietors. There was the greatest difficulty in establishing the right to patents, and constant litigation and anxiety in maintaining them. All this pointed to a reform of the patent laws, for they were so vague, uncertain, and ambiguous, that it was never known whether a patent was secure. Sometimes, when it was known an invention was coming out, a man who had heard the nature of it described went off and patented the idea. He could not do that in America. There he must deposit a working model, and a committee of scientific men sat and declared whether it was a good and valid invention or not. The result was, that there were 11,000 patents in America, against about 2,000 in this country. Nowhere had so much been done to develop industrial inventions as in America, and this was mainly owing to the excellence of the patent laws in that country. He trusted that the House would consider the interests of the working-men, and revise the patent law, so as to give them a fair share in the products of their discoveries. The patents called "dog-in the-manger patents" ought to be prohibited, and some board appointed which should grant licences to work patents at a reasonable rate.

Mr. Stapleton said there were three classes of inventors—the master manufacturer, the labourer, and the man of science who made invention a pursuit. The first paid himself by keeping his invention secret, but the labourer, unless he had a patent law for his protection, would go unrewarded for his time and trouble. As to the third class, it was desirable that every man should pursue the course of life which would do the greatest good to mankind, and if he were likely to make discoveries, it was to the interest of society to encourage him in that career. He could not, therefore, agree to any proposal to do away with the patent laws. No doubt some more definite description ought to be insisted upon before a patent was granted. The time for which patents were granted might be reduced in certain cases, and a patent might be repealed at a fair valuation whenever it stood in the way of trade. It should be compulsory, moreover, upon a patentee to grant licenses. A great reform had, however, been effected in the law. Patent suits were now, to a great extent, carried into the Court of Chancery, and a claimant must set forth in a bill that he had a good patent, and show that there had been a distinct breach of it. If they did away with patent laws altogether, invention would be damped and discouraged.

Lord Elcho said, having listened to the discussion, he preferred the speeches of the hon. members for Bedford and Sheffield, because they took the most sensible and practical view of the subject. It would be unwise for the House hastily to adopt the resolution, and it would be better to inquire whether the patent laws could not be amended after the example of the United States. On the whole he suggested the propriety of postponing a decision on the question raised, until it had been thoroughly gone into.

Mr. Samuda doubted whether the inventors themselves were really gainers from the patent laws. If there were a manifestly new invention, he did not see why the inventor ought not to have the benefit of it, as much as an author who had written a popular book. There ought to be a full investigation into the patent laws, and if they were not abolished altogether, some power ought to be given to remove obstructive patents.

The Attorney-General thought that it would be premature to come to a decision on this important question, seeing that it was the first time the general principle of the abolition of the patent laws had been mooted in the present House. His hon. friend the member for Leeds would compensate inventors out of the public funds, instead of allowing them a monopoly; but he thought that part of his scheme wholly inadmissible, for everybody knew that it was impossible to estimate the value of an invention when it was first introduced to public notice, and he concurred with the noble lord the member for King's Lynn,

that it would be extremely difficult for any public functionary to make a selection of patents, and if such an attempt were made, in nine cases out of ten the wrong invention would be subsidised. One great objection to the patent laws was, that they produced a crop of patents which were extremely inconvenient, and they had a race of inventors all running the same road, in the hope of striking out something which would result in making their fortunes. At the same time it would be a dangerous experiment to take away the stimulus to inventions; and therefore he was for continuing the present laws, but amending them, because on the whole he thought they did more good than harm. The House had before it the report of a Commission, the members of which comprised the names of Lord Stanley, Lord Overstone, Sir Wm. Erle, Sir W. Page Wood, Lord Cairns, Mr. Fairbairn, and other eminent men, and they unanimously recommended that a careful inquiry should be made both of the specification and a model before a patent was granted. He fully concurred in that recommendation, and also in another, that the tribunal should be improved, and that the jury should be dispensed with in the trial of patent cases—the trial to be conducted by the judge, assisted by one or two scientific men as assessors.

Mr. Denman considered that previous inquiries had failed because the principal witnesses were either patent agents or officials, and working-men inventors were entirely excluded. It was in the experience of every lawyer that the owners of patents were not inventors, but some great capitalists who had wit enough to see the value of inventions, and buy them at a cheap rate. He should like the government to promise that they would deal with the question early next session, it being fully admitted that the law was at present in a most unsatisfactory state.

The motion was then withdrawn.

THE ENDOWED SCHOOLS BILL.

This Bill consists of two parts. The first part contains the temporary provisions for the re-organisation, by commissioners, of endowed schools needing reform; the second part consists of permanent provisions for the appointment of an educational council, the examination of masters before their appointment to endowed schools, and the periodical examination of the scholars, and also of scholars in private schools, if registered with the educational council.

The Select Committee have presented to the House of Commons the first part of the Bill as a separate Bill, with the following amendments in it:—The list of institutions excepted from the operation of the Bill is increased by now including schools maintained wholly or partly by annual subscriptions, and having no endowment except school-house or residence; endowments for the education of ministers of any church or religious denomination, or for teaching any particular profession; and choristers' schools; but it has not been thought necessary to retain in this list colleges at Oxford, Cambridge, or Durham.

A new clause enacts that, in framing schemes under this Bill, provision shall be made, as far as conveniently may be, for extending to girls the benefits of endowments. The vested interest clause now proposes that in any scheme relating to an endowed school the Commissioners shall take into consideration the rights of patronage of any member of the governing body, in consequence of any donation made by him. The prohibition against interfering with modern endowments without consent is extended to endowments given within the last 50 (instead of 30) years; and the constitution of the governing body of Quakers' schools and Moravian schools is not to be interfered with, unless by consent.

The Conscience Clauses are not to apply to cathedral or collegiate church schools, nor to endowments which, by express terms (which have been constantly observed), require the scholars to be instructed according to the doctrines or formularies of any particular church or denomination. The clause enacting that in every scheme the Commissioners shall provide for the dismissal at pleasure of every teacher and officer in the endowed schools, adds, "with or without a power of appeal in such cases, and under such circumstances as to the Commissioners may seem expedient."

Some new clauses make provision for the apportionment of income in the case of mixed endowments, partly educational and partly for other charitable uses, the latter not to be diverted from those uses by the new scheme unless with the consent of the governing body. The clause relating to the application to education of non-educational charities does not now include loan funds, neither does it require the consent of the Charity Commission; but it requires the consent of the governing body, and it provides that, in applying such endowments to education, due regard shall be had to the educational interests of the class of persons now benefited by these funds.

In the part of the Bill relating to the preparation of draughts of schemes, it is proposed to provide that the governing body of an endowment exceeding £1,000 a-year may themselves prepare an original scheme or an alternative scheme to that of the Commissioners, to be by them considered, and, if required, submitted to the Committee of Council on Education. The power of the governing body to appeal to the Queen in Council against a scheme is extended to cases where they consider that it has not due regard to any educational interests to which the Bill requires due regard to be had, on the abolition, &c., of privileges to which a particular class of persons are entitled. A new clause provides that no new scheme of the Commissioners shall be submitted to the Committee of Council for approval unless two at least of the Commissioners signify in writing their approval of it; but in other respects one Commissioner may act under this Bill.

The Bill consists of 57 clauses, and disposes of that part of the subject-matter which occupied the first 52 clauses of the original Bill.

THE NEW LAW COURTS.

The following report (accompanied by plans) has been addressed by Mr. G. E. Street, A.R.A., to the Right Honourable the First Commissioner of Works:—

5A, Portugal-street, Lincoln's-inn-fields, May 24th, 1869.

Sir,—In compliance with your request, I have prepared two sets of plans, which I have the honour to send you herewith.

Three of these plans show how the proposed new courts of justice may be placed on the site selected for the purpose by you, and lying between the Embankment roadway on the south, Howard-street on the north, King's College on the west, and the Temple on the east.

The other two plans show how a building of similar contents might be planned, so as to occupy the site already purchased on the north side of the Strand, without any additional purchases of land whatever.

The adoption of the new site on the Embankment, or of the old site on the north side of the Strand (without any purchase of additional lands), would equally involve an entire alteration of the plan which I prepared under the direction, and which received the approval, of the Courts of Justice Commission. That plan depended entirely on my being able to widen Carey-street on the north side, and to alter the boundaries of Clement's-inn and Bell-yard. Without this power, for which additional purchases of land were absolutely required, my scheme was impossible.

In the case of both sites I may observe that as the area to be covered with building is so much smaller than was originally proposed, it will be necessary to omit many departments which were included in my former plans. On neither site would there be any possibility of finding

space for all the offices of the Probate and Divorce department; and probably the Appellate Court, the Bankruptcy department, the Admiralty offices, the Land Registry and Middlesex Registry, or some of them, might also have to be omitted. It does not come within my province to suggest which of these departments should be included and which omitted, but they would be about the same on either site. I propose also to reduce the number of courts to eighteen in all, with the addition, if required, of a large spare court. The Court of Appeal would then have to remain in Downing-street, and there would be no provision for a Bankruptcy Court.

With these prefatory remarks I proceed to report upon the advantages which the two sites offer, and to explain the principal features of my plans, and for convenience I shall take the scheme for either site under the same heads, *seriatim*.

These heads will be—

(A.) Approaches to, and roads round the building, and character of surrounding buildings.

(B.) Light, quiet, and air.

(C.) Arrangement of building, involved by the nature of the site, and its surroundings and levels.

(D.) Advantages or the contrary afforded by levels of ground.

(E.) Advantages or the contrary from an architectural point of view.

Plan for Placing the New Courts on the Thames Embankment.

(A.) The approaches to the building are shown on the accompanying block plan. They are many, and in every respect admirable. They possess the merit, which cannot be too much dwelt upon in the case of such a building, of being not only ample for the purpose, but also of being such as would, for the most part, be free from all noisy traffic, except that which is coming to the building itself. The Embankment roadway will probably never be a very great thoroughfare for carriages; but if it were, the space between the road and the front of the buildings, and the vast open space on the river side of it, would prevent the traffic ever being an inconvenience in the way of noise. The Metropolitan District Railway appeared at first to present a very serious difficulty, the station authorised by the Act of Parliament being opposite the centre of Norfolk-street, with a long opening above it for the purpose of ventilation and light. I am glad to be able to report, however, that all difficulty on this point seems to be capable of easy remedy. I have gone into the matter with the engineer of the railway, Mr. Fowler, who, at my suggestion, has prepared a plan showing how the railway-station might be moved to the bottom of new Essex-street, whilst the ventilation and light are provided for by two moderate openings in front of the south-east angle of the new courts of justice, and a third in the angle of the Middle Temple-garden. I have ascertained that there would be no objection on the part of the benchers of the Middle Temple to this concession of an opening in their garden; and I am of opinion that, with these alterations, the neighbourhood of the railway will do no great damage to the proposed building, whilst the convenience of having a station so close to it cannot be exaggerated. The station will also be more convenient for the public, being at the end of a fine new street, and close to the steamboat pier, which again will be most usefully placed, as affording excellent access by water to the new courts.

On the east side of the building it is proposed to form a new street, following to some extent the line of Essex-street; this will involve the purchase of the whole of Essex-street, and will enable me to deal with the gradients of the new street in the most convenient manner. A continuation of this street across the land already cleared on the north of the Strand would join Carey-street just opposite the end of Serle-street, and so form a junction with Lincoln's-inn-fields.

On the north side of the building an entirely new street would be formed. Howard-street would be widened by the purchase and alteration of the houses on its north side, and would be lengthened so as to be the whole length of the new building from King's College to Essex-street.

Finally, a street would be left on the west side of the building, opening under an archway to the Embankment, and continued as far only northward as Howard-street.

These streets would afford, on every side, admirable accesses to all parts of the building for the general and professional public. But, besides these, it would be possible to make use of two other modes of approach which might be most useful.

The first of those is the terrace carriage-road which already exists in front of Somerset-house. By a few trifling alterations this may be opened to the Waterloo-bridge road, and continued on to the angle of the new building, so as to give carriage access for the use of the judges very nearly to the level of their own rooms; and an entrance from the same terrace would give access, by a few steps down, to the attorneys' rooms and corridor below the judges' floor.

The other mode of access is not one which I can do more than throw out a suggestion for, but it seems to be worth mention, as indicating a mode in which the complaints of the separation of the courts from Lincoln's-inn, by the Strand, may, at any rate, to some extent, be met. You will have to re-sell the land purchased in Essex-street, and to pull down the houses for re-building; and it appears to me that, in doing this, it might be possible to set back part of the fronts of the houses behind open arcades, so as to afford communication with the north side of the Strand, by a bridge on the east side of St. Clement's churchyard, and, if thought desirable, by a tunnel at the same point. A passage might be carried at a level from the base of the north-east angle of the building, and as the difference of level between the Strand and Essex-street at this point is 14 feet, it might pass under the Strand roadway, and rise with steps to the level of the ground on the north side of the Strand. This passage would occupy the area in front of the lowest floor of the new houses east of Essex-street. At the same point, a bridge rising about 25 feet above the Strand would give access on the same level to the rooms and offices above the judges' rooms in the new building, so as to make them, in fact, very much more accessible than they would otherwise be. I make these suggestions in order to show that the position of the new building on the south side of that great thoroughfare, the Strand, may, if proper steps are taken, be so manipulated as to prevent any inconvenience arising to the vast number of lawyers and lawyers' clerks who will daily have to come to the new building from the other side of the Strand. The passage from the Strand bridge to the second floor of the new offices would be treated somewhat like one of the well-known "rows" at Chester, whilst the passage to the tunnel would be an open one, and the tunnel itself might have an opening opposite the end of St. Clement's Church for light and ventilation, without interference with the Strand traffic. It is important to observe that these means of communication with the new building would be really useful, without involving any ascending of staircases on one side of the Strand for the sake of descending on the other. All experience shows that people will not make unnecessary ascents of this kind; but if you can provide passages without such drawbacks, then they will use them, and so avoid the inconvenience or danger of the Strand crossing.

It may be as well here to say that the exact distance from the south-east angle of Lincoln's-inn-fields to the north-east angle of the proposed building will be 2 furlongs and 47 yards, whilst the distance from King's-bench-walk, in the Inner Temple, to the same part of the building will be 1½ furlongs. This north-east angle of the new building will be the natural entrance for bar-

ristersers, and, if it is desired, it will be easy to make a bridge across Essex-street at this point, communicating with Fountain-court, Middle Temple. It may also be as well to observe that the distance from the south-east angle of the new building to the existing offices of the Probate and Divorce Court, in Doctors'-commons, along the Embankment roadway and the new road to the Mansion-house, will be as nearly as possible half a mile.

I say nothing as to the more distant approaches to the building. It is obvious that, where so many good and distinct modes of access exist, the more distant approaches will never be crowded by reason of the existence of this new building. The traffic will distribute itself—or filter, so to speak—into the Strand, and from thence, through no less than four practicable streets—Surrey, Norfolk, Arundel, and Essex-streets, to the Courts; whilst the Embankment-road, the railroad, the river, and the approach in front of Somerset-house will very largely assist in distributing the traffic equally to the various entrances all round the building. Distant alterations of approaches on the north side of Carey-street would not, therefore, be properly chargeable to the New Courts; they would be metropolitan improvements in the strict sense, and not a necessary consequence of the new building, which would, in fact, be only very slightly benefited by them.

I have always laid great stress on having the surroundings of such a building as the New Courts of Justice of good and harmonious character, and such as could not in any way affect the proper and convenient use of every part of it; and on this site they will be singularly good. On the south, we shall have the outlook on the finest river, I suppose, of which any capital in Europe can boast. On the east, almost the whole buildings will have the benefit of the Temple-gardens, and the distant sweep of the river to Blackfriars, and you will provide, no doubt, that the new buildings which will replace the existing Essex-street houses will be erected with strict conditions that they shall be in harmony with the new building, and confined entirely to the use of barristers or solicitors. So again, on the north side of Howard-street, and its prolongation, the whole property will pass through the hands of government, and whether the opportunity is taken to provide here for refreshment-rooms, for law-stationers and booksellers, or for chambers, it will equally be certain that the buildings need be in no way an inconvenience, or an eyesore to the occupants of the New Courts. On the west side, the prospect will not be so cheerful, owing to the singularly lugubrious character of the King's College buildings. But there will be nothing otherwise objectionable in it; the light will be good, and from the whole of the three upper ranges of windows it will be possible to see across the river to the Surrey side of Waterloo-bridge. To conclude, it is difficult, therefore, to conceive a public building being erected on any site in London with greater advantages in its surroundings than this site affords.

(B) What I have already said as to the surroundings of the new building bears to a great extent also on the quality of the light, quiet, and air which it will enjoy. But I may say that I have always maintained that, if the admirable light and air afforded by the river are to be made the most of, it must be by making some considerable opening into the heart of the building from the Embankment. With this view I propose to arrange the bulk of the offices to the east of the Courts round a spacious quadrangle, which will be open on its southern side to the river, so that all the rooms which surround it will partake of the vast advantages which the river side of the site affords. So, again, on the eastern and western sides of the site, owing to the position of existing buildings, the light and air will leave nothing to desire. On the northern side they will be the same as in all other London streets of good width, neither better nor worse. The whole of the site will have unusual advantages as regards quiet. There will be foreign traffic on one side only, viz., down Essex-street, but I suppose this would never be very great in quantity. And there would, no doubt, be some annoyance to the south-east angle of the offices from the passage of trains. This annoyance I have endeavoured to reduce as much as is possible, and it will not affect any other part of the building.

(C) The shape of the ground is so completely different from that which I had to deal with in making the previous plans, that I have had to re-arrange my whole scheme. My principle was, from the first, to separate the Courts from the offices by internal streets and quadrangles; and, in the plan approved by the Courts of Justice Commission, this principle was carried out as completely as possible. If it can in any way be accomplished, I am persuaded that this is the arrangement which will secure the greatest simplicity and ease in the use of the building, and cause the least confusion; and though I think it will be impossible to secure it completely on the Embankment site, I have still kept the same principle in view, and have adhered to it as closely as I could.

The broad feature of my plan now is, that I put the courts, central hall, and all the rooms for juries, witnesses, and the public to the western side of the site, and the great group of offices round a quadrangle to the east of it. But, as the upper and lower portion of the buildings which surround the central hall and courts would not be required for their use, I propose to provide some of the offices, as *e.g.*, the Vice-Chancellors' chambers, above and below the judges' rooms. They are so planned as to staircases and mode of access as, I believe, to minimise any confusion which might otherwise arise from their neighbourhood to the courts, and their position will no doubt be felt by the judges to be better than it would have been in my former plan.

The arrangement of the courts and rooms connected with them is substantially the same that it was in the plan approved by the Commission. In that plan I was always pinched for space between the Strand and Carey-street, and I was compelled, therefore, to make the small internal areas for lighting the rooms below the courts themselves smaller than I would have wished. I am able, in the new plan, to give a few more feet to each of these areas, and so to make a great improvement by putting the jury-rooms immediately under the courts, whilst I also improve the jury staircases and provide lobbies at the back of the bench to all the courts, as well as improve the light to a number of rooms and corridors.

I propose to give the public an entrance to the central hall in Howard-street, opposite Norfolk-street, and other entrances at its eastern and western ends. In this way every facility will be given for access to the courts which surround this hall, whilst it will not form a natural line of thoroughfare for people who have no business to transact in it. The public coming from the railway, the steamboats, or the Embankment will all enter by the eastern quadrangle. But, to prevent the annoyance which would be caused if this were used as a public carriage thoroughfare, I propose to make its pavement at two levels, divided by a terrace or flight of steps across the centre. Carriages then will be able to enter the quadrangle either from the north or from the south, but will have to return by the way they came.

A good deal has been said as to the access for the judges; and, as it has been held to be important that they should not have a great height to mount to their rooms, I propose to avail myself of the roadway already existing on Somerset-house-terrace for their benefit. They will probably always come to the courts from the Embankment roadway, and I assume that some carriage access will be contrived from thence to the western side of Waterloo-bridge, so that they will be able to drive or walk to an entrance only some ten or twelve steps below the level of their own rooms. Here they will have, as in my previous plans, a continuous corridor, entirely without disturbance by the professional or general public, whose staircases will not open into it. I can also provide a judges' entrance in Howard-street or on the Em-

bankment, if it is thought desirable to have either of them.

The bar-rooms will, I think, be best placed to the north-east of the central-hall, where they will be most easy of access from both the Temple and Lincoln's-inn.

The detailed arrangement of the offices, to which I have devoted some months of continuous and earnest labour, and which had received the assent, not only of the Courts of Justice Commission, but also of almost all the heads of departments, will all require reconsideration and rearrangement. The knowledge which I have of the requirements of the various offices, and the plans already approved, will, of course, be of great assistance to me in making fresh plans. How far the amount of accommodation asked for is to be granted or curtailed will probably require some reconsideration, if the cost of the building is to be strictly limited to a fixed sum. But it is not out of place here to say that, soon after my appointment as architect to the new courts, I applied for the appointment of a sub-committee to go through all the provisions for rooms contained in the "Instruction to Architects," issued by the Commission, and that, with their assistance, the requirements were reduced by nearly 40,000 superficial feet. I believe that still further reductions may be made in some of the offices, and that it might be well to have accurate plans made of all the offices in which the business is transacted at present, so as to be able to judge fairly of the amount of enlargement which may properly be asked for and granted, with a view to facilitating the progress of business, and meeting the just requirements of the officials.

(D.) The slope of the ground from the Embankment up to Howard-street is rapid, and at first sight presented considerable difficulties, there being a rise of no less than 23 feet from the Embankment to the highest point of Howard-street. I have bestowed considerable pains on this part of the subject; and I think I see my way to using these levels, so as to make them rather an advantage than the contrary to the convenience of the building. In the first place, I have found it necessary, on various grounds, to give up the idea (which was propounded by the first promoters of the Embankment site) of raising the whole building upon an artificial substructure to the level of the Strand. The expense of such a substructure would be counted by hundreds of thousands of pounds, whilst there could be no compensating increase of convenience, but rather a great deal of inconvenience.

I have preferred to adopt the more common-sense plan of taking the levels of the ground as they are, and building to suit them. And the advantage of this course is, that I am able to make entrances at various levels, and so to give many offices the practical effect of being on the ground floor, which on a level site would have to use flights of steps up or down. Thus, I have ground-floor entrances on the Embankment, and at higher levels in Essex-street, and still higher in Howard-street and from Somerset-house-terrace. And if my suggestion of a bridge across the Strand is ever adopted, there will be the still further advantage of enabling people to go from the Strand to the upper part of the building, with an extremely moderate ascent of steps. I have marked the levels of the various streets and rooms on my block plans with the levels above the Ordnance datum line,* and I think a little study of these will explain better than words can, the levels of the principal parts of the building. The floor of the central-hall would be four feet below the Howard-street entrance, and about 15 feet below the Strand. The courts would be arranged, as to their level in relation to the hall, precisely as they were in the plans approved by the Courts of Justice Commission; and their floor would be 11 feet 6 inches above Howard-street (*i.e.*, exactly on a level with the Strand). The attornies' corridor would be 1 foot 6 inches above the Howard-street entrance; and the judges' corridor 8 feet 6 inches above the terrace entrance, and 15 feet 6 inches above Howard-street, supposing it is thought desirable to give the judges an entrance on this side, as well as at the south-west angle.

(E.) Before I thoroughly went into the question of a design for the Embankment site, I had not realised some of the advantages which it affords. It is true that I allowed, in the discussion on the subject at the Society of Arts rooms, that the Embankment site was preferable to that on the north side of the Strand, but I protested against the unfair disparagement of the latter site as it was proposed to be formed by means of additional purchases, and I pointed out how these had enabled me to design a building, which would not only be very convenient and very conveniently placed, but which would also, I hoped, be an ornament to London. At that time I had thought of the Embankment building as raised on a terrace like that in front of Somerset-house. I foresaw that my building would then rise far higher than Somerset-house, and that the suggestion made by some one to add a story to Sir W. Chambers' building was not one which I could ever endorse. I foresaw also considerable difficulty in planting my building on the curved line of the Embankment without danger of producing an unpleasant result. But in working out the plan to suit the site, I think, as is so often the case in architectural designs, that the very difficulties of the case have proved to be in the end its greatest gains. It is so difficult to do more than express an opinion in a report on such a point as this, that I have thought it best to make a rather careful drawing, showing what the effect of the building would be from a possible point of view. This drawing (which, as regards architectural detail, must, of course, be regarded as only a rapid preliminary sketch) is now before you, and I think shows how very great an opportunity the site offers for a very grand architectural composition, without the slightest sacrifice of the usefulness of the building. The somewhat irregular frontage of the Embankment is met by advancing the eastern end of the building, as near as the railway will allow, to the roadway. In this way I have contrived to make the general line of frontage of the new building very nearly parallel with the line of the Embankment wall. In front of my great quadrangle I have introduced what would, I think, be a striking feature—a grand circular colonnade. This circular arrangement is most convenient as giving a regular termination to the internal quadrangle, and also a regular line when viewed from the outside in connection with the curve of the Embankment wall and road. The irregularity of the frontage gives opportunity for extremely good effects of light and shade, on which above everything I lay great stress in a building of such long frontage; and it involves also a necessity for contrast with the front of Somerset-house, which I cannot but think is a fortunate necessity. In architecture, nothing is more effective than contrast naturally obtained. And I can conceive no less satisfactory mode of dealing with a building on this Embankment site, than any attempt to repeat the somewhat monotonous lines of Somerset-house in a building which, if it were designed and planned on the same system, could not be either in a line with it, or parallel with the Embankment wall, and must, therefore, offend the eye in every point of view.

One very great advantage which the building will have consists in the various points of view from which it can be seen. From Waterloo-bridge (from the farther end of which my drawing is taken) I find the view will be most admirable, because not only will the whole front be seen, but owing to the height of the bridge above the Embankment, the central-hall, rising above and behind, will also be well seen, and will have the most important effect in binding together and combining the general features of the composition. Again, anyone who goes to Hungerford or Westminster bridges, and notices the gap between Somerset-house and the Temple, will see at once how much such a space will be beautified by the occurrence of a succession of bold vertical lines, forming a varied sky

* This is 14 feet below the level of the Thames Embankment roadway.

line, an effect which I think the disposition of my plan will give very completely.

It is important also to say here that in the drawing I have made I have taken no liberties whatever with existing buildings. The space between Somerset-house and the new courts will be exactly as I have shown it, and an even better space for seeing the eastern side of the building will exist between it and the Temple library.

The top of the parapets of my building will be as nearly as possible level with those of Somerset-house, and the raised portions of my design—the central hall and the towers, will be so far removed from Somerset-house as not to affect it. On the other hand, by omitting a terrace in front of my building, I not only am able to utilise the whole of it, but at the same time my building gains enormously in apparent height.

The general line of frontage is advanced as far as the front of the terrace of Somerset-house. This is, of course, a great advantage to my plan, and does no harm, in my opinion, to Somerset-house. If the building were set back to a line with Somerset-house, it would be hardly at all seen by anyone coming from the westward, whereas, as I have planned it, one of the very best views would be obtained from this direction, and Somerset-house-terrace is so large an erection that it may properly be taken as the building line for anything which is built on this part of the Embankment.

Plan for Placing the New Courts on the Site between the Strand and Carey-street.

I proceed now to give a similar explanation of the plan which I have prepared to show how the already purchased land between Carey-street and the Strand may be used for the new courts of justice, without the purchase of any additional land whatever. In the instructions which I received from you to prepare this reduced sketch plan, you requested me to bear in mind that the ascent to the court level by staircases from the street must be of no greater height than would be the case on the Embankment site, and that the same facilities for carriage access, &c., must be provided on the one site as on the other. The plan I have prepared fulfils these conditions as far as possible, I believe, and may be considered under the same heads as that for the Embankment site.

(A) The obligation to confine such a building within the land already purchased is one which puts the greatest difficulties in the way of a satisfactory arrangement of the plan. It is perfectly obvious that no one can have sanctioned the purchase of such a site, with the impression that the purchases were to terminate with those which have been already completed. Nothing, as will be seen by my plans (where the boundary of the land already purchased is marked by a red line), could well be less convenient than the outline of the site, and no provision is made for the amendment of any of the buildings surrounding the site, or of the approaches to it. The difficulties connected with this subject were made apparent as soon as the competing architects were first of all consulted, and, after some discussion, they were finally informed that they might all assume that they were to deal with a site measuring 510 feet from north to south, and that they might make a give-and-take arrangement with the property on the western side of the site, so as to make its general outline rectangular. These directions turned out to be so vague and elastic that no two of the competitors dealt with exactly the same ground, though all of them without exception assumed that additional land would be purchased or obtained by exchange.

In order to provide approaches of some kind to a building on this site, it will be necessary to convert Bell-yard and Carey-street into wide streets, and to make entrances to the office quadrangles from Bell-yard and from Pickett-street. The Pickett-street entrance will be used by all vehicles coming from the west, Bell-yard by those coming from the east, and Carey-street by those which come from the north. The Embankment road and railway will send all their passengers up by Norfolk, Surrey, and Arundel streets to the Strand, and so on by Pickett-street to the courts. But I apprehend that the Embankment roadway would not be very much used for a building on this site, and that most vehicles would come to the courts from the City by Fleet-street, and from the west-end by the Strand. Some alteration of the block of houses between Holywell-street and the Strand, near St. Clement Danes, might be required, in order to make this access convenient; and no doubt the removal of Temple-bar would also be felt to be a very great gain, if it could be accomplished. On the north side there is more difficulty. Every vehicle coming to the courts from this side would of necessity come by Chancery-lane, by Serle-street, or by Portugal-street and Carey-street. All these are very bad streets. The narrowest part of Serle-street is 16 feet 6 inches between the foot pavements, and 26 feet 10 inches between the houses. The narrowest part of Portugal-street is only 18 feet between the houses, and 15 feet between the pavements, and at the junction of Portugal and Carey-streets there is a width of road of 15 feet, and a total width of 26 feet.

These dimensions are all such as to make some alteration imperative if any additional traffic is to be brought into these streets, as it certainly would be by the erection of the new courts on this site. Either Serle-street must be widened, or the road on the western side of Lincoln's-inn-fields must be prolonged southward until it meets Portugal-street, and the latter must be improved and widened until it joins Carey-street. This is not a metropolitan improvement so much as a necessary consequence of the erection of the courts of law on this site. So also, an opening from Holborn to Lincoln's-inn-fields, if not such an absolute necessity is still a necessity; for the building, if it is on the north side of the Strand, ought to intercept the northern traffic and bring it by way of the open roads of Lincoln's-inn-fields to its northern side, without allowing any of it to find its way unnecessarily into the Strand. On the diminished site no space could be sacrificed for a road from the Strand northward, and any such improvement must be made in connection with the streets which lead from the south-west of Lincoln's-inn-fields towards the Strand—such as Houghton-street and Newcastle-street. The plan put out by the Incorporated Law Society is entirely misleading. It shows a site, coloured yellow, which measures 500 feet by 465 feet (contents 5 acres, 1 rood, 433 yards), and a 60 feet road, going from the north side of St. Clement Danes Church to the narrowest part of Carey-street. Such a scheme is absurd on the face of it, and if the Carey-street site is used it must be in its integrity (such as that is), and without any such destruction of its usefulness as such a bisection of its area would involve. And, again, if such a street is to be made, it cannot stop short at Carey-street, but must be carried on to Lincoln's-inn-fields, and thence again, by an opening, into Holborn. This latter opening, however, and any improvement of the thoroughfare on the north side of Holborn, would be metropolitan improvements, and not, it appears to me, fairly chargeable to the Courts of Justice building.

Unfortunately, I have discovered that this map is worse than misleading; it is extremely incorrect. The object of the map is obtained by altering the eastern boundaries of the ground already purchased, and bringing them considerably nearer to Chancery-lane than they really are. And in order to do this, the whole block of houses from the Law Institution on the north to those which front the Strand on the south, is drawn of much smaller dimensions than it ought to be, *e.g.*, from the eastern side of Chancery-lane to the western face of the Law Institution, the Law Society's plan gives 135 feet. In reality, it is 180 feet. So, again, the distance from the south-east angle of Chancery-lane to the south-east angle of the purchased site is shown 105

feet, whereas, in reality, it measures on the ordnance map 145 feet. Again, the clear dimension from east to west between the houses in Bell-yard and the houses in Clement's-inn is shown 630 feet, out of which two 60 feet roads being taken, would leave an area 510 feet in length for building on. In reality, the exact length on the ordnance map between the two points is only 560 feet, which, if the proposed roads are deducted, leaves a building area of not more than 440 feet. Anyone may see that this alteration has been really made on this map by comparing it with my plan of the building on this site, or with the Parliamentary map of August 1st, 1845, from which it professes to be, but is not, accurately copied. It will be seen that, whilst the south-east angle of my building only projects about 10 feet to the east of Temple-bar, the yellow (or building) site on the Law Society's map projects 50 feet east of Temple-bar. The result of this examination of the actual dimensions of the ground is, that allowing the same depth from north to south that I have shown on my plan, viz., 470 feet, and allowing for the two roads east and west of the building, the site coloured yellow on the Law Society's plan, and described as containing 6 acres, would, in truth, only contain 4 acres, 2 roods, and 1,175 yards, As I have felt obliged to show the inaccuracy of this plan in regard to this site, it may not be out of place to say here that it is similarly inaccurate as regards the Embankment site; and that, curiously enough, the inaccuracy in this case makes the distance from the north side of Howard-street to the line of Somerset-house-terrace about 40 feet less than it ought to be, and so diminishes the apparent value and size of this site, in the same way that it increases those of the other site.

The surroundings of the building on this site were all of them provided for amply in the plan approved by the Commission, but every portion of them, except on the Strand side, depended upon the power to make additional purchases of land. If these purchases are not made under compulsory powers, I do not see how a public building can properly be placed on this site. The surroundings are, to a large extent, not merely poor, but of a very bad kind indeed. In Bell-yard the frontage is very irregular, and many of the houses appear to need rebuilding; but they are so shallow, having another court or alley behind them, that it would hardly be worth while to rebuild them, unless the whole block from Chancery-lane to Bell-yard could be purchased at one time. Higher up in Bell-yard is the Law Institution, which is now in course of being added to and raised a story in height. Its front is not parallel with the new courts, and I regret that the Law Society have not seen their way to making alterations in their building of such a kind as would make it harmonise with the new law courts, if they are built opposite to it. On the north side of Carey-street, east of Serle-street, the houses are not quite so irregular as they are in Bell-yard. They consist of shabby low buildings at the back of the houses in New-square. It seems that these houses are, each of them, divided among so many different owners, that it would be next to impossible to purchase them with any view to their improvement, except by the compulsory powers of an Act of Parliament, and it may be assumed, therefore, in the absence of such powers, that these houses would remain very much in their present condition, facing the new buildings. The case is very much the same as regards the houses west of Serle-street. Here a large number has been bought by a company with a view to rebuilding the whole block as offices, but many of the houses have not been, and cannot, I believe, be bought by any private company, and so, here again, the houses will, I presume, of necessity, remain in somewhat the same condition as at present.

On the north-west side, the buildings remaining formed one side of Yeates'-court. They are poor squalid houses, and ought undoubtedly to be purchased and rebuilt, or removed. On the south-west, the property all belongs to Clement's-inn, and there is an agreeable opening to the gardens of that inn and New-inn. Probably if the courts were built here, the authorities of Clement's-inn would build chambers facing the new building, and so give no reason for complaint on this side. But, on the other side, I feel bound to say, that unless in the exercise of a wise economy, Parliament would authorise the purchase of most of the property I have described, with a view, not necessarily to building on it, but to its resale, under strict conditions, as to rebuilding, it would not be wise to erect a public building on such a site; for I am quite certain, that, owing to its inferior character, if the building were placed here, it would, after all, have to be purchased when it would have much increased in value, and after the arrangement of the building had been interfered with to its detriment on account of it.

The judges' approach to this building would be from the north-west, *viâ* Portugal-street or Serle-street. They could then drive to a door very nearly at the level of their own floor. The barristers from the Temple and Lincoln's-inn could not have the bridges originally proposed for their use, inasmuch as I have had to lower the floor of the central hall, and with it the floors of the courts and other rooms. They would, however, all enter the bar rooms in Bell-yard. This entrance would be rather more convenient, of course, to Lincoln's-inn than to the Temple.

(B) In respect of light, air, and quiet, this site would not be so good as that on the Embankment. The Strand is so noisy as not only to affect all rooms looking towards it, but to make it impossible to allow of large openings in the south front for architectuaal effect or entrances. Carey-street and Bell-yard, also, will not be so quiet as I should wish to make them. In my former plan, approved by the Commission, I had not allowed Bell-yard to be a through thoroughfare for carriages, and heavy traffic in Carey-street would have been, to some extent, diverted by means of the bridge which it was proposed to make to New-square, Lincoln's-inn. In the absence of these precautions both these streets might be noisy. If it could be done without interfering with the rights of the old houses on the east-side of Bell-yard, I should still wish to put a bar across to stop traffic through it, but I doubt whether this could be done. The rest of the site looking towards Clement's-inn and Yeates'-court will be perfectly good as regards quiet, but it may be doubted how far the air coming from the poor neighbourhood of Clare-market and King's College Hospital will be good, unless some steps are taken to effect a clearance round the site.

(C) The instructions I have received, require me to provide as good an arrangement of plan, in regard to levels, light, &c., as that which I have provided on the Embankment site. This requirement would have involved a complete alteration of some portions of my plan, even if the reduced and irregular shape of the site had not made it absolutely necessary. It will be seen by referring to my block plan, that in order to get length of ground for the group of courts, central hall, and rooms attached, it is necessary to move them all up to the northwards, to that part of the site which possesses sufficient length to receive them. And in any case if the shape of the site had admitted of the courts, &c., occupying the centre, as they did in my approved plan, there would have been a great objection to their doing so, on account of the reduced width of the site, which would have made it necessary to reduce the internal areas so much in width, as very much to interfere with the amount of light throughout. And, I thought, also, that if on the Embankment site I provided an open quadrangle for the offices, I was bound to show how a nearly equally good arrangement might be provided on this site. My plan also provides the same increased width from north to south of the block containing the courts which I have provided on the Embankment plan, and consequently for the improved lighting and arrangement of many of the witness and jury rooms, &c. The

entrances to the central hall and courts will be at the east end in Bell-yard, and at the west end under a raised courtyard. The floor of the hall will be raised very little above the natural level of the ground, so that there will be as few steps as possible up to the courts from the Strand side. The bar room will be at the east end of the hall. The judges will be able to drive to their entrance at the west end, which will be as convenient in point of height as their entrance to the building on the other site. I have managed this by the construction of a raised courtyard at the end of the building, with a road rising very easily from the west angle of Carey-street. This entrance involves the necessity for the judges to arrive from the north; if they come from the south, which they probably would not usually do, they would have to ascend about 22 feet 6 inches from the entrance to the floor of their rooms.

The irregular shape of the western portion of the site makes it very difficult to use it satisfactorily. I have shown on my block plan how it might be used so as to make the most of the land, and at the same time to admit of fairly good architectural arrangement, both for convenience and for effect. But even this arrangement brings the building into most inconvenient proximity to existing buildings.

In this plan it would be necessary to put offices above the judges' rooms. There would be a somewhat greater area occupied by offices, but, as far as I can judge at present, there would not be much difference in the available office room between this plan and that for the Embankment, owing to the greater height of building on the latter to which it would be possible to get convenient and easy access.

(D) If no more land is purchased, of course no alteration of any kind can be made in the levels of any of the streets surrounding the building. I think the levels may, however, be managed very well, though it will be impossible here to contrive any such scheme for facilitating the rise to the upper floors, as I have suggested on the southern side of the Strand; in most other respects the levels will be equally good. It will be impossible, now that the floor of the courts is lowered, to contrive any passage to them across the Strand, and a tunnel under it would involve the purchase of a considerable amount of property (which might of course be partly sold again) on the southern side of the Strand.

This site presents some æsthetical advantages which it would be very wrong to ignore. The elevation above the river is considerable. The entrances to the central hall would be exactly on the same level as the court-yard in front of St. Paul's Cathedral, and the floor of the central hall here would be 22ft. higher than it would be on the Embankment. To this extent, therefore, it would, in all distant views, rise higher and be better seen than on the lower site. And I think also the position would be an important one, crowning the hill opposite St. Paul's, and supplying what the views of London want, some very marked architectural feature in the long expanse of buildings between St. Paul's and Westminster.

On the other hand no near view could ever be obtained which would at all equal the view which would be had of a building on the Embankment site. The buildings facing the streets would all be so high as to shut in and completely conceal from sight the whole of the central hall and a great part of the towers, and it would only be at a great distance that these would ever be seen rising above the rest of the buildings. Again, it would be impossible in the Strand-front to gain anything like the fine effects of light and shade which could easily be obtained on the Embankment, and which are indeed a necessity there, if the ground is to be made the most of. In previous expressions of my opinion on this subject, I have spoken strongly of the effect of a great building crowning this eminence. I had in my mind when I did so, the vast extent of my plan as approved by the Courts of Justice Commission, including, not only the central hall and courts, but the great Probate Department, with its towers for the reception of wills, which, grouping with the other towers and lofty roofs of the building, would have given scope for great architectural effect. The reduction of the scale of building, the omission of the towers for wills, and the apparent certainty that the surrounding buildings will all be mean and unworthy of their position, if no more land is purchased, seem to me to make a vast difference in the view I am compelled to take, and to deprive this site of the claims I considered it had to be very nearly on a par with the other, in regard to the opportunities it afforded for erecting a building which should be a great architectural success, and an ornament to the capital.

I have now gone through the reasons which, it appears to me, are to be given for and against the two sites, endeavouring, I hope successfully, to treat the question in the most impartial and dispassionate manner.

On the whole, it appears to me that the Embankment site affords by far the best opportunity for a great work, now that the reduced scale of the building is accepted by the opponents to your scheme. I have found, I am bound to confess, that the more I worked at the plan for the building on the Embankment, the more it seemed to be possible to make the work one with which men of taste might be satisfied from an architectual point of view; and I have good hopes that, if the building is in the end placed on this site, it would be possible, in the way I have indicated, to make it so really convenient to all those whose business lies in it, as to involve no very serious sacrifice, if any, of the present use or asssociations of the great inns of court, or other centres of legal business.

I have the honour to remain, Sir,
Your very obedient servant,
George Edmund Street.

PARIS CATTLE SHOW AND AGRICULTURAL EXHIBITION.

The second general exhibition of fat cattle which has taken place since the establishment of the great market and abattoirs at La Villette, opened on the 22nd March. The number of animals exhibited was—232 oxen and bulls, 53 cows, 23 calves, 26 lots of sheep (ten in each lot), and 166 pigs. These numbers show no advance since 1858, but an immense one as compared with 1850, where there were exhibited only 72 head of neat cattle of all kinds, and 21 lots of sheep. It is remarked that the number of sheep is falling off in France, and therefore it is not very surprising that the number shown this year, although slightly exceeding those of 1868 and 1862, is otherwise the lowest since 1858, and below the numbers of 1851 and 1852. The number of pigs, on the contrary, progressed, almost without interruption, from 22, in 1851, to 127, in 1864, then fell gradually to 103, last year, rising this year to the unprecedented number of 166.

There were several supplementary exhibitions added to that of cattle this year, which added greatly to the general interest. First, exhibitions of live and dead poultry, rabbits, &c. The collection of the former numbered 345, and included fine specimens of every kind of poultry reared in France, rabbits, leporides, or crosses between the hare and rabbit, and again of crosses between the leporides and wild and tame rabbits. The exhibition of dead poultry, exhibited as prepared for market, was much smaller than those which have taken place in the heart of Paris in the winter season, but there was no falling off in the quality and appearance of the poultry, in which France certainly surpasses all other countries.

The exhibition of seeds, grains, and roots comprised about six hundred lots of all kinds, including, amongst other comparative novelties, several varieties of gigantic maize, such as caragua, horsetooth, and illinois, which are now being cultivated in all parts of France for

forage, and in the south for seed or for grain for fattening poultry, and other purposes. Many well-known agriculturists report most favourably upon these varieties of Indian corn, which grow to the height of ten or twelve feet.

But the section which has a special interest in Great Britain at the present moment is that of the sugar-beet, which was largely represented at the exhibition in nearly all its forms and colours. Amongst others, we found specimens of a long kind of beet grown at Steene, in the department of the Nord, on a sandy soil, of which one hundred acres are sown with beetroot; each hectare, equal to two and a-half acres, receives, we are informed, fifty tons of farm manure, and rather less than half-a-ton of colza oil-cake, and produces from 45 to 48 tons of roots, or from 32 to 36 cwts. of seed. Other samples of the long kinds produced at Fortez, in the Aisne, on a clayey soil, and reported to produce on the average from 70 to 85 tons per hectare. Long sugar beetroot, with rose-coloured top, largely cultivated in the department of the Oise, and producing 60 tons per hectare. Of the more favourite varieties of sugar-beet, those with globular roots, the following are examples of those exhibited:—Yellow globe, sown in April on a calcareous soil in the Gers, and producing 30 tons per hectare; the same kind, grown in the Saône and Loire on a silicious clayey soil, produced, in 1868, only 35 tons per hectare, on account of the extreme dryness of the season; the same, grown on the same kind of soil as the preceding, in the department of the Creuse (the ground was cultivated in ridges, and received 90 tons of manure), produced per hectare, 40 tons of roots, and a half-ton of seed; a red globe beet, grown on a clayey soil at Salival, in the Meurthe, twenty hectares received forty tons of manure, and produced 55 tons of roots per hectare.

These particulars, furnished by the growers themselves, will give an idea of the productiveness of the sugar-beet from an agricultural point of view; the relative value of the roots depends of course on the quantity of saccharine matter contained in the beetroot, and this is said to be largest in the yellow globe, and in roots of moderate size.

Fine Arts.

PARIS ANNUAL EXHIBITION OF THE WORKS OF LIVING ARTISTS.

The doors of the Paris salon of 1869 were opened, as usual, on May morning, and the fifteen great rooms containing oil paintings were well filled, not to say crowded, during the whole day, while sufficient visitors were distributed amid the cool glades of engraving and architecture, and in the garden below, to have filled another good-sized exhibition.

The sculpture is placed as, with few exceptions, it has been for some years, in and around a garden laid out geometrically, and planted with charming flowers and shrubs by the Imperial Horticultural Society, which was to have a special exhibition there soon after the opening of the salon, and this garden, in which also is a fairly managed buffet for refreshments of all kinds, supplies a most grateful change from the hot glass-roofed rooms above. Still, even with this relief, a mere flying view of an exhibition containing more than four thousand works of art is a serious undertaking, and it would be rash indeed, from such a first view, to speak at all critically upon the collection.

All that is possible is to mark a few salient points. The central room is devoted, as usual, to official works, a few of the best of the large canvases, and a selection of the most remarkable cabinet works in the exhibition. The tempting Imperial prize of one hundred thousand francs has naturally caused the production of many very ambitious works, and the effect of this is to diminish the effect of the central room, for assuredly none of the large works now on its walls can be considered great enough to deserve the Imperial prize. The place of honour is occupied by a work of immense size—"Apollo and the Muses in Olympus," intended for the ceiling of a concert room attached to the great new theatre at Bordeaux, by M. Bouguereau; the chief figure, that of Apollo, the imperial group, and the Graces are somewhat wanting in dignity and beauty, but many of the figures in the foreground are drawn with a masterly hand, and show how well French artists study the human figure. Opposite to this work is a large one by M. Bonnat, "The Assumption of the Virgin," painted for the Lady Chapel in the Church of St. Andre, at Bayonne; a group of holy men are kneeling around a tomb while the Virgin rises above, supported by angels. Many of the kneeling figures are admirably drawn and draped, although the coarse naturalness of the hands and feet, a characteristic of this painter, rather detracts from the effect of the work. Unfortunately, as in M. Bouguereau's picture, the chief group is the least effective.

M. Courbet contributes one of the large canvases in this room; the subject is a stag hunt, with the snow on the ground, and probably neither the general composition, the colour, nor the drawing will add much to the painter's reputation.

The centre of the fourth wall is occupied by an immense picture, by M. Leullier, of the "Inundation of the Loire in 1866." A number of unfortunate people, many of them half naked, have sought refuge on the tops of the houses, and relief is arriving in boats. M. Leullier has not spared horrors, but he has failed to elevate them by sentiment.

The list of large compositions in this room is completed by two Scriptural works, one of which is "The Burial of Moses."

The most important work in the great room is "Lanjuinais at the Tribune of the Convention" (2nd June, 1793), by M. Muller. The orator has risen to speak against the acts of the Mountain, and the members of that section have risen and attempted to drive him from the tribune; Legendre even points a pistol at his throat, but the orator clings with desperate energy to the woodwork of the tribune, and finishes his speech amid indescribable uproar. This picture does honour to the artist of the famous work now in the Luxembourg gallery, "The Last Day of the Reign of Terror, or the Roll Call of the Condemned;" it differs from it entirely in sentiment, one being a scene of heart-rending despair and resignation, the other of the wildest, almost savage fury opposed to manly fortitude, but both are remarkable examples of acute observation and effective rendering of human passions, and both canvases are filled with life and expression. This is the only really historical work that we have yet found in the exhibition.

M. Viger presents one of his pretty drawing-room scenes of the First Empire, called "Les Loisirs de la Malmaison," with the Empress Josephine and Queen Hortense for the principal figures.

"A Fantasia in Algeria," by M. Fromentin, is another very remarkable picture. The Arabs are going through the Eastern military show, galloping wildly about, and firing their pistols in the air, till man and horse alike seem half-mad with excitement; the figures are small, but they are drawn with great vigour, and brilliantly coloured.

Gustave Doré and Mac Callum divide the honours of landscape in the great room; the former has an Alpine scene, "A Valley in the Bernese Oberland," and the latter, "A Summer Scene in Burnham Wood." Both pictures are sure to attract very considerable attention, owing to the high reputation of the artists.

We were sorry to miss Meissonnier and his son, Robert Fleury and his son, Rosa Bonheur, a confirmed absentee now, Hamon, and several other popular artists. M. Cabanel is only represented by two of his charming female portraits; Gérome has two works, one of which has for its subject "Ladies of the Harem in a

Pleasure Boat," a pleasing work, but in a lower key than most of M. Gérome's pictures. M. C. T. Frère has a remarkable work, called the "Simoon; Ruins of Palmyra."

M. Giraud, one of last year's prizemen, has a very clever work, "An Unfortunate Matador Mortally Wounded," who, while being carried from the arena, gives his fainting mistress the *deirsa*, or knot of ribbons from the bull's shoulder.

The sculpture is considered to be superior to the painting this year, but the correctness of this opinion may perhaps be doubted. There are, however, some admirable examples of the former, as for instance, "The Woman taken in Adultery," by M. Cambos; "Narcissus," by M. Holle; "Despair," by M. I. J. Perraud; and a coloured statue of "Cleopatra before Cæsar," by M. Clésinger, which attracts great attention and much discussion.

Brussels International Exhibition of Works of Art.—The dates of the opening and closing of this important exhibition are now fixed, the former being the 25th of July and the latter the 26th of September. As the title imports, the exhibition is open to artists of all nations. Works of art are to be addressed, "à la Commission directrice de l'Exposition des Beaux Arts de Bruxelles," and to be accompanied by a notice, containing the name and address of the artist and the entry for the catalogue. No artist is to be allowed to exhibit more than four works, but a number of drawings, miniatures, engravings, medals, &c., may be included in one frame. Oval, octagonal, or other works must, according to the usual rule on the Continent, be mounted on or within rectangular frames. Cases must be delivered carriage-free at the Belgian frontier, the Commission defraying all expenses both ways within the country. The 30th of June is the last day for the reception of works for exhibition, unless they have been shown at the Paris Exhibition, when they will be admitted, on previous notice being given, till the 10th of July. All the usual classes of works of art are included in the programme, the class of engraving comprising lithography and heliolithography. Photographs are not named. The jury of admission, following the practice of Paris, is to be elected by the exhibiting artists, and is to be composed of five painters (two at least of whom must have produced historical works), two sculptors, one engraver, and one architect, with the President of the Commission acting as chairman. The prizes are to be awarded by a jury, to consist of the admission-jury above referred to, with four additional members appointed by the government. The number of medals to be awarded is small, namely, five in painting, two in sculpture, one for engraving, and one for architecture, with three supplementary medals if the jury deem them necessary; but there are other recompences and inducements held out to artists. In the first place, the jury is to point out the works which they consider the State should purchase; and, secondly, sums of money, not less than 200frs. or more than 1,000frs., are to be awarded by the jury to young Belgian artists, by way of encouragement.

French Provincial Exhibitions of Pictures.—The number of works purchased at the Lyons Exhibition amounted to 105 in number, and the total of the money paid for them to £2,336. Amongst the purchases were works by Chaplin, Comte, Schreyer, Landelle, Mesdames Huet, Koch, and other well-known artists. The Roubaix Exhibition contains the relatively large number of 800 pictures, and the catalogue is full of well-known names.

Commerce.

West Indies Sugar Manufacture.—The *Produce Markets Review* says:—"We cannot but regard the public sale of a parcel of Barbadoes pieces, made in the island, as an important event; and apart from the question of the sugar itself, we are glad to have to report so very decided a step in advance as the establishment of a refinery in Barbadoes. The West Indies are evidently beginning to move with the times, and with their unrivalled advantages in soil, climate, and the flavour and quality of their produce, there can be little doubt that they have a splendid future before them. But to ensure it the change must be radical, and the whole of the antiquated system at present pursued must be thrown aside."

Cotton Supply.—The *Cotton Supply Reporter* for May 1st, says:—"The last American crop appears to have been overestimated, and is not likely to exceed that of the previous year. Will the next be larger, and may we reasonably calculate on more adequate supplies and lower prices next winter? If, as we are assured, last year's crop was worth 300,000,000 dollars, we do not need any stronger guarantee than this fact affords that there will be no falling off next season in the production of cotton. Accordingly, all recent accounts from the Southern States indicate the determination of the planters to make the most of their opportunities, and confirm the expectation generally entertained, that a very large area will this year be planted with cotton. We may consequently fully expect that the next crop will, at the least, be equal to either of the last two, and it is not unreasonable to anticipate some considerable increase. The American supplies have always the advantage of reaching the market before those from other sources come forward, and according to all present appearances they will realise prices amply remunerative. We cannot doubt, therefore, that in the Southern States no effort will be spared to produce as large a quantity of cotton as possible. But how will it be elsewhere; will the production be so great that, should America raise three million bales, the price must fall so far as to become unremunerative, and to discourage further exertion? We have no fear of this result; the demand will fully equal the supply; the effect of high prices is not to accumulate goods, but to keep stocks low; and as the raw material becomes more abundant, there will be an increased consumption. A larger production of cotton is an urgent necessity, and in India and America combined, in addition to Egypt, Brazil, Turkey, and other cotton-growing countries, there ought to be no difficulty in obtaining all the supplies that are required. The 'fertilisers' used with so much advantage in the Southern States will, it is hoped, be found not less beneficial in India; the soil needs enrichment, and if by means of the manure recently forwarded by the Cotton Supply Association for distribution in the Bombay presidency, the cotton lands there should be made more productive, and should yield a larger quantity per acre than hitherto, the result of the experiment will be an encouragement to further efforts thus to increase the growth of cotton in India. The improved quality of Indian cotton has begun to excite attention, and indicates a very gratifying degree of progress."

Colonies.

Statistics of Victoria.—The returns lately published of the year 1868 show that the total value of the exports was £15,593,990. There were 2,067 vessels, of 653,412 tons, entered inwards; and 2,172 vessels, of 684,207 tons, cleared outwards. The total value of goods transhipped was £593,307. The wool exported was valued at £4,567,182; gold in specie, £507,662; Victorian gold, £6,629,465; other gold, £1,213,732; and tallow, £160,909. Of the £13,320,681, of which the year's imports are made up, no less than £1,305,825 consisted of gold imported from New Zealand. The past was the first year in which such an item appeared among the imports. While there was a duty on the gold exported, all

gold exported might be safely taken to be the produce of Victoria, as no one would import a commodity which he must re-export when he would have to pay export duty. But the gold duty ceased in 1867, and, therefore, comparing the imports of 1868 with those of former years, allowance must be made for this £1,305,000 of New Zealand gold, which really only came here *in transitu*, and did not belong to the general imports of the colony. Making this allowance, we find that the *bonâ fide* imports of Victoria in 1868 were valued at £12,014,836. With the exception of 1867, this is the lowest value of any year since 1855. For the last ten years imports have been as follows:—

1859	£15,622,891	1864	£14,975,815
1860	15,093,730	1865	13,257,537
1861	13,532,452	1866	14,771,711
1862	13,487,787	1867	11,674,088
1863	14,118,727	1868	12,014,836

Galena in Queensland.—A Brisbane paper says that the discovery of a galena mine in the Burnett district has lately created a considerable sensation in this colony. The lode in the ground is traceable for about 600 yards by the outcrop, the matrix being porphyry and limestone—minerals which are said to be always indicative of the probably abundant presence of silver. The continuity of the lode has also been proved by shafts, in some of which the vein of ore, at a depth of 30 feet, attains to the width of 14 inches. It is calculated that, in the present state of the works, two men can easily raise 20 tons of ore per week, but, with the investment of capital, this yield can of course be indefinitely increased, as there appears no limit to the resources of the mine. The ore already obtained is estimated to carry 100 ozs. silver to the ton. It is proposed to erect smelting works on the spot, so as to reduce the cost of land-carriage to a minimum, as well as to turn to profitable account the copper and other minerals with which the walls of the lode appear impregnated.

Mineral Caoutchouc in Australia.—The *Times* says that "recent communications from Adelaide, South Australia, have made known the discovery, in the southern portion of the colony, of a remarkable carboniferous substance, which, hitherto, has only been found in small quantity in the coal strata of Derbyshire. It is a "mineral caoutchouc," so called from its general appearance and some elasticity. In Australia it is found on the surface of the sandy soil, through which it would appear to exude from beneath, as, burnt off occasionally by the bush fires, it is again found after the winter season, occurring in quantity and of various thickness. Analysis proves it to contain 8·2, or more, per cent. of a pure hydro-carboniferous oil; its value for gas-producing purposes would, therefore, be great, and it is also believed to be applicable to the manufacture of certain dyes. The discovery is also important from its indication of the existence of oil or other carboniferous deposits beneath the surface."

Notes.

Agricultural Cottages.—In a letter by Mr. Christopher Nevill, in the *Times* of the 26th May, that gentleman states that he has lately built, in the neighbourhood of Newark, a double cottage, as good as any labourer in one of our best-paid counties need wish to live in, costing rather under £170 per pair. The difficulty has been the three sleeping-rooms, but inasmuch as in practice it is found if half the cottages have three bedrooms, and the other half two, the supply is amply sufficient, he has devised a pair of cottages with five bedrooms, the middle one being thrown into either cottage, as required. Each cottage has half an acre of garden, and the rent pays five per cent on the cost. His bricks cost 22s. per 1,000. A plan and detailed account of cost may be obtained of Mr. Goddard, the architect, at Lincoln.

International Coinage.—The following resolutions of the International Decimal Association on International Coinage were agreed to at the last annual meeting:—1. That it is advisable, for international purposes, that a single standard for coins should be adopted in all countries, and that that standard should be gold. 2. That, for facilities of exchange, the degree of fineness in the standard should in all countries be nine-tenths. 3. That considering the extensive and growing use of the decimal system, and the time and labour which it saves in computations of money value and in all commercial transactions, the unit of money value in every country should be decimally subdivided. 4. That, in the opinion of the association, the greatest advantages would result to the country, if Great Britain were to join the Monetary Convention, concluded the 28th December, 1865, between France, Italy, Switzerland, and Belgium, by Art. 12 of which convention the right of accession is, under certain conditions, reserved for other States. 5. That, in the opinion of the association, in order to make the sovereign interchangeable for international purposes, it is desirable that the quantity of pure gold contained in it should be reduced to the precise equivalent of the gold piece of 25 francs. 6. That in order to bring the British system and the system of the Convention into closer contact, it is desirable that the sovereign so altered should be divided into 250 new pence. 7. That whilst recognising the increased facilities which would result by the establishment of a simple and clear relation between such leading units as the sovereign, the dollar reduced to the level of five francs, and the franc, the Council of the International Decimal Association, anxious to promote one common universal unit of money, strongly recommend to her Majesty's government to consider the advantage of adopting the 10-franc piece in gold, consisting of 100 new pence as before defined, as an international unit, and to submit the same for the adoption of the nations, parties to the Monetary Convention of December, 1865. 8. That it be recommended to her Majesty's government to take the necessary steps for convening or joining another International Monetary Conference, for the purpose of settling the details of a complete system of international coinage. 9. That copies of these resolutions be transmitted to the president and vice-president of the International Decimal Association in all countries.

MEETINGS FOR THE ENSUING WEEK.

Mon.....Entomological, 7.
British Architects, 8.
Victoria Inst., 8.
Royal Inst., 2. General Monthly Meeting.
Social Science Assoc., 8. Dr Alfred Carpenter, "Influence of Sewer Gas on the Public Health, and the Theory of Ventilation as required in Sewers."

Tues ...Society of Arts, 11 a.m. London Cab System.
R. Medical and Chirurgical, 8½.
Photographic, 8.
Ethnological, 8. Sir Wm. Denison and Major Pearce, "On Indian Ethnology."
Royal Inst., 3. Mr. Emanuel Deutsch, "Semitic Culture."

Wed ...Geological, 8. 1. Rev. — Joass, "On the Auriferous Deposits of Sutherland." Communicated by Sir R. I. Murchison. 2. Dr. G. H. F. Ulrich, "Observations on the Nuggetty Reef." 3. Mr. J. J. Murphy, "On the Nature and Cause of the Glacial Climate." 4. Mr. D. Mackintosh, "On the Correlation, Nature, and Origin of the Drifts of N.W. Lancashire."
Architectural Assoc., 8.
Microscopical, 8. 1. Rev. J. B. Reade, "On a Method of Illumination by which the True Form of Diatom Markings is Discovered." 2. Mr. Jabez Hogg, "On Results of Spectrum Analysis."
R. Literary Fund, 3.

Thur ...Royal, 8½.
Antiquaries, 8½.
Zoological, 10.

Royal Society Club, 6.
Mathematical, 8.
Society of Fine Arts, 7½. Adjourned Annual General Meeting. 8½. Lecture by Mr. T. Page.
Fri .....Astronomical, 8.
Sat .....R. Botanic, 3¾.

Patents.

From Commissioners of Patents' Journal, May 28.

Grants of Provisional Protection.

Albums, &c.—1453—H. Ing.
Armour, mounting and working defensive—1497—T. Berney.
Beetroot, &c., treating—1486—J. H. Johnson.
Bicycles, &c., wheels, treadles, and breaks of—1463—V. de Stains.
Blast furnaces, &c.—1435—H. Bessemer.
Bottles, devices for securing corks in—1535—A. Van Winkle.
Bottles, washing, &c.—1472—C. Ferguson.
Bottles, &c., caps for the tops of—1550—W. M. Moore.
Bottles, &c., cases for—1482—H. B. Barlow.
Bottles, &c., capsules for closing—1536—W. R. Lake.
Cables, &c., lever fastening for—1465—J. Timmins and J. Gayton.
Carriages, propulsion of hand-power—1491—V. R. Batchelor.
Cartridges—1490—I. M. Milbank.
Cast-iron, treating—1391—C. D. Abel.
Cast-iron, treating—1409—F. C. Knowles.
Cloth, &c., damping and pressing—894—V. Chémery.
Coal vases—1521—F. Walton.
Cord tighteners for curtain fixtures—1558—C. C. Parker.
Cotton, &c., spinning, &c.—1500—R. Wilson.
Counterpanes or quilts, weaving—1478—J. and J. Kippax.
Cushions, mattresses, &c.—1423—W. Currie.
Drinking fountains, &c.—1477—I. and J. H. Storey, H. Lea, and T. Lane.
Driving bands, couplings for connecting together the ends of—1475—W. Cadogan.
Dyeing and printing—1421—C. Lauth.
Electro-telegraphic apparatus—1467—W. A. Lyttle.
Factory sliver cans—1509—W. E. Newton.
Feeding bottles, &c., valves for admitting air to—1468—T. G. F. Dolby.
Fire-arms, revolving—1510—W. R. Lake.
Fire grates—1499—R., J. J., and L. R. Bodmer.
Fire grates—1518—J. Waterworth.
Fluid meters—1401—E. Seyd.
Furnace doors—1412—H. Myers.
Galvanic batteries—1441—C. D. Abel.
Gas—1493—L. A. V. Dubourg.
Gas and water meters—1522—J. Woodward.
Gas pendants and chandeliers—1501—H. de Garrs.
Glass, securing panes of—1534—R. E Keen.
Glass, &c., ornamenting, &c.—1495—W. Wilkinson and M. Boss.
Gun locks—1427—W. E. Newton.
Hay-making machines—1417—W. N. Nicholson.
Horse collars—1411—B. Hunt.
Horse shoes—1485—F. Hedley.
Horse shoes, &c.—1546—D. Roberge.
Hot-water boilers used for heating purposes—1503—R. Harlow.
India-rubber bags for the manufacture of felt hats—1516—C. Moseley.
Iron and steel—1431—H. Bessemer.
Iron and steel—1433—H. Bessemer.
Iron and steel, preserving—1562—J. McMillan and J. McGregor.
Iron and steel tubes—1524—J. L. Clark and J. Brotherton.
Juices, expressing—1461—A. V. Newton.
Kitchen ranges—1393—W. Bennett and J. Currall.
Knives and forks—1480—J. T. Griffin.
Lace—1507—T. Wright and I. Fox.
Lifting apparatus—1488—G. T. Bousfield.
Liquid soap—1277—J. Scharr.
Liquids, measuring—1471—J. Fawcett.
Locomotive engines and carriages—1519—A. M. Clark.
Looms—1504—D. Hitchen.
Machinery, working without fuel or labour—1261—J. Thompson.
Measuring distances, apparatus for—1566—J. P. Nolan.
Meat, &c., desiccating and preserving—1419—H. A. Dufrené.
Metal cans or tins—1505—A. Dunn and A. Liddell.
Metal plates employed for roofing, &c., securing—1520—G. Allan.
Metal screws, machinery for forming the threads of—1512—W. R. Lake.
Motive-power, obtaining—1333—A. Sleigh.
Needles—1514—A. Tatham.
Oils and fats, refining—1469—J. Townsend and P. Forbes.
Ornament for personal wear—1474—A. Friedmann.
Paper-hangings—1525—A. V. Newton.
Paper, manufacturing—1337—R. Craig.
Pens, penholders, &c.—1407—F. Leonardt and H. Hewitt.
Perambulators—1538—W. Martin.
Puddling furnaces—1413—E. Maybury, G. Matthews, and E. Marston.
Pumping apparatus, &c.—1405—J. Ramsbottom and T. M. Pearce.
Purses, &c., fastening for—1484—M. Wolfsky.
Railway breaks—1395—W. Galloway.
Railway breaks, &c.—1529—W. Naylor.
Railway carriages, working and applying the breaks of—1481—W. Finley.
Railway lamps—1508—S. W. Clark and W. R. Sykes.
Railway trains, communication in—1415—E. S. Copeman.
Railways—1487—C. E. Spooner and G. A. Huddart.
Railways, applying breaks on—1506—C. E. Brooman.
Railways, connecting and sustaining the rails of—1447—A. Vickers.
Roller blinds, &c., fittings for—1445—J. B. Payne.
Safes, &c.—1399—J. M. Hart.
Safes, &c.—1552—W. F. Fuller.
Saw teeth—1459—J. H. Johnson.
Secret votes, apparatus for registering—1526—E. C. Warburton.
Ships, &c., composition for coating—1464—E. V. Newton and P. M. Crane.
Ships, &c., constructing and propelling—1556—A. L. McGavin.
Shot, apparatus for concentrating—1479—C. W. Lancaster.
Signals and alarms, means for conducting electricity for communicating or transmitting—1564—T. Herbert and J. C. Fowler.
Smoke, consuming—1476—W. Stephenson.
Spirituous liquors, distillation of—1568—G. Johnston.
Steam, applying waste heat to the generation of—1326—E. Crowe.
Sugar cane, &c., extracting the juice from—1498—F. Kohn.
Sugar, drying—1511—W. R. Lake.
Tell-tales for omnibuses, &c.—1365—R. Wappenstein.
Threads, braids, &c., polishing—1437—E. Brennan.
Tobacco pipes—1403—D. and A. Posener.
Tobacco, steaming and compressing—1473—J. Bownes.
Umbrellas—1527—F. Johnson and W. Hatchman.
Urinals—1457—J. L. Greatorex.
Velocipedes—1299—J. Anderson.
Velocipedes—1397—J. Needham.
Velocipedes—1492—S. Corbett.
Velocipedes—1532—H. Livesey and T. Collison.
Velocipedes—1542—J. T. Lucas.
Velocipedes—1548—F. Zysel and O. Burdett.
Velocipedes, &c.—1389—E. N. Hudson.
Velocipedes, &c.—1533—J. Sawyer and J. Woodman.
Velocipedes, &c.—1544—A. W. Banks.
Vessels, propelling by means of water—1554—A. J. Dudgeon.
Water meters—1429—J. Withers.
Waterproof garments—1515—T. and J. Fagg.
Window sashes, &c.—1455—T. Bullivant.
Window sashes, &c.—1466—H. Luke.
Wool, &c., combing—1470—I. and G. Battinson and T. Whitehead.
Wool, &c., generating gases and chemical vapours employed in the manufacture of extract—1540—G. Martin.
Wool, &c., liquids for lubricating—1483—G. Felix, H. I. Axel, F. Bang, F. Roch, C. Monestier, and J. P. A. Figaier.

Invention with Complete Specification Filed.

Electric clocks—1560—A. A. Rossignolt.

Patents Sealed.

3637. W. Soper.
3652. H. A. Bonneville.
3664. J. Tidmarsh.
3666. E. Hely.
3668. H. N. Maynard.
3670. S. Pallant.
3676. L. J. Marechal.
3694. M. P. W. Boulton and J. Imray.
3693. W. G. Ainslie.
3697. F. Beech.
3715. A. B. Bérard.
3726. A. M. Clark.
3748. F. Meadows.
3817. J. T. Grice.
3863. E. P. H. Vaughan.
3871. J. Jones.
23. H. A. Bonneville.

From Commissioners of Patents' Journal, June 1.

Patents Sealed.

3667. J. Alexander and J. Hill.
3675. D. Dorrity.
3682. C. H. Chadburn.
3686. W. R. Lake.
3688. H. Robinson.
3689. S. Hirsch.
3691. J. H. Johnson.
3692. J. G. Rollins.
3696. J. S. Capelle.
3708. A. Masson.
3714. A. M. Clark.
3741. W. H. Pottle.
3749. R. Needham.
3753. A. G. Goodes.
3770. P. Kotzo.
3771. W. H. Bailey.
3797. W. J. Murphy.
3799. J. Hay.
3832. S. C. Lister.
3834. S. C. Lister.
3892. H. W. Hammond.
3896. J. Breeden.
3915. B. Norton.
3941. G. T. Bousfield.
83. J. H. Johnson.
147. J. B. Whitehall.
171. H. W. Hammond.
284. J. H. Johnson.
375. C. D. J. Seitz.
491. F. J. Knewstub.
623. W. Simpson & A. Gardner.
690. W. A. Gilbee.
874. G. T. Bousfield.
946. G. T. Bousfield.
1136. J. H. Johnson.

Patents on which the Stamp Duty of £50 has been paid.

1466. J. T. King.
1467. E. Bevan and A. Fleming.
1471. J. D. Whelpley and J. J. Storer.
1475. D. Thomson and W. Porter.
1526. W. E. Newton.
1505. W. Bayliss, jun.
1506. H. Schofield.
1507. G. T. Bousfield.
1491. J. Hall.
1492. J. D. Whelpley and J. J. Storer.
1493. J. D. Whelpley and J. J. Storer.

Patents on which the Stamp Duty of £100 has been Paid.

1637. A. Gilbey.
1653. W. E. Newton.

Journal of the Society of Arts.

FRIDAY, JUNE 11, 1869.

Announcements by the Council.

India Committee.

On Friday evening, June 18th, the seventh conference will be held, when the subject of "Cotton Cultivation and Supply" will be discussed. The chair will be taken at 8 o'clock. Members of the Society interested in Indian questions are invited to attend.

Conversazione.

The Conversazione originally fixed for the 23rd inst. is unavoidably postponed to a later date, which will be announced as soon as the arrangements are completed.

Annual Conference.

The Eighteenth Annual Conference between the Council of the Society and the Representatives of the Institutions in Union and Local Boards will be held on Wednesday, the 23rd inst., at Twelve o'clock, noon. The Chairman of the Council will preside.

The Council will lay before the Conference the Secretary's Report of the Proceedings of the Union for the past year, and the results of the Examinations; and the Programme of Examinations for 1870 will also be brought before the Conference.

The following suggestions of subjects for discussion have been received from various quarters, it being understood that in putting them forward the Council express no opinion whatever upon them :—

1. What arrangements can Mechanics' Institutions make for promoting the systematic Technical Education of the people in their several localities, either by the establishment of trade schools or otherwise?
2. It being in contemplation to call meetings of the members of the Society of Arts and others in corporate towns, for the furtherance of Technical Education, how far can the Institutions in Union with the Society aid in promoting the success of such meetings?
3. Does the Endowed Schools Bill, now before Parliament, afford any facilities which can be taken advantage of by Mechanics' Institutions for such purposes, and if not, can any steps be taken for obtaining the insertion of clauses with that object in view?
4. In what way can the advantages of union with the Society of Arts, apart from the Examinations, be made available in the provinces?
5. How can the Society of Arts assist in obtaining the extension of State aid to Night Classes in the Institutions in Union?
6. Do the Examinations in the subjects of Science and Art, carried on by the Department of Science and Art, render unnecessary those of the Society of Arts in the like subjects?
7. Would the extension of the Final Examinations to Middle-class Schools produce beneficial results?
8. Is it not desirable that scholars in attendance at Day Schools should be excluded from the Elementary Examinations?

Secretaries of Institutions and Local Boards are requested to send, *immediately*, the names of the Representatives appointed to attend the Conference; and early notice should be given of any other subjects which Institutions or Local Boards may desire their Representatives to introduce to the notice of the Conference.

Secretaries of Institutions are requested to forward *at once*, by book post, copies of the last Annual Reports of their Institutions.

Albert Medal.

The Council have this year awarded the Albert Gold Medal to Baron Justus von Liebig, Associate of the Institute of France, Foreign Member of the Royal Society, Chevalier of the Legion of Honour, &c., "for his numerous valuable researches and writings, which have contributed most importantly to the development of food-economy and agriculture, to the advancement of chemical science, and to the benefits derived from that science by Arts, Manufactures, and Commerce."

This medal was instituted to reward "distinguished merit in promoting Arts, Manufactures, or Commerce," and has been awarded in previous years as follows:—

In 1864, to Sir Rowland Hill, K.C.B., "for his great services to Arts, Manufactures, and Commerce in the creation of the penny postage, and for his other reforms in the postal system of this country, the benefits of which have, however, not been confined to this country, but have extended over the civilised world."

In 1865, to his Imperial Majesty the Emperor of the French, "for distinguished merit in promoting, in many ways, by his personal exertions, the international progress of Arts, Manufactures, and Commerce, the proofs of which are afforded by his judicious patronage of Art, his enlightened commercial policy, and especially by the abolition of passports in favour of British subjects."

In 1866, to Professor Faraday, D.C.L., F.R.S., for "discoveries in electricity, magnetism, and chemistry, which, in their relation to the industries of the world, have so largely promoted Arts, Manufactures, and Commerce."

In 1867, to Mr. W. Fothergill Cooke and Professor Charles Wheatstone, F.R.S., in recognition of their joint labours in establishing the first electric telegraph.

In 1868, to Mr. Joseph Whitworth, F.R.S., LL.D., "for the invention and manufacture of instruments of measurement and uniform standards, by which the production of machinery has been brought to a degree of perfection hitherto un-

approached, to the great advancement of Arts, Manufactures, and Commerce."

Primary Education.

The Council have resolved to invite the Trade Societies of the United Kingdom and others to send Artisan Representatives to a Conference, to be held in July, for the purpose of extending Primary Education on the half-time system to all children under ten years of age, and to consider what proportion of the necessary cost should be borne by parents and by the State.

Address to the Viceroy of Egypt.

The Council have decided to invite His Highness Ismail Pasha, Viceroy of Egypt, to receive an address from the Society for the Encouragement of Arts, Manufactures, and Commerce, in acknowledgment of the exertions of His Highness and his predecessors for promoting intercourse with India, for supporting the Suez Canal, for the extension of railways, for the improvement of cotton culture, and for the introduction of machinery for irrigation, the sugar manufacture, and the preparation of cotton.

Members Proposed.

The following additional candidates have been proposed for election as Members of the Society, and will be balloted for at a special meeting, to be held after the Annual General Meeting, on the 30th inst. :—

Earle, Thomas, 1, Vincent-street, Ovington-square, S.W.
Galloway, Rev. William Brown, M.A., 1, Fitzroy-road, Primrose-hill, N.W.
Laing, George E., 1, Raymond-buildings, W.C.
Lamb, Robert, 56, Richmond-road, Barnsbury, N.
Langley, J. Baxter, 50, Lincoln's-inn-fields, W.C.
Lansdowne, George, 2 and 3, Warwick-street, Charing-cross, S.W.
Warren, Reginald A., 99, Great Russell-street, W.C., and Preston-place, near Arundel.
Worley, Joshua, 6, Brabant-court, Philpot-lane, E.C.

Subscriptions.

The Lady-day subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

India Committee.

The sixth conference was held on Friday, May 28th, Lord William Hay in the chair. The papers read were, on "Trade between Calcutta, Darjeeling, Bhootan, and Thibet," by Dr. Archibald Campbell, late Superintendent of Darjeeling; and on "Trade between Assam, Thibet, and Western China," by Col. Hopkinson, Commissioner of Assam.

ON TRADE BETWEEN CALCUTTA, DARJEELING, BHOOTAN, AND THIBET.

By Dr. A. Campbell.

Before reading my paper, I shall allude to some circumstances which have an important bearing on the subject and which are not, I think, generally familiar to people in England.

A trade between India and Thibet always went through Nepaul and Bhootan, but after the present Goorkha dynasty conquered the valley of Nepaul, the trade which had been well carried on by the Newars, whom the Goorkhas displaced, became much reduced, and it then went chiefly through Bhootan. The Thibetans were always favourable to trade with India, and had a trading establishment near Calcutta. The Grand Lama was so desirous to improve this trade, that he asked the Governor-General of India to send an envoy to him for the purpose, and this led to Bogle's mission, in 1774, and to Turner's, in 1783. Shortly after this, however, the Chinese became paramount in Thibet, but their exclusive system and the normal misrule in Bhootan destroyed the trade, or nearly so.

In more recent times the trade again reverted to Nepaul, and we have opened a way for it through Darjeeling. We have also, with other nations, opened trading ports in China itself; and the supremacy of China has been thrown off by the Pauthays in the south-west, and by the Mahommedans in the extreme north-west of the empire. If the Thibetans follow suit—which is not unlikely—their tolerant usages will probably resume their sway, and we may look for many trading facilities from them. In the meantime there is a good occasion for trying to induce the Chinese government at Pekin to relieve the trade with Thibet from all obstacles and restrictions in that country.

In venturing to bring this portion of our conference before you, I must at once announce that I have not the means of showing that an extensive or flourishing commerce is in existence in this direction, or that such can be easily or at an early date realised. My aim is to draw attention to the subject, to indicate the state of things which obstruct the development of trade, and to point out how these may be most easily obviated. In doing so, I shall endeavour to give the information as concisely as possible, to meet the demands on our time this evening, and to furnish some details.

Our subjects are, trade with Central Asia, Thibet, and South-Western China. As the first is almost entirely carried on from the north-west provinces of India, with Bombay as the seaport for English exports, it is quite distinct from the second, which is carried on from Bengal, with Calcutta as the seaport. It is not, however, so distinct from the third division of our subject, as trade with Thibet has the ultimate object of being trade with South-Western China also, although the routes from India lie through very different countries. Thus, goods reaching Lassa, the capital of Thibet, through Nepaul or Darjeeling, go on to Siling and Sechuen, Chinese marts; goods from Rangoon, through Upper Burmah and Bhamoo, being destined, according to Mr. Cooper's recent account of his unsuccessful effort to reach India from the Yangz-te-kiang, to reach the province of Sechuen also, and thus the two streams of commerce will meet in China. Taking trade between India and Thibet in its fullest sense, then, it also means trade between the rich and populous countries of India and China by overland routes. Thibet must be considered, to some extent, as a medium of passing the commerce between these two great and populous countries. A trade with Thibet only would be, comparatively speaking, a restricted one, as silks, satins, fine woollen fabrics, &c., come from China. Although Thibet is a country of immense extent, and has very valuable products in gold, the finest wools, musk, borax, &c., its population is not dense, and Lassa itself, although a great entrepôt for trade, is not a great manufacturing city.

Looking at the map before you, then, you see the plains of Bengal on the south, and the country of Thibet on the north, with the great chain of the Himalayas lying between them. Taking Bengal geographically for my present purpose, it includes the provinces of Oude, Goruckpoor, Tirhoot, Purnea, Darjeeling, Rungpoor, and the valley of Assam. The corresponding portion of the Himalaya includes the independent state of Nepaul, the small protected territory of Sikhim, and the hill country of Bhootan.

Our frontier with Nepaul, from the Kali river on the west, to the Mechi river on the east, is 500 miles, with Sikhim and Bhootan, about 250 more. The breadth of the chain is at least 100 miles. In no part of this long line of frontier—750 miles north of Nepaul, Sikhim, and Bhootan—have we any direct access into Thibet, nor have we any political relations whatever with the government of the country. It will therefore be readily admitted, after this outline of the relative positions of the two countries, India and Thibet, that there must be many obstacles to the carrying on of trade between them, and at present it is so. The obstacles are of two kinds, physical and political. The first lie in the character of the mountains, which, in the position indicated, form an aggregate of the highest peaks in the world, with innumerable lofty spurs and ranges, the whole embracing elevations from 29,000 feet downwards. The mean elevation of this extensive barrier, for such it may be called at present, is not easily computed, nor would it be of much importance to state it. The great facts, however, remain, that there is not one road through the Himalayas, except for carriage on men's backs, and that the passes leading into Thibet are all above 14,000 feet above the level of the sea, that these elevations involve the closing of the routes by snow for many months of the year, that the mean elevation of the route in Thibet is not under 14,000 feet, and that the lowest point on the road to Lassa, the terminus in Thibet, is 11,000 feet, which gives an inclement climate for many months of the year; added to this, the route in Thibet, although admitting of carriage on ponies and mules, and easy compared with the passage of the Himalaya, passes over Kambala and other ranges, the elevation of which involve heavy snow-falls and great cold.

The following are the elevations of the passes into Thibet from Nepaul:—The Kiroong I reckon to be 14,000 feet. I have not the exact elevation given by the pundit Numphal, who crossed it on his journey to Lassa, published last year, but the monastery of Tadum, close by, on the Thibetan plateau, is 14,200; Kooti, also a pass from Nepaul, say 14,000; Walloongchoong, from eastern Nepaul, measured by Dr. Hooker, is 16,764; from Sikhim, the Kangra Lama pass is 15,600; Donkia, 18,500; Tunkra, 16,000; and Chola, 14,000, all given by Dr. Hooker. Phari, the principal pass from the western parts of Bhootan, I reckon to be about 14,000 feet. Of the passes from Bhootan, east of Phari, I have no information.

The political obstacles arise from the character of the governments in the Himalaya and in Thibet itself. In Nepaul, through which the greater part of the trade runs at present, the government is very exclusive. No European, except those belonging to the political residency, is allowed to reside there, and the residency officers are not allowed to travel in the country more than a few miles from Cathnandoo, the capital. There are many restrictions on free trade in the form of customs and transit duties, government and official monopolies, and the entire want of anything like a road from the British frontier to the capital, or beyond it to the Thibetan frontier, and this is after an alliance with Nepaul of more than 50 years. All natives of India, however, whether our immediate subjects or belonging to native states, have free access to Nepaul. This rather invidious distinction between natives of India and Europeans does not prevent the Nepaulese of all ranks and classes from deriving the fullest advantage from free resort into our provinces, where they are welcome to trade and settle without any restrictions.

The next obstacles of a political nature with which the trade to Thibet had long to contend, were in Sikhim. In consequence of a monopoly of the trade with Thibet being in the hands of the Dewan, and actual ruler of the country, who did not scruple to use his full power for his individual benefit, the trade through other hands was prevented, and it was almost annihilated in his own. After long continued and strenuous efforts directed to their removal, and in the end the expulsion from Sikhim of the obnoxious individual, they are nearly or quite removed. All this has followed our settlement at Darjeeling, and it is from this place, as shall be presently shown, that we have it most in our power to diminish the obstacles, and that we must look for the greatest development of a trade with Thibet.

In Bhootan, ever since our first political relations with it in 1774, it has been altogether hopeless and impossible to make it the medium of a trade with Thibet. Turner's mission to the Grand Lama, in 1783, failed to effect this object; so did Pemberton's mission to Bhootan, in 1838, and Eden's, in 1864. Since then, however, we have annexed the Dooars and lower hills of Bhootan, and although there is still a government, or, more correctly speaking, a system of the greatest mismanagement and lawlessness that ever existed anywhere, in possession of the portion of Bhootan giving access to Thibet, for the people's sake, it is to be hoped that our nearer contact with the Bhootanese, since the annexation of the Dooars, or some fortunate necessity for extending our frontier to the Thibet border may occur, to enable us to clear all political obstacles in this quarter.

I shall now proceed to give the most reliable information I have of the actual state and extent of the trade with Thibet.

For the Nepaul portion I am indebted to a paper by Mr. Brian Hodgson, who was long our distinguished Resident in that country. It was written in 1831, and is published in No. 27 of the "Selections by the Government of Bengal," for 1858. Mr. Hodgson invited the attention of the merchants of Calcutta and Bengal to the high profits then ruling in Nepaul, where 100 per cent. on prime cost in Calcutta or Benares was very common, and 30 to 40 per cent. was the ordinary rate of profits; and he gives tables, showing the imports and exports, rates of duties, profits, and much other information on the trade with Thibet, and with Nepaul itself, from which the former is scarcely separable. The following is an abstract of this important paper:—

"Goods from India, whether the produce of Europe or India, pay about 12 annas, or 1s. 6d., per package of 96 lbs., as transit duty, and this franks them to the Thibet frontier.

"All goods into and through Nepaul are carried on men's backs.

"Imports from Thibet into Nepaul pay no duty, exept musk and gold.

"All the silver from Thibet must be taken to the Nepaul mint, where it is purchased.

"The trade with Thibet is carried on principally by Cashmeres, who have houses at Dacca, Patna, Catmandoo, and Lassa.

"Imports from India into Nepaul, in 1831, estimated prime cost, 17½ lacs of rupees, or £175,000; 157 articles enumerated. Of this amount, on 57 articles, it was estimated that about three lacs, or £30,000 worth, went on to Thibet.

"The exports of Nepaulese and Thibetan goods to the plains in 90 articles enumerated, estimated value 11 lacs, or £110,000, of which two-thirds, or £65,000, are on account of imports from Thibet into Nepaul. The trade with Nepaul is carried on principally by merchants of Benares, who have 10 kothees or firms at Catmandoo.

"Transit duties levied on goods from the Nepaul frontier to Catmandoo, about 7 rupees, or 14s., per bullock load of 380 lbs., or 3s. 6d. per man's load of 160 lbs.

"An *ad valorem* duty of 3½ per cent. is levied on arrival at Catmandoo. The valuation is made by government officers. If it is objected to by the merchant, the government requires a sale to itself at the merchant's valuation.

"An export duty of over 4½ per cent. is levied on all articles, whether of Nepaul, Thibet, or China."

The following is a list of the principal imports into Nepaul:—European broad cloths and other woollens of all sorts; European chintzes and other cotton of all sorts; European silks of all sorts; European linens of all sorts; Amritsir and Cashmere shawls, good Dacca muslins, and Jamdanees' sahans, &c.; Malda and Bhaugulpoor silk and mixed silk and cotton stuffs; Benares' kimkhabs, toftas, mushroos, shamlas, dopattahs, &c.; Mirzapoor and Calpee kharwas and garbas, mowsahans, andarsahs, &c.; Behar pagrees, khasas, &c.; Bareilly, Lucknow, and Tanda chintzes; European cutlery, as knives, scissors, &c.; European glass ware, as chandeliers, wall-shades, &c.; European mirrors, window glass, &c.; Indian kiranas, or groceries, drugs, dyes, and spicery of all sorts; peltry of Europe and India, as Dacca and other skins, goat ditto, &c.; quicksilver, vermilion, red and white lead, brimstone, jasta, ranga, camphor, indigo; precious stones, as diamond, emerald, pearls, coral; Indian laces, as kâlâbuttu, gotah, &c."

The following is a list of the principal exports from Nepaul:—Chours or yak tails; Thibetan, Himalayan, and Chinese woollens, as maleeda, toos, namda, chourpat, rahry, bhot, &c.; Chinese damasked and brocaded satins and silks; sohâga or borax; Nepaulese, Bhootea, and Chinese drugs; rhubarb, mihargiyah, zaharmohara, momira, jatamangsie, hurtal, &c.; Bhootea and Nepaulese paper, musk pods, gold, silver, rupees of the plains, rupees of Nepaul, and copper pice of ditto, ponies, or tanghans; hardware, as iron phowrahs, &c., &c."

The chief exports to Thibet are European broad cloths (crimson, green, orange, liver, and brown are preferred), cutlery, pearls, coral, diamonds, emeralds, indigo, and opium.

The chief imports from Thibet are, Chours or yak tails, white; ditto, black; Chinese velvets, satins, silk thread, and raw silk; peltry of Mongolia and Bhote, as samoor, kakoon, chuah-khal, garbsooth, &c., borax, and furs; Chinese and Bhotea tea, drugs."

From Calcutta, Patna, and Benares the routes meet at Sugowlie, on the frontier of Champarun, whence it is ten stages to Catmandoo. There are two routes from Catmandoo, the capital of Nepaul, to the frontier of Thibet, one by Koote, the other by Kiroong. The former runs from the east end of the valley of Nepaul, the latter from the western. Both places are eight stages from Catmandoo. From these places it is about a month's journey to Lassa, and the hire of a pony or mule is about ten rupees, or £1.

From Mr. Hodgson's tables, I reckon the total annual trade between India and Nepaul, including Thibet, to amount to about £285,000. It has probably increased since his time, but of this I have no authentic information.

I now come to Darjeeling as the next route for trade with Thibet. This place being a British possession in the Himalaya, it differs in every respect from Nepaul, as holding out superior advantages for a greatly-extended trade with Lassa. It is under 400 miles from Calcutta, of which 200 has a railway, and although a rail is much wanted for the remainder of the distance, it has, in the meantime, a good cart-road from the foot of the hills to the station, 30 miles; whereas Catmandoo is more than 600 miles distant from Calcutta, with no road at all in the hills. Darjeeling is the shortest route from Bengal to Lassa, the distance being say 500 miles, of which we have now the control of 70 miles through Sikhim to Choombi, and over which we can, under treaty with the Sikhim Rajah, make a road whenever we wish.

The present trade with Thibet through Darjeeling, as in Nepaul, cannot well be separated from the trade of Darjeeling itself. Of the present amount of this trade I have not correct information. In 1854, the imports into Darjeeling from the plains were estimated at three lacs of rupees, or £30,000; from Thibet, in 1861, at 70,000 rupees. The principal export from Darjeeling to the plains is tea, of which about 1,500,000 lbs. is expected this season, which may be valued at £100,000. The principal exports to Thibet are, English broadcloths (brown, purple, orange, green, and yellow, the most preferred), cutlery, indigo, tobacco, sugar, rice, cotton sheetings, endy (or castor-oil) silk, crockery, &c. Wool is a very important product of Thibet, and may be looked to as a valuable export. In that country and the adjoining ones there are immense tracts of pasture land, on which flocks of sheep, in almost countless numbers, are maintained. Seven or eight thousand sheep is a common number for even ordinary graziers to possess.

The great elevation and cold temperature of these countries, with the fine pasture, produce very heavy fleeces of the finest wool, and of a very long staple, quite as fine as the Australian wools, but more valuable for many fabrics, on account of its longer staple.

While at Darjeeling I procured some loads of this wool, and sent samples of it, with rate of cost, for trial and export to Calcutta and elsewhere. It was highly spoken of; and the industrial school at Jubbulpore, in the Central Provinces of India, celebrated for its fine carpets, was so pleased with it, that the managers offered to send me a lac of rupees (£10,000), to be laid out in purchasing wool for them, at the rates I had quoted. I need scarcely say it was not procurable; but the wool is, in Thibet, in immense quantity.

Of the state of trade at this moment through Bhootan I cannot speak. It was, as regards English and Indian goods, at a complete stand-still all my time (from 1839 to 1861). Captain Pemberton, in his report (1838) says:—"There was every reason to believe that the trade which formerly existed between Bengal and Thibet was at one time carried on through Bhootan, and to its total cessation may, in a great degree, be attributed the marked deterioration of the latter country."

The following is a list of the principal articles imported from and exported to Bhootan. The former amounts to 7,375 rupees, or £737 only, the latter to 4,150 rupees, or £415. Imports:—Debang (China silks), cow-tails, hill ponies, wax, walnuts, musk, lac, madder or munjeet, blankets, silver. Exports:—Indigo, cloves, nutmeg, cardamum, nukher, camphor, sugar, copper, broad-cloth, goat-skins, endy-cloth (castor-oil silk), coarse ditto, googool, sandal-wood, country gunpowder, dried fish, tobacco.

Of the city of Lassa, as the focus of all Thibetan trade, there is, as you are all aware, not much known as the result of European observation on the spot, nor can I give you positive information as to the profits to be made there on English and Indian goods. From all I learned at Darjeeling, they are very large, and as goods in transit, loaded with a profit of 30 or 40 per cent. in Nepaul, are still profitable at Lassa, it is quite clear that goods going direct through Darjeeling to Lassa, without any custom or transit duties, as in Nepaul, and not having Nepaul profits added to the prime cost, must be very profitable indeed.

At Lassa, the trade arrangements are on a good footing, according to my information. It is resorted to by people of many different nations from every direction, and the merchants of each country appoint their own chief or consul, who is the medium of communication with the local government, and has the power of settling all disputes among his countrymen without reference to his own or the Thibetan government. The Newars of Nepaul, the Cashmerees of Patna and Dacca, the Bhootanese, the Ladakees, as well as the merchants of many countries lying between Thibet and China, have consuls of this description. The last account of trade at Lassa by a traveller, is by Nunphal Pundit, of the Indian Trigonometrical Survey. He says:—

"During the month of December, merchants from all parts bring their merchandise here from China, Tartary, Darchando, Chando, Khan, Tawang, Bhootan, Sikhim, Nepaul, Darjeeling, Patna, and Ladák. From China, silks of all varieties, carpets, and chinaware. From Jiling, in Tartary, is brought gold-lace, silks, precious gems, carpets of a superior manufacture, horse-saddles, and a very large kind of dumba, or large-tailed sheep, also valuable horses. From Darchando immense quantities of tea (Darchando is said to be situated north-east of Lassa, and to be distant two months' journey). From Chando city, in the Kham territory, an enormous quantity of the musk perfume is brought, which eventually finds its way to Europe, through Nepaul. Rice and other grain that is foreign to Lassa, is brought from Tawang, in Bhootan. From Sikhim, rice and tobacco; and from Nepaul, Darjeeling, and Patna, broadcloth, silks, satins, saddles, precious stones, coral, pearls, sugar, spices, and a variety of Indian commodities; charas and saffron come from Ladák and Cashmere."

I have now to conclude with a few observations on the best means of improving and greatly extending this trade, and they are suggested by what has gone before. Our great aim should be to clear the way of all obstacles from our own to the Thibetan frontier, and it may be done in this way:—Firstly, we require a new commercial treaty with Nepaul, stipulating for the abolition of all transit and customs duties on European and Indian goods, whether for Nepaul or Thibet, and for the removal of all official interference with the trade between the British frontier and the frontier of Thibet. I have no hope that we can at present induce the government to make a road to Catmandoo and onwards to the passes, but it may be hoped for some day, and the treaty is feasible. Secondly, we should take advantage of our present close connection with Bhootan, to remove all obstructions to trade between the Dooars and the Thibetan frontier. I am, however, one of those who think that it would have been the best thing possible for the people of that country, if the British Government had annexed the whole of it, instead of the Dooars only. This would have effectually cleared the way for trade to the north, and put a stop for the future to Bhootanese kidnapping of our subjects, and violent breaches of frontier, which the partial annexation will not effect. Thirdly and lastly, we should direct our best attention to the route by Darjeeling as the shortest and best to Thibet. There is not very much left to be done now to secure the benefits of that route, if the government would take it up in earnest. There are many other considerations connected with Darjeeling which could be fulfilled at the same time, and it would be wise and beneficent to attend to them. What is wanted is the extension of the railway to the foot of the hills, a road from Darjeeling for foot travellers and ponies, with rope or iron suspension bridges over the Rungeet and Teesta rivers to the Thibetan frontier at Chola, and the establishing of an annual fair or bazaar, to continue for two months in the spring, at some place in Sikhim, near the frontier, to enable the Thibetans, who might not desire to go on to Darjeeling, to dispose of their goods, and provide themselves with return investments. After these arrangements are completed, I do not see why we should not go further a-head to develope our commerce with Thibet, and arrange to have a British consulate at Lassa. Russian goods are to be found in the bazaar at Lassa, and the Russians are fond of following their wares in this direction; our English and Indian goods are in great request there, and we may as well follow them also. This, however, is a matter which, you will probably agree with me, requires much consideration and discussion.

ON TRADE BETWEEN ASSAM, THIBET, AND WESTERN CHINA.

By Colonel Hopkinson.

I think it by no means improbable that the practicability of a communication between Western China and Assam will be some day established. Such a probability has indeed been assumed from the fact only of the proximity of the north-eastern corner of Assam, on the left bank of the Brahmapootra (so far as the mere distance in miles measured on the map goes), to Yunan, in China, and supposes that the mountainous region which intervenes may not be found on close examination so impracticable as all inquiry, and, indeed, experience has hitherto led us to believe it to be. Mr. R. D. Mangles, in some observations on this point, certainly speculates "on a tract not known, at least, to present any special difficulties," but all the routes that have been explored or inquired into, as those by Wilcox, Burnett, Hannay, White, and, if I mistake not, Bayfield, appear to be crowded with every species of obstruction that can be imagined, to impede and prevent commercial intercourse.

If we accept the importance which has been insisted on, of so directing the course of any exploration that it should keep clear of tribes dependent directly or indirectly on the Burmese government, we must at the same time adhere strongly to the opinion that no practicable route is likely to be found, except through Burmese territory, and one, moreover, that will not bring the explorers among tribes very directly under the influence of the Burmese government.

Lieut. Wilcox's adventurous journey illustrates the difficulties of any line passing through the Burmese tribes, and these were met with, not because he started from Suddya, since there is a very good line from Suddya to Beesa, and thence to Moursing, but because he attempted to proceed east, and then north-east, after leaving Suddya, and he had hardly quitted Assam than he found himself in the region of perpetual snow. On a clear day, snowy ranges can be seen from Suddya bounding the whole horizon from north to south-east. My idea of this region is, that it is filled by the convolutions of a mighty knot, uniting vast mountain ranges which radiate from it in every direction, and amid the intricacies of which I should despair of finding a way either in or out.

There is no doubt that it was by the pass that derives its name from the Patkoe hill, over which it leads, that Assam was originally invaded, and as every successive wave of conquest or immigration has followed the same channel, I think it may be inferred that the Patkoe pass is, in fact, the only route that presents any facilities for transit.

The journey from the foot of the Patkoe mountain to Kookoong or Mangkhwon may be accomplished in seven marches, of which only one, the first, is said to be long and difficult; and between Mangkhwon and Moganny there are said to be only eight marches, through a very fine and thickly inhabited country; and again, from Moganny to Santa Fou, in Yunan, there is a direct road.

From what I know of the relations subsisting between the various tribes of Singphos and Kamptees, I think the supposition a mistaken one that has been made by some explorers, Mr. Goodenough for instance, that the influence of the Singphos on our side over those in the Hookoong valley can be other than extremely limited, possibly—even probably—the fact may be that it is altogether non-existent.

I believe, however, that, on the other hand, the power of the court of Ava, in the valley of Hookoong, and the parts adjacent, has been greatly underrated. I have seen a report concerning the detention of one of our chiefs in the Hookoong valley, which goes to show that there is at this time a Burmese governor, called the Woonpoong Monng-tha, acting as governor of Mangkhwon, and that the Singphos of Hookoong are wont to look at the Burmese government at Mondelay for protection against the arbitrary conduct of their own chiefs.

I should doubt whether any exploring party engaged up to lat. 27°, or even further north, could prosecute their object without the unreserved and cordial assistance of the Burmese government.

I should be sorry to be thought to express myself dogmatically against the practicability of establishing

trade communication between China and Assam, through the tract under consideration, for the information we have about it is too small to warrant a positive opinion one way or the other, but even going no further than the map tells us of the position of the Irrawady, I cannot understand how any land route which comes within any distance so near it as to be put into competition with it, should be preferred to it, nor what could be the description of merchandise that it would be more profitable to seek an outlet for at Calcutta *viâ* Assam, than at Rangoon *viâ* Bhaumo. If Rangoon were still in the hands of the Burmese, the case might be different, but now that Lower Burmah has become a British possession, to attempt to divert the course of any trade which, left to itself, would naturally seek the Irrawady, or any trade which, on the whole, could be more economically conducted by the way of the Irrawady, appears to me to be futile and impolitic.

One reason that forbids me from indulging in the hope of seeing commercial intercourse established between China and Assam, through northern Burmah or the Shan States beyond is, that no native trade at present exists, even in the humblest and most insignificant form, between the two countries. Now native trade, though usually wanting in expansion beyond the most moderate dimensions, is often audacious in its enterprise, and penetrating in the extreme; it may flow by minute and scarcely perceptible channels, yet still it will find its way through every crevice, and ooze out at the most unexpected and inaccessible places; and its absence in this case appears to me peculiarly significant. The Shans, the Burmese, and the Chinese are all three keen traders; how is it then that they have not found their way to Assam by some route? Debrooghur is known, at least by name, to thousands and tens of thousands of Khamptees and Singphoos; they know that they can obtain there piece-goods of any description and in any quantity; and that their ponies, their cinnabar, or their leaf-gold would be taken as readily in exchange there as at Rangoon or Moulmein. How is it, then, that they do not come?

Though I am not so sanguine as some persons, the main idea of opening a communication with China may, I think, very possibly be realised on the north or right bank of the Bramahpootra, and by one or other of the passes leading into Thibet. I would in particular invite attention to the route from Towang through the Kooreeaparah Dooar, which does not, in any part, enter the territories of the Deb and Dhurne Rajahs of Bhootan, but lies entirely across a tract of country dependent upon Lassa, and forms an integral portion of Thibet, so that, as was most happily observed by Pemberton, "we have literally the Chinese and British frontier in immediate contact with each other at a Dooar in the valley of Assam, not more than fifteen miles from the northern bank of the Brahmapootra."

Sixty years ago the trade between Thibet and Assam by this route was estimated to amount to two lacs of rupees per annum, and this though Assam was then in a most unsettled state; and up to the time just prior to the Burmese invasion, the Lassa merchants brought down gold to the value of 70,000 rupees. The occupation of the country by the Burmese, however, killed the trade; and in 1833, only two Thibetan merchants are said to have come down; but since that period there has been a gradual revival of it, which even our late quarrel with Bhootan did not interrupt, and it has now every appearance of being flourishing and on the increase.

The trade is carried on principally through the instrumentality of a fair, held at a place called Oodalgooree, situated at the mouth of the Kooreapara pass. I visited the fair in 1867, and again this year, and was much interested by what I saw of the Thibetan traders. I found men among them from all parts of Thibet, from Lassa, and from places east, and west, and even north of it; some of them looked like Chinamen, they wore Chinese dresses, ate with chop sticks, and had about them various articles of Chinese manufacture, as pipes, strike-a-lights, and embroidered purses, such as I have seen in use among the Chinese at Rangoon and Moulmein. They were accompanied, in some cases, by their families, and carried their goods on sturdy ponies, of which they had a great number, I should think some hundreds. Besides the Thibetans who attend this fair, there are some who still take the alternative route through Bhootan *via* Tassgong to Hewangiri.

The want of competent interpreters prevented me from seeking information from these merchants, about the road by which they travelled. I have no doubt that it is beset with great difficulties, and if it be alleged that they are greater than would be encountered on the route *via* the Patkoe pass, I am in no position to dispute the assertion. At the same time, there is no getting over the fact that, a trade between Assam and China being the object in view, we have it actually made to our hand, on the one side, and only wanting such extension and development as we have a right to suppose we could give it; while, on the other, not the faintest trace of any commercial intercourse between the two countries exists, and we are absolutely without any data whatever for the presumption that we could call it into existence. So much evidence, also, in favour of the practicability of the Towang route, at any rate exists, as may be derived from the circumstance of women, and children, and laden ponies coming down to Assam by it. I may add that I noticed particularly the good condition of the ponies, and that there were few—indeed I do not remember seeing any—sore backs among them. On the occasion, too, of the difficulty which arose between us and the Thibetan authorities, in 1852, about the Geling Rajah, Tartar troops were pushed towards our frontier by this pass, and the demonstration was considered so formidable, that we put a body of 400 troops with artillery, in camp at Oodalgooree to meet them.

If the Thibetans can come to us, surely we can go to them; indeed, in Assam it has never been supposed that there was any real obstacle to intercourse between the two countries, save the jealous restrictions imposed by Chinese policy and influence. In a brief notice which I read in the *Friend of India* newspaper, of a memorandum by Capt. Montgomerie, of the Trigonometrical Survey, it is stated that the Thibetans were in the habit of resorting to Towang for rice. Now it happens that rice is the principal commodity exported from Assam to Towang, and so, therefore, the Thibetans would seem to be dependent on us for food, in which case it is possible that we might be able to exert a certain pressure, to induce them to reciprocate the freedom of trade which we allow them. Our relations with China are also very different from what they were 20 or 30 years ago, and a rescript might now, perhaps, be obtained from the Chinese government, requiring the Thibetan and Towang authorities to assist us. In a political point of view, I should suppose that the opening of communications between China and Assam, *viâ* Thibet, would be more valuable than that by Northern Burmah and Yunan, while its scientific interest must be held to preponderate beyond all comparison. The identification of the Sampoo river with the Brahmapootra, which is still matter of conjecture, would of itself amply reward the exertions of any expedition which should succeed in establishing it.

DISCUSSION.

Major-General Sir Henry Rawlinson said—My Lord, I have listened with great attention to these two papers. They are both interesting. I will consider the last one first, as it is more immediately in the recollection of the meeting. The main object, as I understand, which we have in view, and to which these papers are directed, is the opening and facilitating trade communication between India and China. I say the main object, because the mere transit trade of Thibet itself, which has been also alluded to, is not nearly of such great

importance. Now, all the information which I have been able to collect on this subject leads to a conclusion very different from that which is given in Colonel Hopkinson's paper. It is a subject which has created much interest in China, in India, and even in England. It is, in fact, one of the great commercial desiderata of the present day. Mr. Cooper's journey was undertaken specially for the purpose of elucidating the subject, and Captain Sladen had the same object in view; and the result of those journies, I think, points out undoubtedly that the real line of traffic is that conducting from the Irrawady in Burmah to the Yang-tse in China. It leads from Bhamo to Momein (to which point Captain Sladen penetrated), from thence to Tali, and so on to a place of great importance, Cheng-king, on the river Yang-tse, up to which point that great river is navigable to steamers. We are in possession of most important reports and documents in relation to this subject, which I hope, in the course of a few months, will be made public. There is especially a report by a European gentleman, of very high cultivation and extensive knowledge, who has resided in the neighbourhood of the Yang-tse for the last twenty years, travelling between Lassa and Cheng-king; he has prepared a most elaborate report on the social and political condition of the country and its commercial capabilities, a report which is of great interest and importance at the present juncture, and which he placed at the disposal of Mr. Cooper. It was indeed under his direction and advice that Mr. Cooper, I believe, performed all the latter portions of his journey. The gentleman in question does not, for obvious reasons, wish his real name to be known, but he writes under the title of "The Old Resident," and he points out that there are three great natural centres of trade, and, it may be said, of civilisation, in South-Western China; one is Cheng-king, which is the highest point to which the the Yang-tse is navigable by ordinary steamers, though small steamers can pass 100 miles further up to So-cheu; another is Bathang, on the frontier of Thibet; and the third is Tali, near the Burmese border. Cheng-king, in connection with the two other points, forms, indeed, a triangle; that is, from Cheng-king to Bathang, the distance is 500 miles; from Bathang to Tali, 275 miles; and from Tali to Cheng-king, 510 miles. Those three stations are of such great importance, both commercially and politically, that the "Old Resident" advocates very strongly the establishment of European factories or consulates at such points. Now, this is a matter which requires great consideration. The course recommended by the "Old Resident" is also strongly advocated by the British merchants in China, as a necessary preliminary to the opening of the overland trade between China and India, and I have no doubt that the scheme has received, and will continue to receive, full consideration by the Foreign Office, for, in real truth, it is surrounded with difficulties. The Chinese, as you are all aware, have ever shown great repugnance to the introduction of foreigners into the country, and have thwarted as much as possible all attempts in that direction; and in this case not only the government but the local interests also must be considered. It seems to be the opinion of our minister at Pekin at present, that a certain degree of pressure might lead the Chinese government to sanction the establishment of English factories, at the three points which have been thus indicated, but he fears there would be great opposition on the part of the local population, as the Chinese traders would be little disposed to welcome foreign competition in a lucrative trade which is now all their own. We have little idea in this country of the importance and richness of these tracts in South-Western China. Cheng-king, on the Yang-tse, is the centre of an immense trade, and Tali, in the province of Yunan, which is the next great station on the road to Burmah, is situated near a navigable lake, forty-five miles long and twelve to fifteen miles in width, and is surrounded by nine great and fertile plains. The population of these plains is estimated at over 400,000 souls, and they are generally peaceful and well-disposed. The products of Tali are coal, gold, silver, porcelain clay, musk deers' horns, pearls, diamonds, amber, lead, iron and copper (red, yellow, and white) in immense quantities, also tin and white marble. The native population of Tali are, as I have said, generally peaceful and well disposed, but they detest the Mahommedan yoke under which they are now groaning. (I should have mentioned that there is said also to be a mine near Tali of a most valuable kind of iron, which is of such a character that the inhabitants make their swords and gun-barrels from the metal direct, without subjecting the iron to any carbonizing process.) This account, which I have taken from the "Old Resident's" Report, shows of what immense importance these districts are, and how desirable it must be to establish through them direct communication between China and India. Mr. Cooper, in his attempted journey, arrived safely at the frontier town of Bathang, but from there he was unable to penetrate into Thibet. Then he turned south, and tried to go to Tali *en route* to Burmah, but he failed also in that object, and was ultimately obliged to return to Shang-hae by the Yang-tse. The route from Bathang to Tali, however, presented no physical difficulties; he was merely baffled by the jealousy of the Chinese authorities. Captain Sladen himself penetrated from Bhamo, the frontier town of Burmah, to Momein, in the Panthay province of Yunan, now under Mahommedan rule, and independent of the Emperor of China; and the governor of Momein, who treated him with the greatest distinction, offered to send a party of 1,000 men to escort him across the Kah-kyen hills to Tali, which offer, however, was not accepted. In former times it is asserted that hundreds of caravans passed by this route between Bhamo and Tali, but since the Mahommedan war of independence all traffic has been stopped. The hill-men in the Kah-kyen hills are reported to be naturally quiet enough, though for the moment excited by the war raging round them. It is that war which is the present obstacle to the prosecution of trade. Twenty years ago the Mahommedans of Yunan rose in rebellion against China, and the war which was then commenced is not over yet. The inhabitants, it must be noted, are not generally Mahommedan—of the whole population, indeed, nineteen-twentieths probably are Chinese—but the one-twentieth of Mahommedans have nevertheless established an independent government, dominating the Chinese peasantry, and bidding defiance to the authority of Pekin. It is a moot question among British merchants in China whether this independence is to our advantage or not; that is, whether it would be better to negotiate direct with the independent Yunan Mahommedans, or to aid China in re-establishing her power. Under present circumstances, however, nothing is likely to be done either in one direction or the other. The French, it is said, purposed at one time to unite Yunan with their possessions in Cochin China, and even commenced negotiations for that purpose, but the scheme came to nothing, and Yunan is at present free from all European engagements. I have confined myself hitherto to the consideration of what I conceive to be the great natural route between India and China—a route which, I have no doubt, will, sooner or later, be fairly opened out for the commerce of the world. It remains to consider the line which was specially alluded to in Dr. Campbell's paper, viz., the Great Northern route by Lassa. The road through Thibet has always occupied considerable attention, connected as it immediately is, not with Burmah, but with India; but the real fact is that, of late years, and even at the present time, the jealousy of the Thibetans has rendered this route practically impossible. The Nepaulese are jealous enough, but the Thibetans are infinitely more so. There are, indeed, two very curious documents which have just been received from the East, and which forcibly illustrate this jealous feeling. When Mr. Cooper desired to prosecute his journey from Bathang

to Lassa, he produced the permission of the government authorities at Pekin to pass through the country, but he was nevertheless refused admission into Thibet; and we have now a translation of the official answer which was sent back by the authorities at Lassa to Pekin, and which is neither more nor less than an absolute refusal to obey the Emperor's order. They wrote from Lassa, "We know better on the spot what is for the interests of the Buddhist religion, and we will not, under the circumstances, permit Europeans to pass through this country." "Moreover," they added, "all the orders that we might give for the purpose would be inoperative; Europeans could not pass through Thibet in safety, and it is at their own risk if they attempt to do so." The answer of Jung Bahadoor, of Nepaul, was to the same effect. We know, indeed, that Capt. Montgomery's pundits were last year in fear of their lives at Lassa; in fact, if their Indian nationality and connection with the British Government had been discovered, they would most assuredly have been murdered. Therefore I look upon anything being done at Lassa, in the way of establishing a commercial post, as quite impossible. It is the line through Burmah, conducting from Tali to Bhamo, to which we shall have to devote our attention, as the only practicable means of passing from China to India. I admit the great advantage there would be in having the upper or Thibetan line also available for traffic, but at present, from all the information we have, I am bound to say that I think that line is quite impracticable.

The Chairman—Will you give us your opinion with regard to another route, recommended by Captain Sprye, more to the south?

Sir Henry Rawlinson—The Sprye route does not conduct to Yunnan; it passes into Cochin China far to the south, the main object being to cross the peninsula so as to arrive at a convenient port for sea-communication with Hong Kong. I am glad, however, that the question has been put to me by the noble lord in the chair; it gives me an opportunity of imparting information on a subject which has been hitherto but very imperfectly understood, the Indian government having been much blamed for throwing cold water upon the efforts made to open this communication through Southern Burmah. It has been said, indeed, that the government have blown both hot and cold on this matter; that one Secretary of State sanctioned measures which another Secretary of State refused, and there is, perhaps, some truth in the complaint. We cannot, however, squander the resources of India on a mere Quixotic undertaking. There might be practical good which would overbalance the risk of failure and a certain expense; and in this view a preliminary survey will be prosecuted. In reference to the trade with Central Asia, I may mention the circumstance that information has reached us that Mr. Shaw, a British merchant, has reached the city of Yarkand. Letters which I have received from Dr. Cayley states that Mr. Shaw had reached that city, and was received there with distinction. It is a fact of great importance that a British merchant should have reached so distant a point without the interference of the government. At present we have no reliable information whether Mr. Shaw will succeed in establishing a factory, or entering into any extensive arrangements for trade. He will meet, no doubt, with great difficulties. In the first place there is the difficulty of passing through the inhospitable tract of country between Leh and the Turkistan frontier. From the enormous elevation of the road, it is very inconvenient for travelling, though Mr. Shaw has shown the possibility of passing over it. Then, when he has got to Yarkand, and established himself there, he may be able, perhaps, to supply the tea wants, tea being the staple of commerce of Chinese Turkistan, but he cannot furnish tea to other parts of Central Asia, or introduce it into the Russian territory. There is an organised prohibitive tariff, so that not an atom of tea can reach Russian Turkistan legitimately. They may smuggle the article, it is true; these prohibitive tariffs, indeed, are evils which correct themselves, and, ultimately, I have no doubt tea will be smuggled in, but at present the prohibitive tariff is effective, and merchants who follow Mr. Shaw must content themselves, therefore, with supplying the wants of the independent districts alone. There is, however, considerable merit in what Mr. Shaw is reported to have done; not that there is a very large population to be supplied, but the people, such as they are, are inveterate tea-drinkers, and now that they are independent of China—in fact, at war with China—they have no means of supplying themselves with tea direct from China. They can only get it either from the Russian territory or from us. Hitherto it has been said they do not much like the Kangra tea; they find it too strong, but they will take that article rather than none at all. With regard to Mr. Hayward, we have no letters from him. He is occupied not with trade, but with geographical exploration, and we are led to understand that his discoveries in Thibet are of great interest and importance. There would seem, however, to have been some jealousy between Mr. Hayward and Mr. Shaw, so much so that when they met on the frontier they pretended not to know each other. They each lived in a different part of the camp; and for the sake of mutual safety, it was thought advisable that there should be no communication between them. According to the last accounts, Mr. Hayward was still detained on the fromtier, but on that, as well as on other matters of interest connected with his journey, we have not as yet any reliable information.

Mr. Wyllie, said he could offer only a few disjointed remarks on this subject. Sir Henry Rawlinson had drawn a just distinction between the trade from India northwards and north-westwards with Central Asia, and the eastward trade with China. He (Mr. Wyllie) would confine himself to the latter topic. He concurred with Sir Henry Rawlinson that it was the trade between India and China which was the great desideratum. If we could extend our trade with China *viâ* Thibet or any other country, it would be very desirable, but as for Thibet *per se* it was altogether barbarous and barren, and there was not much to be got out of it. Sir Henry Rawlinson had brought before their notice three places which had been particularly recommended as depots for trade by the "Old Resident," viz., Tali-foo, Bathang, and Chengking. He (Mr. Wyllie) knew something of the two former places, though his attention was called, when in India, to the political condition of Western China rather than to our commercial relations with that part of the world. With regard to Tali-foo, it was the head-quarters of the Mahommedan revolutionists called Panthays, who had broken off all relations, commercial as well as political, with the great Chinese dominion of which they were formerly an integral portion. We knew what a difficult matter trade was, even in this country. The difference of a few pence in a customs tariff was sometimes sufficient to extinguish a trade. It followed that the first element of trade was security and good government. There was no such thing in the whole of Western China. Besides the Panthays in Yunan, the other home provinces of Kansu, Shensi, and Sechuen, and the outlying territory of Ili were all, more or less, in revolt, and for the last six or seven years they had been a prey to banditti, and spoliation, and every form of civil misery. Bathang, in this respect, was far worse off than Tali-foo, as proved by the recent experience of some Nepaulese travellers. The Nepaulese ruler was bound to send every five years a mission to Pekin, with presents to the Emperor of China. In 1867, Jung Bahadoor's envoys reached Bathang, but at that point they were prohibited from going on towards Pekin, and they returned, having failed in their mission, with a lamentable description of the state of things which they found. Spoliation prevailed in every form, and the governor of the province was living in a miserable shed, glad to get shelter there. With respect to the two explorers, Shaw and Cooper, the former it appeared had got to Yarkand, and all he (Mr.

Wyllie) could say was, he hoped he would be able to get back again when he wanted to do so. His ever having reached that city appeared to him a most memorable feat. Mr. Cooper had already tried to get from the Chinese provinces into India, but he only got as far as Bathang, where he was turned back in one direction at the time when the Nepaulese ambassadors were sent back in another direction. He believed Mr. Cooper's present project of penetrating from India through Assam to China was hopeless.

The Chairman asked if Mr. Wyllie could state how far the Chinese had been driven back from Eastern Turkistan.

Mr. Wyllie replied that he had no very recent information. But it was quite certain they had been driven back to the great desert of Gobi, and the greatest hope for peace, and therefore for trade, was that the Russians would annex the whole territory, and become our neighbours in that part of the world.

Dr. Campbell begged to interpose that there could be no doubt that the refusal to allow Mr. Cooper to pursue his journey was made by the Chinese officials in the confidence of the government at Pekin. This might be gathered from what we formerly experienced in Canton. The Chinese official, if he knew the policy of his government, would adopt it in the face of any formal orders from the government. If the official was denounced for what he had done, he had only to fall on his sword and kill himself. The Chinese had great repugnance to communication with foreigners. He had similar experience in Darjeeling. When that tract was ceded to us by the Rajah of Sikhim as a sanatorium, he wished to be on a friendly footing with us. Soon after that territory was ceded, the Rajah got into the hands of a Thibetan, and under his influence imbibed the Chinese principle of exclusiveness, and he wrote to say, if we touched the soil of the country to form roads or carry out other works, the whole of the gods would be incensed against us; and the inhabitants were secretly kidnapped, carried into Sikhim, and kept in slavery. This state of things having continued for some time, it necessitated the British government entering into specific stipulations that the individual who favoured the policy of China should be expelled from Sikhim, and not be allowed to enter the kingdom again. From that day to the present no difficulty had arisen. The portion of country between the Brahmapootra and Lassa was the most precipitous of the whole of the Himalayas; and the people the most violent and bloodthirsty—the very last that Europeans would think of going amongst. The last Europeans who went there were two French priests, and they were very soon murdered; and their fate was incurred, not so much because they were Europeans, as because they had been well treated in the dominions of another chief. At the present time, the rice, which was sent to Lassa in considerable quantities, went through Darjeeling and Sikhim. The reason was, the Chinese soldiers at Lassa preferred rice to any other food, and the whole of the rice that went to Lassa came from the plains of Bengal, and through Darjeeling and Sikhim, principally for the benefit of the Chinese soldiers.

Sir Henry Rawlinson, in explanation, said he thought there was a misunderstanding on the part of Dr. Campbell as to the communication he had referred to between the authorities of Lassa and Nepaul. He (Sir H. Rawlinson) did not allude to the instructions sent by the Nepaulese government to its ambassadors to bring back Mr. Cooper with them, but he referred to a sort of protest which the government of Lassa addressed to the government of Nepaul, in answer to a letter begging them to permit Mr. Cooper to come through their territory to Nepaul. That answer was barely courteous, and it was somewhat of an humiliation to Jung Bahadoor, to meet with such a rebuff. He thought Dr. Campbell had spoken of the Lassa government as he knew it five or ten years ago. He did not take into account the blow which Chinese authority had recently received in all those countries to the south-west. Chinese authority in Lassa was now a mere cypher, as far as the civil power was concerned. The protest sent to Pekin was a spontaneous action of the Thibetan government, and rested on the ground that, whenever Europeans appeared in their country, the visit had been followed by all sorts of terrible disasters, drought and locusts, plague and pestilence, so that all were impressed with the belief that, if European travellers were permitted to visit Lassa, Buddha would be displeased, and would subject the country again to the same miseries. But Lassa was not such an unknown country as was supposed. Huc and Gabet were there for years, and they gave a full account of the place. Other missionaries had also been there and it was by no means an unknown place; the "Old Resident," indeed, who, he might state, was a highly-accomplished Frenchman, had lived in Lassa ten years, passing his time between that place, Bathang, and Cheng-king. He must add that Mr. Cooper had discovered another middle route, which was sometimes followed. This route led from Bathang to Zi-yu, a Thibetan town at the eastern foot of the Himalayas; from thence it crossed the mountains to Sud-ya, on the Brahmapootra, a town in British territory, only 180 miles distant, and having direct water communication with Calcutta. From Bathang to Zi-yu the distance was 125 miles, and 65 miles on to Sud-ya. Mr. Cooper stated that caravans of ponies and asses were in the habit of passing from one side of the mountains to the other. The country was difficult, and inhabited by wild tribes, so that, though much the nearest, he did not think the route would ever be much followed. There was this also to be considered—it did not lead anywhere, the mere transit from Suddya to Bathang being of no importance. The last news of Mr. Cooper was that he wanted to visit Suddya, and penetrate from thence either to Lassa or Bathang. With regard to the hill-tribes south of Tali, said to be so savage, those to the west of the Irrawady were so undoubtedly; but of those to the east of that river, Capt. Sladen gave a different account, and Mr. Cooper also. In respect also to Tali-foo, the accounts of the "Old Resident" did not agree with Mr. Wyllie's impression of the entire disorganisation existing in the country; he stated, on the contrary, that at Tali-foo perfect order prevailed, and that the Mahommedans were in full power there, the Chinese having given up all attempts to maintain supreme authority. Although at Bathang a guard for Europeans was necessary, yet they might reside at Tali-foo without danger or risk. Generally he concurred with Mr. Wyllie that from European settlement small good was to be obtained, with a great deal of attendant risk, but he (Sir H. Rawlinson) did not think that such would be the permanent condition of the country. He looked to the time when communications would be opened out, and a high road of traffic established from the Irrawady to the Yang-tse-kiang.

On the motion of Mr. Spencer Price, seconded by Mr. Hyde Clarke, the discussion was adjourned till Friday evening, 4th June.

The adjourned discussion was held on Friday evening, June 4th; Lord William Hay in the chair.

The following letter from Mr. Hyde Clarke was read:—

I regret very much my inability to be present this evening, as it deprives me of the opportunity of hearing your communications on an important part of the subject, and of myself sharing in the discussion.

Appreciating the general importance of the subject of communication with Central Asia, I should desire, on this occasion, to look at it chiefly from its commercial aspect. My attention was early drawn to it while act-

ing as honorary agent for Darjeeling. Whatever may be our views as to the functions of government in commercial questions otherwise in India, yet with regard to Asia beyond the frontiers, it is the duty of the government of India, as a government administering the public works, and as a landlord, to provide the requisite communications for the development of the trade.

If, as Sir Henry Rawlinson states, the present trade is inconsiderable, and so far, *le jeu ne vaut pas la chandelle*, yet, as he says, it is susceptible of development. It is idle to look for this development from the native merchants of India pottering at it; they cannot make roads in troublesome passes; they have no diplomatic authority to negotiate with chiefs and tribes in the defiles. It is only the continuous action of the government that can effect this, doing what the great governments of antiquity did—what the great government of the United States is doing in our day. This, too, must not be forgotten, that since many of us begun to consider this matter, India has become a producer of tea and other commodities used in Central Asia, which enable us more readily to carry on this commerce. We have, consequently, additional reasons for promoting this trade. The trade, therefore, which was formerly great, which has perished in the decline of the old governments of India and in the rank growth of the jungle of barbarism, will become still more considerable than of old. When the communications are cleared politically and physically, India, which is now self-contained, will have a back country, and it is the bounden duty of the government to take charge of the necessary measures.

As to replacing even the Chinese government by the Russians, or encouraging or allowing the Russians to exterminate Yakoob-Kooshbegi, and the people of Eastern or Western Turkistan, I cannot concur with Mr. Wyllie. Commercially and politically the govern- of Russia is the same as the government of China—one of monoply and exclusion, and a crushing oppression on human nature. Had Turkistan been more carefully looked after by our own Indian government and by the Foreign-office, the condition of Turkistan might have been ameliorated, and many of the recent disasters averted. At Constantinople, a centre of resort for the Turkish race, no systematic exertion is made, either with the Ottoman government or the natives of Turkistan, who arrive there during the Hadj.

One reason for the neglect of our interests in Central Asia is, undoubtedly, the apathy of our government; another is the few persons showing a care for those interests. In my own belief, the chief support of our policy in Central Asia is Mr. John Murray, the publisher, who devotes the only funds to the purpose, and affords the only encouragement to travellers and explorers at his own risk. The only reward Vambery has received has been from Mr. Murray. Another votary of Central Asia was the late Lord Strangford, and now we depend greatly on the attention Sir Henry Rawlinson can give in share with his public duties and his labours as a cuneiform discoverer. Sir Roderick Murchison, as President of the Geographical Society, has kept the region before the public, and Mr. Wyllie and Mr. Eastwick have charge of it in Parliament.

By systematic action, the question of our relations in Turkistan and of trade with Central Asia can alone be benefically pushed. There must be some one in India, some one in the India-office at home, and some one in the Foreign-office conversant with the business, and specially appointed to take charge of it. There must be a special person at Constantinople, another at Teheran, and some one at Pekin. The cost would soon be repaid, even if charged on the revenues of India. Every traveller should be encouraged. Professor Vambery may be again started on another venture, and be provided with a professorship or agency, instead of a sum of £60 a year from the University of Pesth. Independent travellers should be assisted to explore at their own risk, and rewarded on their return. Unaccredited commercial agents should be allowed to select stations in the cities of Turkistan, and draw small salaries. Above all, the functionary with the supreme government of India should watch our relations with the native tribes from Affghanistan to the Indo-Chinese frontier, and urge the government to follow up each tribe, by employing officials conversant with each language, and by encouraging the study of the aboriginal languages. This is one of the great means of effectually promoting the welfare of India, not only with regard to external trade but internal development.

There must be some means provided, my Lord, by which the counsels of functionaries like yourself may, on their return home, be made officially available for the public service, instead of their being offered as an intrusion and rejected with scant attention. There would be no harm, but much good, if there were councils here for the affairs of Western Asia and of Eastern Asia among other matters. The division of labour and the special applications of power are the most effective instruments in promoting political as well as industrial progress.

Mr. Spencer Price expressed his regret that speakers at the previous conference, whose remarks carried so much weight with them upon Central Asian questions in general, encouraged us so little to look for success in the endeavours of those who are seeking to find a practicable trade route between India and China, through Thibet. He gathered from the observations of Sir H. Rawlinson, that the primary, if not the insurmountable obstacle will be found in the exceeding jealousy of the Thibetan people. It would be presumptuous on his part to attempt to offer an opinion in opposition to so eminent an authority as Sir H. Rawlinson, nor, from his own experience, would he attempt to do so; but he might remark that, when in the north of China eighteen months ago, though not fortunate himself in meeting Mr. T. T. Cooper, whose name has of late become so prominently associated with explorations in Chinese territory, he did hear, from those who knew Mr. Cooper, some particulars as to the nature of the difficulties he considered he had before him. The chief difficulty appeared to be the jealousy of the Chinese authorities, and perhaps that of the Pekin government nominally, but what the various mandarins could show, especially as he neared the frontier. As the distance increased, so their power became, he supposed, more individualised. This was only natural, and to be expected. He held in his hand the report of a speech delivered by Mr. Cooper before the Calcutta Chamber of Commerce last February. On the point in question Mr. Cooper says:—"The Chairman had told the meeting of some of the difficulties which he had met on the borders of Thibet. These difficulties did not originate with the people of the country themselves, who, in every instance, treated him with the greatest kindness. The only difficulties he met with anywhere were those he met from the hands of the Chinese mandarins, who, not satisfied with jealously guarding the borders of their own territory, exerted their influence with the Thibetans, which resulted in stopping him from the further prosecution of his journey." A gentleman who spoke at the former discussion, Mr. Wyllie, as he (Mr. Price) understood him, looked upon Mr. Cooper's project as a hopeless, if not altogether a visionary one. But that very practical and intelligent body, the Calcutta Chamber of Commerce, are evidently not disposed to adopt the "rest and be thankful" principle; nor, apparently, do they think so slightingly of the adventurous Mr. Cooper; for we find that, fully impressed with the important results which would accrue to themselves if Mr. Cooper succeeds in establishing his route, they had resolved to subscribe and give him substantial assistance in the prosecution of his undertaking; and he thought the Calcutta Chamber was right, for it is to such men as Mr. Cooper that we have ever had to look, and must look again, for those great geographical discoveries which are

destined to inform the civilised world, as well as increase its wealth. Here was a man who carried his life as it were in his hand—who accepted all risks. Physical difficulties clearly did not appal him; but he did not disguise from himself that those which were political were important. There were were doubtless some present who would be aware that this traveller, after working his way 1,500 miles up the Yang-tse-kiang, had reached a point 200 miles of the Bramahpootra, when he was turned back by the Chinese mandarins. When he appeared before the Calcutta public, he proposed to reverse his plan of action, and, in place of reaching Calcutta from Shanghai he now therefore, proposes to start from Calcutta, with the hope of reaching the China seaport; and according to his showing, there seems to be good reason why he should succeed, assuming, as he clearly does, that the people of Thibet will let him pass through safely. Whether their fear of the Chinese power will operate to prevent their doing so remains to be seen. But the same objection can scarcely hold with the Chinese to an Englishman crossing the frontier from Thibet into China as from China into Thibet. The mischief (if mischief in their eyes there be) would be already done. China has, in point of fact, for centuries exercised a sort of paternal influence over Thibet. She supplies the Thibetans annually with from four to six million pounds of brick tea, the same article which, I believe, our planters in India have successfully imitated, and found to be appreciated by the people of the Punjaub and other parts. We can hardly expect, looking at the present condition of trade on that great river, the Yang-tze, and the prospects of still further facilities of communication therewith, that an improvement of our direct China commerce can be expected through their western land route; but the access to Central Asia in this direction undoubtedly holds out in itself a sufficiently alluring prospect, not only to our tea-planters in Assam, but to our manufacturers in Manchester as an outlet for their piece goods. As regards the nature of the Chinese influence in Thibet, he believed it was well known that the Pekin government subsidised the five chief Lama monasteries, and it is certain that the Lama government issue orders that no Thibetan shall buy Assam tea. The Chinese are truly a people strangely constituted. Whilst we find them full of romantic notions of government which, in this part of the world, we have ages since dismissed as unfit for progress and civilisation, there is probably no people in the world who are more keenly alive to the value of a dollar, and the protection of their pecuniary interests. On all sides, however, it appears to be agreed, as an absolute necessity, whatever be the success which may attend Mr. Cooper or any other explorer, in a geographical or scientific point of view, that we cannot hope to establish a trade in a permanent manner along this desired route unless we have a British envoy or resident at Lassa. There were gentlemen present more competent to speak upon that point than himself; but, looking at the marvellous openings to our commerce possible in this direction, he could not but think it was a subject demanding the consideration not only of the government of India, but quite as much of our government at home.

Mr. George Campbell said he had very little personal knowledge of the country to the east of India, and had not had the advantage of hearing the previous discussion. The British Association did him the honour to place him on a committee appointed to address the Secretary of State on this subject. He had not the opportunity of acting on that committee, and did not well know what was done. On one occasion of the meeting of the British Association, Sir Arthur Cotton, a very distinguished man, and the great apostle of water communication, brought forward a plan for a canal to connect the Brahmapootra with the Yang-tze. It was possible there were some physical difficulties with regard to that project, but the association were agreed it was highly desirable that the country should be explored. He had the honour of suggesting that, though it might not be possible to make a canal to join China direct with India, still there might be other advantages in making a communication of some sort between the two countries; that we might have a new road, something of the nature of the hill-road of Lord Dalhousie, and that great advantages might be looked for from it; Labour fitted for the cultivation of tea being what was most wanted in Assam, and the Chinese being a most emigrating and enterprising people, if we made a road passable for light passenger traffic, we might expect a large influx of Chinese emigration into Assam. He had read the paper which Colonel Hopkinson, an officer more conversant with this country than most other men, had communicated, and he was sorry the result, in his (Mr. Campbell's) mind, was discouraging as respects direct communication between Assam and China. If he might venture on a theory of his own, it would be this—that there is in fact, as shown by Col. Hopkinson, a continuation of the great snowy range of the Himalayas to the east of Assam, which could only be passed transversely by different passes; but a passage longitudinally along that range was almost impossible. We might pass from north to south, but could not pass along the snowy part from east to west. He thought we had neglected the precise information given by the French missionaries, who had published an exact account of the route from Lassa to China. The information of Colonel Hopkinson went to show that the snowy range was continued in that direction, and that being so, the direct route from Assam to China was impassable, but that we might either take the route somewhat further to the south, over the lower range, or get to the north of the snowy range, into the route by which he believed the French missionaries travelled, and by which also certain enterprising men had travelled from Lassa to the Chinese towns on the Yang-tze. If this was the case, we must choose between Burmah on the one side and Thibet on the other. He thought that, physically, the Burmah route was the best, but by reason of the jealousy of the people the greatest difficulties had arisen in the way of trade and commerce, whereas the less easy, but still practicable route by Thibet might have certain political advantages; but, unluckily, we had the difficulty that the Thibetans would not let us go through Thibet, or rather that Chinese authority in Thibet prevented us from passing through that territory. So far as Thibet was concerned, less than a hundred years ago we had free intercourse with Thibet. He believed it was in 1783 that a British envoy traversed these mountains, and was hospitably received by the Thibetan authorities at Lassa. At all events, he got to the capital of the Grand Lama, and entered into friendly intercourse there. It had been the habit of the Chinese, authorities when they wished to obstruct us, to put forward that it was the subordinate people who were the real obstructors, and not themselves. He was not anxious to press our trade by force of arms. He thought there was a chapter of history, in respect of our dealings with China which we could not look back with feelings of satisfaction. Still, his impression on this subject had been derived from a visit to Canton. There was a time when the Chinese government appeared extremely anxious to admit Europeans into Canton. They said—"We will do all we can, but what are we to do with these ungovernable people;" and that was the reason why they did not admit us into Canton. We overcame that resistance by force of arms, and we found, so far from the population of Canton being prejudiced against us in the way represented by the government agents, at this moment a man could walk about the streets of Canton with greater security than in the streets of London, without the slightest risk, and without the slightest symptom of dislike on the part of the population. Therefore, he thought, if the Chinese government honestly carried out their obligation, if obligation there be, with regard to giving facilities to passing through their

country, it was possible we might establish trade with Thibet, and through Thibet with China itself. He was not, however, surprised that the Chinese did not want to see more of us than they could help. With regard to the Central Asia question, a political character was sought to be given to the trade of Central Asia. We were told that we were losing our trade through the jealousy which Russia had excited; and we were, moreover, told it was necessary to establish commerce in Central Asia, and do all we could to forestal the Russians in trade. Central Asia might be divided into two parts, viz., Turkistan proper and eastern Turkistan. He must say, his own opinion with regard to Turkistan proper, looking at the position we occupy, Russia must have the best of it. They had political and commercial relations with those tribes inhabiting it, and he did not see how we could disturb them in that respect. It was not as if Russia were the only obstacle to our entering Turkistan; there was the whole country of the Affghans, not only the country of the Ameer, but the country of independent tribes, who will not permit European traffic to pass that way without exacting black mail. It was out of the power of the Ameer himself to make a safe route. With regard, therefore, to most of Turkistan, it would seem impossible for us to compete with Russia. Bokhara, as the crow flies, is nearer to us than to Russia, but these difficulties were weighted against us. If we got over the tribes of the Affghans, and succeeded in establishing commercial relations with them, we might compete at Bokhara with the Russians. On the whole subject he thought the tendency had been to exaggerate the trade and riches of Central Asia. That it was important to a certain degree there could be no doubt, but, compared with India, it was insignificant, and was, moreover, hedged in by multitudes of irreclaimable cut-throats. Though it was desirable, in a local point of view, to push our trade into those regions, still when compared with 200,000,000 of prosperous Hindoos, to add to that a small trade, only to be got with great difficulty, with 5,000,000 or 6,000,000 cut-throats, would not, he thought, justify any measures which would set us by the ears with the Russians. With regard to Eastern Turkistan he was inclined to agree with Mr. Wyllie that, in a commercial point of view, the best thing was that Russia should take possession of that country, for although the Russians imposed heavy tariffs, they wanted to get tea, and if Dr. Barry would supply them with tea from Assam cheaper than they could get it from China, he believed they would take Dr. Barry's tea and leave the Chinese article alone. With regard to Eastern Turkistan, therefore, he felt no jealousy of the Russians, but whoever might be the possessors of Eastern Turkistan, if trade could be directed across the Himalayas, we might be able to compete profitably with the Chinese at Turkistan in tea. He hoped the road commenced by Lord Dalhousie, from Simla towards Thibet, and the other roads projected from the Punjab, would be sooner or later carried out to completion, and that we should succeed in establishing trade in that direction. There was one point deserving of notice which had not been referred to, that was, that the most important article of commerce to us was the fine quality of shawl-wool which that district yielded. The Rajah of Cashmere, like most Eastern potentates, was ambitious of being a trader, and he had the monopoly of the Cashmere shawl trade, and his object was to obtain the monopoly of the whole of this great shawl-wool country beyond his own territory to the east, and which might be brought into immediate connection with our own territory. The completion of the roads to which he referred would be the most likely means of diverting that trade to our own territory in the Punjab, and we should, in the manufacture of shawls and other articles, obtain great advantages.

Mr. Vesey Fitzgerald wished for information on two or three points. He could not agree with Mr. Campbell as to the comparative unimportance of Turkistan. The latest accounts showed that country to be one of the most fertile in the world.

Mr. Campbell asked whether Mr. Fitzgerald referred to the country generally, or only to certain tracts?

Mr. Fitzgerald could not make a distinction. The accounts he had received stated that there was a great deal of very fertile land in Turkistan. He wished to ask whether the commerce of Central Asia, in the direction of Russia, had been estimated as to amount? He suspected not, except by certain lines of caravans that existed.

Dr. Archibald Campbell said accurate statistics had been published by the government of the Punjaub.

Mr. Fitzgerald wished also to know whether there was a probability of that commerce being increased to a large extent from India, and whether the power of underselling Russia was great under a system of unrestricted competition. He saw a statement in the *Standard* newspaper of that day, to the effect that Russia had imposed a duty of 84 per cent. on English muslin goods at Bokhara, which might be regarded as a prohibitive duty. Then he wished to know whether the Russian lines of communication could be increased by subsidy, as the *Messageries Imperiales* in the Levant were supported by subsidy to his knowledge, as also in the Caspian Sea. He understood Russian commerce and politics were identical with Central Asia much in the same way that building operations in Paris were identical with the politics of France.

Mr. Trelawney Saunders regretted to say that he agreed with scarcely any of the observations which had fallen from Mr. Campbell. He had said, amongst other things, that intercourse on the Himalayas, east and west, was impracticable. He (Mr. Saunders) believed that east and west were more practicable than north and south. Again, the route between Lassa and Bathang was pointed out as a direct route east and west; but anyone who took the trouble to read Huc's account of his journey through that portion of country would see that it was one of the most frightful countries on the face of the earth. The accounts of the difficulties there encountered were such as most persons would regard as exaggerations, yet he believed there was no exaggeration in them whatever. They could readily understand from them how impossible it must be to expect commerce on anything like a large scale between Lassa and Bathang. At the same time, let not that be taken as a reason for abandoning all attempts to solve the problem they had before them, for all who studied this subject must rise from that study with great hopes for the development of trade in Central Asia, when they found that what they viewed as natural difficulties were not insurmountable by the inhabitants. The Himalayas throughout were traversed by the natives at the proper season, and that was all that could be done in the case of the Alps; and if they studied the old trade with Central Europe, which helped to make Venice rich, and the country between the Mediterranean and the interior of Europe before such roads as the Simplon and railways existed, and applied those conditions to the traversing of the Himalayas, they would find the proper solution of that great problem. A greater problem than that they were now discussing could not be presented to humanity, and it could not be expected that a problem so vast as this could be studied at first without some mistakes being committed, and he thought the greatest use of these meetings was to compare their ideas and correct one another's mistakes. In that way they got light thrown on the subject, and in the end they might hope to arrive at a satisfactory solution. They were much indebted to the Society of Arts for giving them an opportunity of discussing a question which involved the intercourse of half the population of the globe, of two hundred millions on the one side, and four hundred millions on the other. That was what they were attempting to do; and they had not to remove natural barriers, but those political

barriers which have been allowed to remain through the supineness of the people, or the governments which had the question before them. He said the difficulties were political rather than natural, either with regard to the people or with regard to inorganic nature. He believed there was no occasion to make great roads like that projected by Lord Dalhousie. He believed that was a huge mistake at this period, and that if they gave people the power to find a way, they would find it. Moreover, with regard to the people themselves, they had evidenec enough to show that, when they were approached in a proper manner, the difficulty in that direction was removed. Captain Godwyn-Austin, one of the surveyors of the Himalayas, crossed the Chinese frontier. He knew there were difficulties in the way, and yet he felt himself at liberty to trespass on the Chinese territory, against the orders of that government. He could not say he approved of that; but what was the reception Captain Austin met with? Instead of being treated with discourtesy, the Chinese official came down, and told him he had strict orders to refuse permission to Europeans to pass the frontier; he also hoped he would not interpose force, and advance any further, because if he did it would cause him to lose his situation, and on those grounds he begged him to retreat. Again, he had been assured by a gentleman of great experience in China, who had passed the best years of his life in the British service in that country, that no country was safer to travel in than China, by those who were competent to convey their ideas to the natives, and allay any suspicion they entertained. But what was to be said of people who entered the country without the least knowledge of the language? That he understood to be one of the greatest difficulties of Mr. Cooper. He was told that gentleman could not speak a word of the language. Again, he did not think any steps should be entertained, here or in India, to advance across the Chinese frontier till the existing political obstructions were removed. They could not advance far in the direction of Yunan from Assam without coming upon a residence of the Lama governor. No man was more competent than Lieut. Wilcox for such an enterprise. He approached the residences of the Lama governor and of the high priest, which were indications of a settled population, but he was compelled to return. If Mr. Cooper, or anybody else, attempted forcibly to push his endeavours too far, so as to trespass upon that territory against the will of the authorities, resistance would be interposed, and a disturbance take place. Something of that kind might have led to the death of the two French missionaries. No doubt we were entitled to cross the frontier, nor could we doubt that, if the subject were really and earnestly advocated by the Foreign-office and by our ambassador at Pekin, the authorities at Pekin would remove those restrictions on the part of their officials. He would now call attention to a few points which he considered of importance with regard to Central Asia. There was no doubt Chinese authority had suffered considerably in the western parts of the empire, in what was called Chinese Turkistan, and that portion of the country was now in open revolt; but, in his opinion, instead of encouraging that state of revolt on the part of the subjects of the Chinese empire, it should be the object of Europeans to aid China in putting an end to it. He believed the means of effecting that were in our own hands, without exercising undue political interference. We ought to do all we could to support Chinese power in Central Asia, for this reason, that every successful revolt in that direction was a step towards the acquisition of that territory by Russia. What did such acquisition of that territory mean? It meant our total exclusion from its trade. The Russian tariff was not an ordinary one, but entirely exclusive. It had been said of Central Asia it was comparatively worthless, its population sparse, and the commerce insignificant; and that while we have a country like India to our hand, it was not worth our attention. But did they forget that it was precisely from those great regions that all the overwhelming hordes had come that had desolated India, China, Persia, and Europe itself? It was from that country Tamerlane and the great Genghis Khan had advanced to seize upon the territories of the south—in fact, to reach the shores of the ocean in all directions; and it was only so long as that country remained in a disorganised state,—that life and property were not safe there,—that they failed to have that development of population which led to outflowings in the way of hostile migration. It might be argued that under Russian rule there was security of life and property. Yes, but in those countries the Russians would find the population and resources for giving overwhelming influence to the Russian armies, and the power to do that which they regarded as their destiny—viz., the advancement of their dominions to the open seas. He said when once Russia obtained the control of Central Asia, she would attain a position which would make her an overwhelming power. If, on the contrary, they aided in keeping these countries, as they now were, in the hands of the Chinese, opening India as an outlet for them, China also as another outlet, it would lead to the dissemination of our trade, and afford to the people of Central Asia the maintenance of life and property, and increase of population, without danger to the surrounding countries, because these outlets would dispose of the outflowings of their population. The question that we had sooner or later to settle—and it could not be settled too speedily—was, whether these countries were to become subject to the dominant power of Russia on the one hand, or maintained under the power of China and the beneficent exercise of British principles on the other. He believed, unless we secured freedom of access to Central Asia, and carried our trade there, and opened up the doors of the Himalayas, the doors of China, and the doors of India, we should have Russian influence in Central Asia as irresistible as any that had proceeded from it.

Mr. H. Stanley would make an observation, in answer to Mr. Campbell, with reference to Canton. That gentleman assumed that it was pretence on the part of the Chinese government, with respect to the hostility of the people towards Europeans, whereas the early history of Canton showed the people to have been very turbulent, as compared with other portions of the population of the empire, then, as was the case in later years.

Dr. Barry would not pretend to follow the gentleman who had addressed them on the subject of Central Asia, but he thought they might leave Russia to herself. She might come to the northern aspect of the Himalayas, without giving us much concern. He believed Mr. Campbell had pointed out difficulties that exist for any power, however great, to cross that frontier to disturb us. The British government, he thought, was getting hold daily of the immense population in India—about 200,000,000—by good government, and the exercise of just laws (and more just administrators of the law did not exist); when we considered that every day we were improving our courts, giving justice to the people, and getting hold of them, he did not think we had much to fear from Russia. With regard to commerce, what was the use of opening out commerce north of the Himalayas, when we had millions of square miles the trade and commere of which was yet undeveloped. Take Assam, for instance. He went there in 1849, and the trade was then almost *nil*; the difficulties of communication were so great that he had to order his supplies six months before he received them. The country was one of the finest in the world, and, with a population of under one million, was capable of supporting twenty millions. The valley of Assam—he could scarcely tell them what it was. If we wanted to exercise civilising influences over barbarians, let us exercise our influence to civilise our own territories before we attempt to cross that tremendous frontier. He agreed with Mr. Campbell when he spoke

about Simla. A gentleman had spoken disparagingly of Lord Dalhousie's road. He thought, if ever there was a man who graced humanity and did good for India, Lord Dalhousie was the man. History had not done justice to him. Fifty years hence we might hear more of him, and his name would be in every page of Indian history, not with regard to that road only, but in the opening out of other means of communication which had laid the foundation of Indian greatness. Who was it gave the start to railways in India, and swept away all opposition, moral and physical?

Mr. Saunders interposed that he had no intention of speaking disrespectfully of Lord Dalhousie; he merely questioned the policy of attempting to make a road across a barrier like the Himalayas, at a time when it was not required for the promotion of any existing trade in that direction.

Dr. Barry went on to remark that it was only part of a system of opening out the country—civilising by roads. It was the system adopted by Sir Henry Rawlinson. Look at his papers, and see what he wrote. He said (and it was becoming true) that the great civilisers of India were railways and roads, and he (Dr. Barry) contended that roads were the great things to open out commerce. Mr. Campbell had referred to Simla. No one was more competent to give an opinion of Simla than the noble lord in the chair. He believed that some day there would be direct communication, but he did not agree with Mr. Campbell that they would be able to get labour from an eastern direction. Those who had read the reports of the Asiatic Society for the last thirty years must be aware that communication had existed between Western China and Bahmoo by caravans. It was stated that a young man in charge of a tea-garden came to a misunderstanding with the native labourers, who rose against him, and having shot at them, he made his escape across the frontier. He got as far as Yarkand, intending to go to Manisa. He got upon a river leading to Burmah, but the British Resident, hearing that he had committed some crime, turned him back; and he described that he had no difficulty in getting from the Indian territory into the Burmah territory. Captain Sladen pointed out that, in course of time, no doubt that would be the route of communication with China. He (Dr. Barry) believed that was one of the great communications between China and India. He did not think the Manchester trade could be conveyed from Calcutta to Bahmoo, and thence to China; but no doubt steamers could go up the Irrawady as far as Bahmoo, whence the goods must go by caravan; and some years hence we might look to getting labour for tea cultivation in Assam, but we should never get it from Lassa.

The Chairman asked if there was any hope of obtaining coolies from the lower ranges of Assam.

Dr. Barry said the ranges there were the same as in the north-west.

The Chairman understood there was a road through these mountains below Assam.

Dr. Campbell said there was a road to Towang.

Dr. Barry added that no doubt the difficulties north-east and south-east were insuperable, and if they went from Assam they must go south-east, and strike open one of the great channels leading to the south.

Mr. S. Ward rose with diffidence to say a few words, because, as he previously stated at these conferences, his object in attending them was to obtain rather than to endeavour to impart information; and this being the last conference of the series announced, he was desirous to state that he had obtained a great deal of information from them. It would be gratifying to the promoters of these conferences to know that a friend, to whom he sent a copy of the report of the proceedings of the first conference on tea-cultivation, had procured the publication of it in the Darjeeling newspapers, in the hope that it would evoke the criticisms of native planters, and in that event, a promise was made that he would send home the papers containing them. He hoped a similar course had been taken by gentlemen connected with Assam, so that additional information would be obtained, which would add to the benefits of these conferences. He would not occupy them by attempting to address the meeting on the subject before them. There certainly appeared to be great difficulties in the way, but he was glad to learn, from what had fallen from preceding speakers, that the imaginary difficulties were greater than the real ones, and hoped that all difficulties, made and real, would be eventually overcome.

Dr. Campbell wished to say a few words in reply to the remarks made upon the subject of his paper. In giving authentic details of the road through Nepaul, Darjeeling, and Bhootan, he was going over ground of which he had had personal experience for twenty years; but when he came to the subject of Lassa, he said there was not much known authentically, from European observation, in the present day. Sir Henry Rawlinson remarked that he did not think anything could be done in Lassa, on account of the jealousy of the Thibetans, and that Lassa itself was not so unknown as was represented. He was quite familiar with the doings of MM. Huc and Gabet, and heard of them at Darjeeling, during the whole time they were at Lassa, but they gave little information as to the trade that existed in that city with India. Sir H. Rawlinson attributed the whole difficulty to Thibetan jealousy. He (Dr. Campbell) thought the latest information on that subject did not bear that way, but it was rather to be attributed to the exclusive nature of the Chinese government. Chinese influence in Thibet was not paramount till 1783, up to which time the Thibetans were friendly to trade with us. The Nepaulese made a raid upon Thibet, and robbed the great monasteries of the images of gold and silver, on which the Grand Lama of Thibet sent a mission to Pekin, to inform the Chinese government of what had been done. An army was immediately sent into Thibet, and it marched to within fifteen miles of Cathmandoo, the capital of Nepaul, so that there was no difficulty about an army coming from the north. The Nepaulese, on this demonstration being made by the Chinese government, made a humble treaty, and they undertook to send a periodical mission to Pekin as tributaries.

The Chairman asked whether Dr. Campbell was aware of the route which that army took?

Dr. Campbell said there were two routes from Pekin, both going by Lassa, and both were described in detail by Mr. Hodgson. One was from Lassa through a place called Siling, and was as nearly as possible that which M. Huc took in going back from Lassa; the other route came also by Lassa, but further north; both these routes were detailed in the *Journal of the Asiatic Society*.

Mr. Saunders remarked that that was the centre of all the Chinese trade in the south-west.

Dr. Campbell having pointed out these routes on the map, further remarked that Huc and Gabet remained a whole year at Lassa, and returned by the lower route. There was no doubt we might do a good trade with Lassa, if roads were opened to the frontier of Thibet. The distance from Darjeeling to Lassa was not more than 500 miles, and such means of communication as existed had been followed for a long time. He agreed with Mr. Spencer Price, that the difficulties of crossing the frontier were imposed by the Chinese government officials. They were most exclusive, but the Thibetans were not so. They were a pastoral people, and a trading people, and their religion was a tolerant one. Mr. Saunders did not sufficiently distinguish between the Chinese people and the Chinese officials. The officials were certainly very exclusive; the Chinese people, he believed, were not so exclusive. the instance mentioned of the Chinese officials meeting Capt. Austin on the frontier was a parallel case to that which he (Dr. Campbell) experienced. Having crossed the frontier, he was met by a Chinese official attended by 100 men, and similar representations were made to him that were made to Capt. Austin. The custom was

for every pass to be visited once a year by an official, who deposited a stick, on which was recorded the name of the official, the date of the visit, and the names of four or five witnesses. The stick which was deposited the year before was taken away and sent to Pekin, so that they had authentic records of every pass from Thibet to India sent every year to Pekin. With regard to the physical difficulties, Mr. Campbell said it was easier to go from south to north than from east to west, but the fact was the people went both ways.

Mr. Campbell said he referred to the crest of the snowy range only.

Dr. Campbell said of course it was impossible to pass that way. There was a route through the centre of the Himalayas, but when the snowy range was approached, there was no passage from east to west.

The Chairman, in summing up the discussion, said the question before them had been dealt with in so elaborate and interesting a manner, that he was relieved from the pleasure and duty of trespassing upon the time of the meeting at any great length, but he would refer to one or two of the salient points raised in the discussion. The object of the conference was to investigate how they could best promote trade between India, Central Asia, Thibet, and Western China. There was no doubt whatever that there had been trade between these parts of the world from time immemorial. The object, therefore, was not to create a trade which had never existed, but to promote a trade which might be developed into something very valuable to our merchants. Before discussing this question, in order that his remarks might be better understood, he would divide this long line of country, from the north-west to the south-east, into three sections—first, that which had to do with Affghanistan and the country west of Eastern Turkistan; secondly, that from Eastern Turkistan to Western China; and then he would offer a few remarks with regard to Western China itself. Dr. Campbell had truly said that the obstacles in the way of promoting trade between Assam and north of the Himalayas were of two kinds—one political and the other physical; and those difficulties would be found varying in degree from one end to the other. In one place political difficulties predominated, in another physical; but they found both throughout the whole length. With respect to the Affghan section, the political difficulties predominated very largely; because, though the roads leading to Bokhara were not so good as they might be, there was nothing in them to prevent merchandise being transported on beasts of burden, if not by carts. If they were to believe the statement of Mr. Hill, who had recently travelled in those parts, there was a route known as the Chitral Valley route, which was traversible by laden carts. He was not prepared to endorse that, but it had been announced to the Geographical Society that such was the case. The political difficulties might be divided into two classes—first, those arising from lawlessness of the inhabitants; and, secondly, those which were created by the advances of Russia. No doubt, without going deeper into the political part of the question, Russia was anxious to absorb the trade of that part of Asia, and would do all she could to prevent the entrance of European merchandise into that part of the country. Coming to the next section, from Kashgar to Western China, which included Great Thibet and Little Thibet, there the physical and political difficulties might be said to be about equal. Amongst the former they might include the great loftiness of the Himalayas, their extreme width, the precipitous character of the mountains, and the numberless rivers which intersect them. Then, under the political difficulties they might include the fiscal arrangements of different countries through which the trade would have to pass—Cashmere, Nepaul, and Bhootan. The Rajah of Cashmere imposed prohibitive duties; the Nepaulese ruler would not permit European traders to pass through his territory; and the difficulties in Bhootan were sufficiently well known. Then there was an important element in the political part of the question, in the policy of the Chinese government in reference to Thibet. There was a difference of opinion on this subject, some persons thinking that the prohibition was due to the Thibetans themselves, and others that it was due to the conduct of the Chinese government. He was one of those who thought it was originated entirely by the Chinese, as far as we had knowledge of the country before Chinese influence extended to it, we had no difficulty in finding our way into that country; and another proof was, the moment Chinese influence was withdrawn from Eastern Turkistan, the difficulty of finding our way into that part of Thibet had diminished. Mr. Shaw had no difficulty in getting to Kashgar. But, on the other hand, it was to be remarked that that policy, though originated by the Chinese, had been followed by the Thibetans in some parts, certainly by the Rajah of Nepaul, whose exclusive policy was as strictly defined as that of China. His own impression was, that the real reason why the Chinese policy had been adopted by certain chiefs on our own territory, and by the Thibetans in certain parts, was the fear of our aggressive tendencies—our tendency to annex. There was no doubt we had got a bad name for that throughout Asia. That was the feeling evidently of the late King Theodore of Abyssinia, when he said that, under the guise of promoting the interests of his country, we aimed at its possession; and Mr. Palgrave, in his work on Arabia, said that our reputation was of the highest order for dealing justly, but the natives had a notion that the further we were off the better it was for them. The Nepaulese had always gone upon that principle, and he ventured to say they were perfectly right, because it was, as far as he knew, the only province in all India where the king of the country could really be said to rule his own dominions. The Rajah of Cashmere exercised considerable authority, but it was only during the six months that Europeans were not permitted to go there. We must endeavour to dispel that feeling, and the moment that was done the doors of those countries would be opened to us, and our traders would be received. He would remark, with regard to Eastern Turkistan, that Mr. Saunders did not view the position of Russia in Asia with the same complacency that Mr. Wyllie had done at a previous meeting, and he had raised the question this evening whether we should recognise the *de facto* rulers of Turkistan, or assist the Chinese to recover that province. It was a curious fact, that the same question had been raised with regard to Yunan. That Chinese province had been taken possession of by the Mohammedans, a small but vigorous part of the population; and as Sir Henry Rawlinson said the other night, it was a question whether we should negociate with the Mahommedans, who had made themselves masters of, or with the Chinese, who wished to recover it. One or two speakers, he thought had underrated the value of the commerce between Assam and Thibet. In quantity it was not large at present, and he did not suppose it would ever figure very largely in commercial returns. Its chief value appeared to be this, whatever trade there would be, would be in products of considerable value, such as tea, borax, and that extremely fine quality of wool which was found only on the backs of animals in that part of the country, and which could be transported without difficulty. The great advantage of opening out that trade appeared to be that the chief persons concerned in it would be Europeans. There were numbers of Europeans settlers throughout the Himalayas, and their chief markets would be the countries north of the Himalayas, and he thought it was a great object to increase the number of those settlers. Nothing would strengthen our hold of India more than having a large number of settlers thoughout the Himalayas; therefore the object was not so much to develop a very large trade to bear a considerable amount of taxation, but such a trade as would lead to the spread of European settlers.

That appeared to him the chief value of the trade at present. Mr. Saunders said, with regard to Bokhara, it was a great mistake to underrate the value of that country, because it was part of the country from which an immense number of people in the world's history had overflowed.

Mr. Saunders said he embraced the whole of Central Asia, including Mongolia.

The Chairman—That was an argument which cut both ways. It was like the Scotch leaving Scotland because they thought they might make a better livelihood elsewhere, and it might be that the people of Central Asia had left it in such huge numbers because the country was not a very agreeable one to live in. He now came to the most important part—the question of Western China. He did not profess to be any authority upon it—in fact, his knowledge was recent—and all he could do was to refer to the most interesting points in connection with it. What was their object? It was to establish communication between Assam, Calcutta, and the provinces of Rangoon, and the two provinces of Yunan and Sechuen, which were considered the most valuable in the whole of Western China. The Manchester merchant was anxious to find a country where he could dispose of his cotton goods. The three important places pointed out by Sir Henry Rawlinson were Chang-king, Tali, and Bathang. Those places were the important entrepôts, and Tali was described as being a very beautiful place. There were several interests to be consulted in connection with this question. First, those of the commercial people who wished to get their goods into those markets, goods, for the most part, of a bulky description; then there were the tea-growers of Assam and others, who were anxious not only to dispose of their tea in those countries, but also to procure labourers for their plantations. The notion at the present time was, that the Assam people had strong influence at the India-office, and that they were considered in preference to the merchants of this country. Dr. Campbell had advocated a route through Darjeeling.

Dr. Campbell—Yes, because it is our own territory, and free from hindrance.

The Chairman—Col. Hopkinson was in favour of the line *viâ* Towang to Bhamoo and Tali. Dr. McCosh, who had written an elaborate paper on this subject, advocated the route known as the Petkoi route, and there were others who advocated the route from Calcutta through Dacca to Munipore and Bhamoo. Then there was the other line by way of the Irrawady to Bhamoo; and, lastly, Captain Sprye's route from Rangoon, right across to the Mikong river, which debouches at Saigon, a French settlement, and is a river of great geographical interest, from being the scene of one of the most brilliant geographical exploits of the present century. The expedition sent out by the French ascended the Mikong, then crossed over the difficult country of Yunan, and finally descended the Yang-tse-kiang. The only regret in connection with that exploit was the loss of Captain Lagrée, who died on the journey. These several routes might be classified into routes leading from Calcutta direct, and from Rangoon. The difficulties, he believed, were great, not so much on account of distance, but of the jungly nature of the country. Capt. Sprye's route had been strongly advocated, and an elaborate memorial in favour of it had been presented by the Chamber of Commerce of Huddersfield, which set forth the advantages of that line. The great objection to it was, that it did not lead to anything. Having got over a very difficult country they arrived at the Mikong, which was not navigable throughout, and they did not tap the rich country they wished to reach. The most available line seemed to him to be that from Rangoon to Bhamoo. The Irrawady, however, he was told, was not so pleasant a one as it looked; in summer it was dry, and in winter it overflowed the banks in a manner that rendered it difficult to navigate. That was the reason why a railway from Rangoon should be carried as far as it could be. If the King of Burmah could be induced to allow of the extension of that railway through his dominions it would accomplish a great thing, because there was no difficulty between his country and Tali, and, upon the whole, it seemed the most feasible way of tapping these two large provinces. The next question was, what could the government do to help the British merchant in this matter? The Duke of Argyle had lately stated that the hands of the India government were full. There was scarcely any part of India where it was not desirable that some sort of roads should be made, and the government must choose those which would give the greatest amount of convenience, and do them first. He believed he was right in saying a railroad in Burmah was in contemplation. It was also highly desirable that the Assam route should be well surveyed, for it was impossible to form a correct opinion till that had been done. Confining what he was saying to the Himalayan mountains, he agreed it was desirable that Lord Dalhousie's road should be completed as quickly as possible. He was very familiar with that road, and at the time he left Simla in 1861, it had been made about half way across the Himalayas and then left unfinished, which was like building a bridge half way over the Thames, and thinking that something had been done towards advancing the trade between the two banks. That road would tap Thibet at the very point where it should, in the neighbourhood of Garoo, which was the head quarters of the wool and borax trades, and the depôt of all the trade of that part of Thibet. But speaking generally with regard to the Himalayas, he was not so much an advocate for making roads; what he thought was more wanted was bridges. He could give a striking example of the importance of bridges in the case of the Chenab river. It was this: if a traveller leaving Simla desired to cross the Himalayas to Yarkand, he would follow a certain road which he (the Chairman) had passed over; he would, in about 10 days, arrive with his ponies and baggage at the Chenab river, which he must cross, but there was no bridge, except one constructed of twigs, which was hardly safe for a monkey to pass over; the ponies would have to be sent back; and to prosecute the journey, a fresh relay of ponies must be obtained on the other side. With the exception of that single river, one might ride on the back of a pony the whole distance from Simla to St. Petersburgh. He was quite sure there were engineers in this country who would be able to construct a bridge over such rivers, either moveable or permanent. What he recommended was, a survey of the Himalayas with reference to the points where it was desirable to have bridges, and then he would endeavour to get the best kind of design for a light iron bridge, capable of being removed if necessary during winter; and he was sure a few thousand pounds spent in that way would do more to improve the communication with the Himalayas, and intercourse with the natives of that country, than anything that could be devised. Dr. Campbell had referred to the importance of fairs being held in the neighbourhood of Darjeeling. He quite agreed with that, and Mr. Atkinson, who had written a work on Siberia, strongly advised the establishment of fairs at Moultan, on the ground that they would do more than anything else to encourage trade between the various races of the country. He thought that was about all we could expect the government to do. There was one thing the government ought not to do, viz., to threw cold water upon the expeditions of adventurous persons in these regions. The Duke of Argyle seemed to entertain the idea that nothing could be done for many years to develop the trade of Western China. That expression of opinion was rather calculated to disappoint and discourage those who were disposed to undertake these expeditions. It seemed, because we made mistakes in Abyssinia, we were now running into the opposite extreme; and because we had acted injudiciously in Africa, we were neglecting the im-

portant matter of extending our commerce in India. Mr. Wyllie laid great stress upon the unsettled state of the Chinese provinces, and said there was no prospect of carrying on a trade there; but it was not to be taken for granted that they would remain in that condition for ever. In the meantime we should endeavour to make such arrangements as would enable us to take advantage of trade when those countries became in a more suitable condition for it. We (added his lordship) are a commercial nation, and we live by commerce; and if measures are not taken for extending it in every direction, we shall be very much like human beings who are deprived of the air on which they exist.

Free Public Libraries and Museums Committee.

The Committee appointed by the Council to consider and report how the Society may aid in promoting the establishment of Free Libraries and Museums of Science and Art throughout the United Kingdom, met on Monday last, at 3 p.m. Present:—Henry Cole, Esq., C.B., in the chair; Gen. Eardley Wilmot, R.A.; Sir Daniel Cooper, Bart.; Messrs. Samuel Redgrave, Seymour Teulon, George Godwin, F.R.S., James T. Ware, Hyde Clarke, J. F. Iselin, and James Hole.

The Chairman explained that the Committee would have been invited to meet on an earlier day, but that government had been collecting information as to the number and condition of the free public libraries and museums established under Mr. Ewart's Acts, and it had been thought that it would be inopportune to call them together before that information had been obtained. Mr. Baines had moved an address on the subject, in the answer to which still fuller and more explicit information than anything hitherto published might be expected. A motion, recently proposed by Lord Henry Lennox in the Council, which had been referred to that Committee, relative to the distribution of works of art among local institutions, might be taken into consideration at once. As regarded the principal object for which the Committee had been appointed, a certain amount of information had been collected through the Science and Art Department. From the returns and replies collected, it appeared that 31 free public libraries and museums had been established in England and Wales, three in Scotland, and three in Ireland. These had been established, to a great extent, by spasmodic efforts and extraordinary inducements, and by accidents of different kinds, rather than by spontaneous action upon the part of the public, and a voluntary adoption of the provisions of the Acts. If the friends of these institutions trusted to popular convictions alone, there might be other thirty or so established in the course of the next 25 or 30 years. This was not satisfactory progress. He (Mr. Cole) was strongly of opinion that efforts should be made to stimulate and guide action in the matter. Almost all corporate towns, he should suppose, would be able, without feeling burdened, to maintain a free library and museum, and in some instances, indeed, they might do so by the diversion of funds, the present application of which was positively demoralising and mischievous in many cases. At Faversham, for instance, a large amount of money had been left, and had been expended in an annual "dole," that attracted idle and worthless persons from all quarters, so that the charity became an insufferable nuisance, but when it was diverted to educational objects, it became a blessing to the locality. He was of opinion that free libraries and museums should form part of a great system of national education, and that, leaving local bodies to provide the penny by rate, the State might be called in to help. The question submitted to the Committee was, the best means of increasing the number of free libraries and museums throughout the country; a first step, he suggested, might be that the committee should be strengthened by the addition of members of Parliament and others who were interested in the subject.

Mr. Godwin said that if the committee considered themselves ready to entertain that question he was quite willing that they should do so, and moved the following resolution, which was seconded by General Eardley Wilmot, and adopted:—"That the following gentlemen be invited to join this committee—Lord F. Cavendish, Colonel Akroyd, Colonel Jervis, Dr. Lyon Playfair, Messrs. Albert Pell, Thomas Bazley, Geo. G. C. Bentinck, E. A. Bowring, Chas. Buxton, Walter Morrison, Edmund Potter, B. Samuelson, William Tite, Edward Baines, George Dixon, J. Melly, A. J. Mundella, the Hon. Auberon Herbert, and other members of Parliament, members of the Society of Arts."

The following resolution was proposed by Sir Daniel Cooper, seconded by Mr. Seymour Teulon, and adopted:—"That the fewness of the places which (as is shown by the following list) have adopted the system of rates for the support of free libraries and museums, is a proof that the present system is insufficient for the purpose."

The following is the list referred to:—

Free Libraries and Museums Established by Means of Rates authorised by Existing Acts of Parliament.

Ashton-under-Lyne—Public Library.
Birmingham—Public Reference Library, Reading-room, and Gallery of Art, Schools of Art and Science.*
Blackburn—Public Library and Museum.
Bolton—Public Library and Museum, and School of Art.
Canterbury—Museum and Library.
Coventry—Library, School of Art.
Dover—†Public Museum.
Exeter—School of Art.
Hertford—Public Library.
Ipswich—Museum, School of Art.
Kidderminster—‡School of Art, Public Library.
Leeds—Act adopted but not yet in force.
Leamington—Act adopted.
Leicester—Museum.
Lichfield—Public Library, Reading-room, and Museum.
Liverpool—§Public Library and Museum, two Schools of Art.
Maidstone—Public Library and Museum.
Manchester—‡Reference Library, District Libraries, and Museum.
Northampton—Museum.
Norwich—Public Library, School of Art, and Museum.
Nottingham—Public Library and Museum, and School of Art.
Oxford—Public Library and School of Art.
Salford—Public Library and Museum.
Sheffield—Public Library, School of Art.
Stockport—Museum.
Sunderland—Public Library and Museum.
Walsall—Public Library and Reading-room.
Warrington—Public Library and Museum, Schools of Science and Art.
Warwick—Public Library and Reading-room.
Westminster (St. Margaret's and St. John's)—Public Library and Reading-room (also a branch Institute).
Winchester—‖Library and Museum.

Airdrie—Public Library, under Act of 1850.
Dundee—Public Library (Museum in progress).
Paisley—School of Art, Public Library and Museum.

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* In some instances, although the proceedings of Schools of Art are conducted in Free Library premises, the School is not supported out of the library rate, but from separate resources.
† 8 and 9 Vic., c. 43.
‡ 14 Vic., c. 65.
§ Special Act.
‖ 13 and 14 Vic., c. 65.

Cork—School of Art.
Dundalk—Public Library and Science Classes.
Ennis—Public Library (unfinished).

Mr. Cole gave notice that he would propose the following motion for consideration at a future meeting of the Committee:—"That free libraries and museums should be regarded as parts of a system of national education, and assisted by funds voted by Parliament, in addition to local rates."

Mr. Hyde Clarke gave notice of the following motion:—"That various old public libraries, as that of Archbishop Tenison, having been dispersed, it is expedient that legal provision should be made for the security, as national property, of all libraries and museums which are appropriated to the public use."

The London Cab Question.

A meeting for discussing any practical measures that might be proposed for improving the cab system of the metropolis, was held in the Society's Great Room, on Tuesday morning last, the 8th instant, at 11 a.m., invitations having been forwarded to the principal cab proprietors and others interested in the subject. In the unavoidable absence of Lord Henry Lennox, Chairman of the Council, Mr. Henry Cole, C.B., a Vice-President of the Society, presided.

The Chairman, in opening the meeting, said he regretted the absence of the noble Lord, the Chairman of the Council; and he had probably been selected to fail his place from having formerly brought the same subject under the notice of the Society,* when it was very fully discussed, and many of the views which he then advocated had since received pretty generally the sanction of public opinion. He considered it as a great triumph that the present government had, in the face of many obstacles, so far reduced the imposts upon hackney carriages as to relieve the proprietors of what was a most monstrous tax upon them, for it was absurd to expect any reform in the system of cab management while this taxation existed. Having now got rid of this impediment, and having obtained the goodwill of the government, who intended to amend the law, it was considered that the time had arrived for considering what practical suggestions could be made to assist the government in the Bill which it was understood they were about to introduce; and in order to keep the proceedings as practical as possible, it had been proposed that the discussion should be taken under the following heads:—

Proposed division of London into districts for the "course" system.
Various classes of cabs—The question of fares—Proposals as to "free-trade" in cabs, &c.
Cab stations—Increase of cab-stands, &c.
Licensing of drivers—Inspection of cabs, whether by police or by special inspectors—Regulations as to lost property, &c.

Mr. Haddan had sent in a description of his scheme, which he would now invite that gentleman to explain to the meeting.

Mr. Haddan said the plan which he had to bring before them was not his own, but the invention of a son of his, who was now abroad. The question was, could London be divided into a number of districts, which might be readily ascertained, and so arranged that the fares from one district to another should be equitable and just, so as to avoid all disputes and wrangles. The system might be described as follows:—It divides London into a certain number of regular or irregular figures (say 37), distinguishable by a different letter or figure, each of which may be considered a "course." It proposes to have the letter of the district made of coloured glass or cut out of tin, and affixed to every lamp-post in the metropolis. A table stating the fares from the various districts, is then, by the assistance of a map, accurately compiled, leaving nothing for the public to do, when hiring a cab, but to look at the nearest lamp for the initial letter or figure (say O), repeating the operation when discharging the vehicle (say at K), referring to the table for the fare (K to O=2s. 3d., or any other fixed amount). Radial divisions have been found to be the best form, as by reducing their size (or increasing the fare) gradually from the centre to the circumference of the four-mile radius, a progressively higher rate can be arrived at, thereby inducing all drivers equally to ply for hire in the suburbs as in the more crowded parts of the metropolis. Any other shape or number can of course be adopted which careful examination may determine as the best—polygons, triangles, or any regular or irregular figure. The fares from any one division to any other may be quite arbitrary; in one case (from 5 to 6), owing to the river intervening, the fare from one square to an adjoining one is considerable. Any obstacle, such as crowded thoroughfares (about the City and docks) can be dealt with in a similar manner, 3d. or even 6d. being added to those particular divisions which may require it; all to be subject to future revision, as occasion may arise. The hirer might have the option of hiring either by the "course" or time, as he might determine. If the driver be requested to deviate from his "course," such request should legally constitute a rehiring, or might, at the option of the driver, be made the subject of private arrangement. In return for these numerous advantages, the driver to be bound, after dark, to carry a small lamp inside the cab, for the purpose of more readily deciphering the table of fares. By this arbitrary system of fares, any class of superior cabs can, with great facility, be supplied with tables of fares at a higher rate, in proportion to their superiority. The usual mode of attaching the table of fares to a cab by means of a plate may be adopted, or, if preferred, the two front blinds may be printed on, one containing a small map, and the other the table of fares. In a hansom the splashboard is available. Maps on a large scale, showing the divisions, would be published; as also a book containing an alphabetical arrangement of all the streets, public buildings, &c., with their initial letter attached thus:—

Alpha-road, St. John's-wood ..	X.
Brixton, the church	9.
&c. &c.	

so that the legal fare can be determined before starting. What he considered a novel feature in his son's plan, and which he hoped would ensure its approval by the meeting, was the mode by which these districts should be indicated, viz., that the lamps all over London should have a mark put upon them, indicating the district in which they were situated. These would form in fact a physical map of the town, which everybody could see and nobody could misunderstand. It was almost universally admitted that the present system was as bad as it could be. The present book of fares, issued by Sir Richard Mayne, contained a list of over 30,000, the mere statement of which fact was enough to show that no cabman nor anyone else could be expected to be well acquainted with its contents; and, even if the book were referred to, grounds for endless disputes were still left open, and for this simple reason, the list gave a fare from a certain place to a certain street, not to a particular part of the street. There was nothing definite in it, and could not be on any such system. The plan his son proposed did not give precisely the distance from house to house, which was impossible, nor did the present mileage system. If you went a yard over the mile you must pay for another mile, and you would pay the same if

* See *Journal*, Vol. xv., p. 175.

you only went a yard short of two miles, and this difficulty would attend any system of fares, and would not be increased by his son's plan. Some 18 months or two years ago he attended meetings of cab proprietors, and, with the exception of three or four, who did not seem to understand the principle, he believed they were all in favour of it. He believed the "course" system would put an end to disputes, and if it were adopted, he could not help thinking that many persons would then use cabs who now avoided them whenever it was possible. Ladies particularly would now rather take two or three omnibuses than hire a cab, not always on account of the expense, but to avoid the disputes which so often occurred. In many cases, he believed, overcharges on the part of the cabmen arose from real ignorance as to the distance travelled. This also would be avoided by the system he proposed.

Mr. Meiklejohn said the plan he had to propose was one which he confessed was not so ingenious or so artificial as that of Mr. Haddan, but one which appeared to him to be based upon very old-fashioned and natural principles. He had hung up on the wall a rough chart of London, marked off in quarter-mile squares. It would be found, on looking at it, that for a considerable distance through the city the river Thames formed nearly a straight line; or an arbitrary straight line might be taken along the line of the Strand and Piccadilly to Hammersmith. He did not propose to take one centre, such as Charing-cross, but a central line, either the river or an artificial line running east and west, and then mark off the squares from that, north and south. Having got that central or equatorial line, which might be distinguished by the lamps all along it having a red band upon them, he should then measure off north and south in quarters of miles, which would be numbered; and beginning at a certain point either west or east, the squares would be lettered from A to Z. By this system no guide-book or list of fares would be needed. In order to ascertain the distance travelled, add the letters travelled in to the numbers travelled in, and the sum would be the distance in quarters of miles. If the rider went northwards from A 1 to A 4, or from M 1 to M 4 in the same way, he would also know that he had gone a mile, all the lamps in each square having a letter and number to distinguish them. This scheme was first designed for postal purposes, but it had struck him that it might be turned to good account when applied to cab fares and distances, and he hoped it would be taken into fair consideration. He thought, moreover, that they ought not to contemplate dividing a great city like London merely for the sake of enabling people to go about readily in cabs. They should think also of the poor man who had to go on foot, and who wanted to know his way to the centre of London or to any other part. Now, by the plan he suggested, the lamps being numbered and lettered, he would know by seeing a No. 12 on a lamp that he was three miles from the central line, and an arrow might be marked upon it pointing out to him which way to go; whereas on Mr. Haddan's plan he would only be confused by the crosses, letters, and numbers, which were all arbitrary and conveyed no meaning. At a very little additional expense, also, the names of the streets could be placed upon the lamps, which would be a great convenience at night to strangers.

Mr. George Smith, cab proprietor and driver, said the best system was to have a regular scale of fares, such as any one could understand, like Mr. Daniel Whittle Harvey's, which was published some years ago. This was not so complicated as either of the plans now laid before them.

Mr. A. H. Wildy said it appeared to him that a person would require to pass an examination at the Institute of Actuaries in order to understand Mr. Meiklejohn's system, whilst the number of marks which he proposed to put on the lamps would greatly interfere with their illuminating power.

Mr. Meiklejohn said if the marks were made in coloured glass they would obscure the light but very slightly.

Dr. De Meschin, referring to Mr. Meiklejohn's system, said it was evident that persons taking a diagonal line would have to pay at the same rate as if they went round the two sides of a right-angled triangle, of which the diagonal line was the hypothenuse, and any one who knew the rudiments of mathematics would be aware that, on such a principle, the greater the distance the cabman went the greater advantage he would have in the fare. This system would certainly be an advantage to the cabman, but he thought it was extremely complex.

Mr. Case, cab proprietor and driver, thought that the extortion so often complained of was, in many cases, owing to the present system of fares, and to cabmen, in many cases, not knowing the distances they had travelled, while in others it might be some excuse that they had been subjected to great extortion on the part of the law. Now the excessive duties were abolished, perhaps the necessity for this would be done away with. The great objection to the "course" system was, that it would give dissatisfaction in the one case to the driver, and in the other to the public. The public would be dissatisfied at having to pay a double fare for just crossing the boundary-line of two districts, while the cabman would be dissatisfied at having to take the passenger from the furthest point of each for the same amount. He supposed the system had been adopted from that of the metropolitan police; and if that were so, one side of Gray's-inn-road would be in one district and the other side in another, and the fare from one side of the road to the other as much as from the other side of the City-road to Tottenham-court-road. He was sure that this would lead to an immense amount of grumbling on both sides.

The Rev. J. Walker said undoubtedly, at first sight, there appeared great strength in the objection just taken, that the fare would be the same from the nearest part of one district to another as from the furthest points, but it must be recollected that a cab could not now be hired at all without incurring the charge of 1s.; and it appeared to him that these charges would, in the long run, bring exactly the same profit to the cab owner as those made according to the distances, and that, in fact, there would be no more objection to the "course" than to the mileage system. He himself had proposed a scheme for accurate measurement, never having seen this plan of Mr. Haddan's, but as soon as he saw it and heard it explained, he saw that the measurement system would not be required, for this seemed as perfect as could be. He thought cabmen should be paid regular wages, like all other *employés*.

Lord William Lennox did not think any objection had been made, or could be made, to Mr. Haddan's plan which would carry any weight with the public or with cab proprietors. The argument that a person would not like to pay a large fare for going a few yards, and that a cabman would not like to go a long distance for the same fare, would apply to any system of fares according to distance, and to many other things; for instance, you paid as much postage for a letter to Hounslow as to Inverness, and as much for drawing a cheque for £10,000 as for £2. In all these matters a general average must be taken, which, in the long run, was found beneficial to both parties. He had never heard of this plan until he came into the room, and it seemed to him perfectly intelligible, and he saw no reason why it should not be adopted. With regard to the measurement system, there would always be difficulties in the way. A person going from home might ascertain before he started where the first mile or the second would terminate, but when he got out there was nothing to decide the point if the cabman was of a different opinion, which he generally would be.

Mr. Millar said that both of the new systems now brought forward were average systems, which were always bad, as the short fares had to pay for the long

ones. The only true and right system was that of mileage. The present system worked very well for commercial men and sharp ladies who knew their way about, but they wanted something to encourage people to use cabs who did not know the fares, and he did not think any of those brought forward would be much assistance to persons of that description. The plan he would propose was simply this—That cab stations should be provided in all frequented places, with reading rooms and proper accommodation for the men, and a ticket office, at which persons should apply who wanted to use a cab. On mentioning their destination, they should be supplied with a ticket stating the fare they had to pay. There would then be no dispute; they would simply have to pay the cabman at the end of their journey, and, if they were treated with incivility, they could complain at the office from which they took their ticket, at the first convenient opportunity. In many cases it was not so much the overcharge as the incivility which was complained of, particularly by ladies, and he believed that if proper accommodation for cabmen were provided, and if they were treated more like civilised beings, there would not be so many complaints on this head as were now made.

Mr. Augustus Goldsmid said there were two or three practical evils which always followed upon the "course" system, as was well known to anyone familiar with foreign capitals. In any case where a long distance was traversed, the cabman was never satisfied with the legal fare, but always expected a *pour boire*. He did not think the "course" system would be practicable in a large capital like London, where there were so many different distances, but the only complete system would be that of some mechanical contrivance which should measure the distance gone over.

Mr. John Cockram (cab-proprietor and driver) said the present system was bad enough, but it was preferable to either of those now proposed. The mileage system was the best, only both the public and cab-drivers required better opportunities of becoming acquainted with the distances. Some one had complained of cabmen not knowing London, but, under the present system of licensing, such a man would not be allowed to drive. He had known instances of men refused on this ground. He believed many cabmen were honest and sincere in their desire to do what was right. With regard to incivility to ladies or "unprotected females," all he could say, for his own part, was, that all the rudeness he had been guilty of in that respect was, always trying to keep out of their way. When an "unprotected female" wanted a cab, he always found that she wanted to go an extraordinary pace, and travel $3\frac{3}{4}$ miles for 1s. 6d. He did not think Mr. Haddan's plan very simple or intelligible. They had quite sufficient examination to go through already, and he believed they would require a still harder one before they would be able to understand such a scale of fares. At the present time there were constant wrangles as to whether such a place was inside or outside the four-mile radius, especially as Mr. Whittle Harvey's book did not agree with Sir Richard Mayne's in many instances; but under Mr. Haddan's plan there would be constant disputes whether a cab was discharged in district A or district B, or what was the letter or number from which it started. He was in favour of the present system of fares, only having the measurement more complete, so that the distances from various parts could be more readily ascertainable. He had been engaged in the cab business since 1851, and he recollected that, directly after Mr. Fitzroy's Act was passed, in 1852, there was immediately an immense number of cases before the police magistrates; and he found, on reference to Mr. Charley's "Handbook of Cab Law," that nearly all the cases there cited arose in the first few years after the passing of the Act, the decisions given being, in many cases, quite opposed to one another. The law had now become more settled down, and it was better understood; but if they were to change it, the same thing would have to be gone over again.

Mr. Hasluck agreed with the last speakers as to the difficulties of Mr. Haddan's system, which were even greater in that of Mr. Meiklejohn.

Mr. Baker (cab proprietor) thought the "course" system would be no improvement on the present one, especially with regard to the public. If a man overcharged or misbehaved himself, there was a stringent law to correct him, and what did the public require more? He did not think Mr. Haddan's plan very intelligible.

Mr. Howard (cab proprietor) said he was well acquainted with Sir Richard Mayne's tables; they took a great deal of trouble in drawing up, and a great deal more to get people to understand them, and therefore they should not be rashly interfered with, and the same trouble gone through to make Mr. Haddan's system intelligible. There was not much difficulty in ascertaining the fare if persons were inclined to be honest, and it was very rare indeed that the difference amounted to more than 6d.

Mr. Crocker (cab proprietor) could not agree with his friends generally in finding fault with Mr. Haddan's scheme, and could not see that it was at all complicated, but, if introduced, the present rate of fare must be altered.

Mr. Haddan said the fares quoted in the list were purely arbitrary, and only intended for illustration.

Mr. P. H. Holland said there was great ingenuity displayed in both plans, and he was at first much struck with them, but the great opposition which they seemed to meet with on the part of the trade would, he feared, be an obstacle to their success. Any change in a law which affected a great number of people was in itself a disadvantage, and as persons were now accustomed to the mileage system, and the cab trade seemed to approve it, there would be a difficulty in making a change. He was constantly in the habit of using cabs, and his own experience was that cab-drivers were, as a rule, a very decent set of men; it was very rarely that he found them attempt to cheat him. The question was, whether it was worth while to make the change of estimating distances by the "course" rather than from point to point, bearing in mind that in either case only approximate accuracy could be arrived at. It was rarely that the fare and driver differed in their estimation of distance by more than a mile, which could be generally settled by giving the doubtful 6d. He believed that the only perfect system was one of accurate measurement.

Mr. Elt said the course system had been adopted in Dublin, and was very satisfactory there as well as in Paris, but he doubted its applicability to such a city as London. Mr. Haddan's plan was far preferable to Mr. Meiklejohn's; in that of the former, the great difficulty was dealt with of the river which divided London, to cross which a considerable *detour* had, in most cases, to be made. In many cases, however, the same fare would be paid for three miles as for less than a mile, and, as soon as the public understood the system, the advantage would, he feared, be all on their side, as they would take care to walk a few hundred yards rather than have another district to pay for, and stop short of their destination on the same principle.

Mr. Hazell (cab proprietor and driver) thought the public were satisfied with the mileage system, and did not see why they should seek to change it. The great cause of over-charging was the manner in which the drivers were paid, any over-charge going into their own pockets. If they were paid weekly wages, and had a way-bill, putting down each fare therein, and giving each passenger a ticket, there would not be so many complaints.

Sir Daniel Cooper, Bart., thought Mr. Haddan's system would be very easily understood by the public, but he doubted whether it would by the cab-drivers, nor would they feel satisfied with a system of fares based on calculations made from arbitrary fixed points, which conveyed no definite ideas of distance to their minds. A cabman going from letter M to No. 16 would see no con-

nection between that and 1s. 6d., or whatever the fare might be. Any system to be satisfactory ought to be based either on distance or time. The latter element had not been mentioned in the discussion, but all who used cabs much were aware that, if the distances were reckoned at four miles an hour for a four-wheeler, and six miles an hour for a Hansom, it was a pretty fair estimate, at any rate, if going through crowded thoroughfares in the middle of the day. It must be borne in mind that if they only paid the cabman his strict fare, at the present rates, he could not earn a decent living; and, therefore, they ought to be liberal, and he endeavoured to be so.

Mr. Wright (cab builder and owner) said he could not understand Mr. Haddan's plan, and if it came into vogue, he thought it would be confusion worse confounded. There would always be disputes as to the number or letter on the lamp. Nothing, in his opinion, would work so well in London as the mileage system. He had been over to Paris on purpose to make himself acquainted with the French system, which seemed to act very well there, but he did not think it would do in London, especially on account of the bridges.

Mr. Johnson (cab proprietor) was surprised to see how persistently the "course" system of Mr. Haddan's was advocated. They admitted that the present system was bad, and yet they recommended one that was ten times worse. Mr. Meiklejohn's system of measuring by squares was twenty-five years old. There was no such satisfactory plan as accurate measurement. Whatever system was adopted must receive the sanction of the trade, or it would not work well. It was no use forcing a system upon them which was unjust. The "course" system might do very well from Charing-cross to the Great Western Railway, but it would be of no use when you got into a cross road.

Mr. Haddan said that was just where it would be of use. Proceeding to comment upon Mr. Meiklejohn's plan, he said that, but for the river, he would freely admit that it was superior to that of his son. He did not think that taking the two sides of a right-angled triangle instead of the hypothenuse was more than an equivalent for the zig-zag course which the cabman had to follow, but when they came to the River Thames the whole thing fell through. The necessary computations would, moreover, form the subject of endless disputes. He did not see how persons from the country, strangers to London, could make use of such a system.

Mr. Meiklejohn explained that, when a journey was performed partly on each side of the river or other central line, the two distances must be computed and added together, which would not be very much trouble. If he had an opportunity of meeting a number of cabmen, he would undertake to make the matter as plain as possible to them, which there was not time to do then. He admitted that Mr. Haddan's plan was more ingenious, but thought his own was more natural. As he had already said, his plan was intended as much for the benefit of the wayfarer as for the cabman.

Mr. Seymour Teulon introduced the second branch of the subject, viz., "Various classes of cabs, fares, and free-trade in cabs." He said it was a most unusual mode of proceeding, and one which had not obtained in reference to any other matter, that the consumer, purchaser, or hirer should fix the price he was to pay. If it were simply left to be a matter of bargain between the two parties on the occasion of each hiring, he could easily believe that there would be more disputes than at present; but this was not the only alternative. When the owner of a cab applied for a license he might state at what fare he proposed to run his vehicle, and that rate being affixed to it, there could be no cause for dissatisfaction. It would then easily follow that there should be in London, as there were in many other places, and as he considered very desirable, more than one class of cab. It was a common complaint with ladies that they could not get into a hansom cab, which was the best description of vehicle at their disposal, without running the risk of spoiling their clothes, and he therefore thought it desirable that, following the plan which obtained in Manchester and elsewhere, a cab-owner might obtain a license for a cab at any price, provided it were marked so that the public could not be deceived. There might be first, second, and perhaps third class cabs, but, at any rate, it was desirable that those who preferred and were willing to pay for a better cab, should have the means of being accommodated. He thought this was the nearest approach to free-trade which was possible in such a matter, and there was no doubt that, before long, the three classes of fares would settle themselves. He believed that in Manchester it had practically come to this, that there were two classes of cabs and two rates of fares, one for the first and another for the second class.

Mr. Samuel Redgrave agreed with the principle laid down by Mr. Teulon, that there should be different classes of cabs, but not that it should be left to the proprietor to settle the fares. If so, a person who held up his hand for a cab would never know what he was going to pay. He thought first and second class would be quite sufficient, the number of persons who used cabs not being so great as those who travelled by rail, and that the fares should be settled by some competent authority, which should also determine whether the cab applying was entitled to rank as a first or second class vehicle. Then care should be taken that each class should be easily distinguishable. He felt certain that, with a better class of cabs, the owners would find it to their interest to employ a higher class driver, though he had no fault to find with the men at present employed, as a whole. They might perhaps have a neat uniform, and certainly they should have better horses. He believed, however, that cab-horses had, of late years, much improved, and also the cabs themselves, but still more so the drivers.

The Chairman said that, in most things, the public had the utmost freedom of choice; in buying butter or any other commodity they could go to what price they liked, according to the quality, but it was not so in reference to cab traffic, and it was a fair question whether the ordinary principle of supply and demand could not be applied in this instance. His own opinion was, that it was an entire mistake for the legislature to fix the price. All that was required was a clear understanding beforehand between the cab proprietor and the public. He saw no objection to free-trade in this respect, as there was quite sufficient competition in the cab trade to make the fare reasonable.

Mr. Teulon said he had omitted to mention that each passenger, on hiring a cab, should be presented with a ticket, bearing on one side the number of the cab and the name of the owner, and on the other the fare to be charged.

Mr. Hazell remarked that, when the 6d. a-mile fare was fixed, the average price of corn was 18s., and it was now 24s., whilst hay had risen in price from £3 6s. a-load to about £5 15s. Horseflesh also varied in price from time to time.

Mr. Towell (cab-driver) had the same objection to various classes of cabs as to the course system, or anything of the same kind—that they would all tend to complication, whilst the great thing necessary was simplicity. If a gentleman sent for a cab, very likely the servant would fetch a wrong class of cab, and then the cabman would want to be paid for his time and trouble in coming to the door. With regard to fares, a simple modification of the present mileage system would be better than anything, for both the public and the cabman understood it. He did not think the cases of imposition were numerous, for when they considered the number of cabs in the streets—over 6,000—the number of charges at the police-courts was not large. He had formerly advocated a principle which met with some favour, that of a uniform rate of 1s. a-mile irrespective of radius, distance, or the number of persons who used the cab; something of that sort would be both

simple and precise. Free-trade in cabs was an absolute impossibility, for free-trade pure and simple meant regulating the price by the current demand at the time, and that would come to this, that on a wet night the first cab on the stand would not take a fare for less than 5s., which would soon be put a stop to. The best settlement of the question would be for the cab proprietors and the public to arrange amicably between themselves what was a reasonable fare; it was absurd for the legislature to fix the fare, utterly irrespective of the price of horseflesh or of provender. During the time of the Crimean War, horses were at an enormous price, but no difference was made in the fares. They might just as well step in and say what price the cab-builder should charge for a cab. His opinion was, that there should be only one class of cabs, improved as much as possible, and every encouragement given to civility, and a good personal appearance on the part of the cabmen.

Mr. Howard thought one class of cabs would be amply sufficient, if they were good. He had been connected with the trade since 1836, a proprietor for the last ten years, and had watched the thing very closely, and he always found that changes and complications introduced fines and punishments on the cab-driver. If cab-riding were made more expensive than it was, the trade would suffer, for railways and omnibuses were both cheap; they did not want a higher price so much as more work. The licensing system was at the root of the whole evil, and he believed that to try and patch it up and improve it would do no good. He was in favour of free trade; the better class of cabs would always command their fares. He had no objection to a thorough and rigid inspection, but the present system was as bad as it could be.

Mr. Johnson could not see why the government should take a great deal of trouble to do a lot of things for cab-owners which they did not want done, and then make them pay very heavily for it. Let the trade be thrown open to anyone, to drive a cab at what rate he pleased; if it was too high, the public would not support him. The trade were quite able to manage their own business if they were left alone. With regard to first and second-class cabs, if a man had a better cab, let him put a higher price upon it, and there was no fear of his keeping it very long on the stand if it did not pay him. Why the government had put the price on his labour he could not see; nor did he want any inspection beyond that of the public.

Mr. Holland quite agreed that there should be different classes of cabs, as, in fact, there were at this moment, only they were not classified. Even now there was a custom, which was stronger than law, almost obliging you to pay more than sixpence a mile for a really good cab, and that ought to be systematised. He saw no reason why the owner should not affix his own price, provided it were marked conspicuously on the vehicle, but he thought two classes would be quite sufficient; and he should propose that the higher-priced cabs should also be compelled to give fair measure, by having an instrument attached to each, to show the distance traversed. The public would not mind paying a fair price for a good cab, so long as they were satisfied that they were not imposed upon in the distance. The ordinary cabs might then be left as at present.

Mr. Pearce, speaking on behalf of cab-drivers, did not think the principle of free trade, which many had advocated, was applicable to cab-driving. There might be three classes of cabs on a stand, one at a 1s., another at 9d., and another at 6d. a mile. The driver of the first-class cab, if business were slack, would run at second or third-class fares, and thus the third class driver would have no chance at all of earning a living, or even of paying the proprietor the money he demanded. He was, therefore, opposed to different classes of cabs, but thought the fares should be settled by cab proprietors amongst themselves, having regard to the cost of provender and so on, the fare being legibly written on the cab. Each driver then would get the best cab he could, in order to secure custom. It had been suggested that there should be different classes, and that a ticket stating the fare should be given to the hirer on entering, but that would often lead to a dilemma; a man would find he was in a 1s. cab when he wanted a 6d. one, and want to get out, and the cabman would object to having his time wasted —perhaps losing another fare—without compensation. Let there be one uniform fare, settled by the cab-owners.

Mr. Wakeling (cab proprietor and driver) said the government had relieved the trade of the enormous burden of taxation which had hitherto pressed upon them, but they ought to go a step further, and not interfere with the vehicles by any system of inspection. He agreed that the fares should be fixed by meetings of the trade.

Mr. Smith saw no necessity for more than one class of cab, and considered that, in London, cabs had already arrived at perfection. If it were not so, how was it that, with so many exhibitions as they had had of late years, no improvements had been suggested? He was a thorough free-trader, and saw no reason why the government should interfere in the matter of fares, but at the same time he would allow all proper regulation, to prevent the public being imposed upon. The owner of each cab should affix upon it legibly the price at which it could be hired, and this should only be altered after a week's notice.

Mr. Wright agreed in the principle of having first and second class cabs, but saw no reason why the government should step in and interfere with the price to be paid for riding in them, any more than with the price of a loaf of bread, or any other commodity. If the public did not like his charges, they would not deal with him; but it was not just that a man who gave £40 or £45 for a cab, £25 for a horse, and £5 for a new set of harness, should have no more return than a man whose whole turnout was not worth more than £15 or £20. He thought first and second class cabs would be sufficient, and he had noticed that this classification worked very well elsewhere. He had put up a paper for a short time, in a tap at Waterloo Station, to collect the opinion of the men as to this proposition, which he begged to hand to the chairman. It would appear that the majority were opposed to having two classes of cabs, but that did not alter his own views.

Mr. Cockram said Lord Elcho had recently told them that the public wanted something between a cab at a shilling and a brougham at 10s. 6d., which he believed, but for the police regulations, would soon be supplied in the form of a small brougham, the charge for which the competition of the cab-masters would soon settle satisfactorily. This was a question which would bear much discussion, and he was aware that there were differences of opinion in the trade upon it; probably at the end of the season, in August or September, when cabby, to use his own vernacular, was "sucking the mop," the shilling man would come down to 9d., and 9d. to 6d., but he never knew of a case, unless it were a man going home, in which less than 6d. was taken. It was to him a question of some difficulty whether or not the police should settle the fares and inspect the vehicles. If they did not, he was afraid they would have every old vehicle, from a donkey's barrow to a break, on the stand. Probably the best plan would be for the cab-masters to settle the fares annually, or let it be done by the police authorities. But the fares of the first-class cabs should not be put outside; the less such a vehicle looked like a cab at all, the more it would be patronised.

Dr. De Meschin thought the distinction of classes might easily be attained by the mode of painting, and a great deal of the present tawdry appearance removed. He was thoroughly in favour of free-trade, on principle, and it was always found that the tradesman who supplied the best article for the money made the largest fortune; but the difficulty was this, that many persons would be afraid to get into a cab unless they knew what

the fare was, and there seemed to be an objection to having it painted outside, whilst, if cabby were at all irritable, he might not like to open the door for the purpose of showing what was the fare.

Mr. Crocker felt satisfied that having several classes of cabs with different fares would lead to confusion, unless there were certain fixed limits, say, from 6d. to 1s. 6d. a mile, so that a person hiring would know that he could not make a mistake beyond a certain amount if he hailed the wrong cab. He did not approve of regulations as to painting and varnishing, because they would interfere unnecessarily with individual freedom. He felt satisfied there were many persons who would as willingly pay as much as 4s. per hour for a carriage and a pair of horses as others would 2s. for a common cab, and that it would suit many as well to pay 1s. a mile for a good drive in a hansom, as it would others to pay 6d. and go slower. Mr. Pearce objected to the difference of fares on the part of the drivers, but there would always be the difficulty which he alluded to of the higher class fares coming down under certain circumstances, and, in his opinion, such things would find their level, and be of advantage both to the public and the driver. If he had been driving a cab all day at 1s., he should not refuse a 6d. on his road home, and then the public would get the benefit, and in the end probably the good article would drive the bad out of the market. He knew several in the trade who said that, if free-trade were introduced, they should send out all their cabs at 6d., being satisfied that, with good vehicles, they would do so much business as to be remunerative even at that price. His own opinion was in favour of limiting the fare for one-horse vehicles from 6d. to 1s., with 1s. 6d. for two horses.

Sir Daniel Cooper would much like to have a choice of cabs, but saw considerable difficulty in the way of obtaining it, unless there were a fixed minimum which only could be claimed by any cab plying off the stand, so that a person hailing a cab in the street could never be deceived. When a cab was taken from the stand he thought there would be no difficulty. Free trade might be carried out if the cab-owner always kept his vehicle on his own premises, like the butter-merchant; but this was not so, and therefore the analogy was not complete. Cabs were public conveyances, and being so, they must, in a place like London, be under some police supervision, or they would become great nuisances; and, in his opinion, the fares should be fixed by some authority independent of the trade. If they had any complaint to make, there were ways of obtaining redress.

The Chairman said he had not been able to collect very distinctly what was really the opinion of the trade as to the desirability of having a fixed fare, or leaving it to the owners themselves. Passing to the next topic, that of "cab-stands, &c.," he said he had been much struck, when in Paris, with the great number of shops, as he might term them, where a superior class of vehicles were always on hire. It had occurred to him that the shelter thus provided must be a great protection to both carriages and horses, as well as men; and that in London, without interfering in any way with the traffic, covered stands might be erected in various places. He was told that even the heat of the sun was prejudicial to horses, and they knew it must be so to carriages, while rain and snow were equally bad. He had therefore had some models of long sheds with light iron roofs prepared, which might be seen on the table, and which were open to comment or criticism by the meeting.

Mr. Cockram said there was only standing room in London for 2,471 cabs, or less by 500 than half the total number licensed. Cab-ranks were either a necessary or a nuisance; if the former, they should be provided at all frequented places, within call of the merchant's house of business, or the nobleman's residence; and, if they were the latter, it was the fault of the police, who had ample powers over them. Neither at the Langham nor Grosvenor hotels were there any cab-stands, and if a cab was called the whole neighbourhood was immediately alive, and the most cruel or most reckless driver obtained the fare. On the other hand, there was a cab-stand at the southern side of St. James's-square which supplied the whole of that aristocratic neighbourhood; and if the Bishop of London and the Earl of Derby did not complain, he did not see why other people should. Every fare from the clubs in Pall-mall was picked up by men plying about the street. More cab-stands were wanted, and in more prominent positions, at the railway stations and elsewhere. It was no use to fine men for loitering about the street; where there was work to be had, there they would go. Men were constantly being fined at Langham-place, and why should it be in the hands of one or two vestrymen to say that there should be no cab-stand there? Cab-stands should be in frequented places, such as Pall-mall, Lincoln's-inn-fields, and so on. He heard the other day that the cabmen in Edinburgh had subscribed £10 towards a covered cab-stand, and if such could be introduced it would be a most excellent thing.

Mr. Case said everyone must agree that if cab-stands were provided similar to the models now shown, it would be an excellent thing for cabs, men, and horses. The increase of cab-stands was the most important subject which had been brought before the meeting. They wanted a cab to be a public carriage, and yet there was no proper accommodation provided for them. And here he must refer to a question which had lately been much agitated in the trade, viz., the cab accommodation at railway stations. As public carriages, cabs ought to have public stands appointed at all railway stations. At present a cab going to a railway station had to come back empty until it could find shelter at some cab-stand, so that really they only got 3d. a-mile instead of 6d., having to do the distance twice. There was thus a deterioration of the owner's property, and an inconvenience to the public. Wherever there was a call for cabs there ought to be a cab-stand; they had to pay for their licence as public carriages, and why should they be excluded from Belgravia, when Belgravia wanted them? He had had as many as five men summoned in a very short period for loitering about the Langham Hotel, but there had not been a case before the hotel was opened. The same with Jermyn-street—a man did not dare look into it without being summoned, and yet there were cabs there continually. The fact was that all these places were frequented by certain men who never went on a rank at all, and whose presence was winked at by the police, whilst a stranger would be summoned immediately; thus there was partiality exercised in favour of a chosen few, to the prejudice of the drivers as a class, and of the public. There was hardly a street in London which was not monopolised in this way with the sanction of the police, while other cabs had to drive a long way perhaps to find standing room. There ought to be a stand in every place where the public wanted cabs.

Mr. Pearce said the question of railway accommodation for cabs had much agitated the drivers of London, and would again until it was definitely settled. The cab trade felt that a great injustice was done them in this matter, the railway stations being open only to a select few; and if the government could see their way to remedying the evil in any way, it would be a boon far beyond that of reducing the duty, much as that was prized. Men who plied about the streets of London were designated "crawlers," but what else were they to do? If a man set down his fare in the street he must make his way to some stand, which perhaps might be full, and if he dared to pull up for a moment he was summoned; he might go to Charing-cross Station, and though there were gentlemen there who wanted a cab, he dared not go in. It was said that the stations were private property, but so was the cab, and yet the government obliged the owner to run it at 6d. a-mile, and to have it in the streets at certain times under the penalty of being fined, and even the railways were obliged to run at least one train per day at 1d. per mile. On the

same principle, that of meeting the public convenience, why should not public cab-stands be provided at railway stations?

Dr. De Meschin considered it was the duty of government to throw open the railway-stations to cabs. When there was only standing-room for something over 2,000 cabs out of 6,000, it was obvious that more accommodation was required, and nowhere could it be provided so easily and advantageously as at railway-stations. He considered that the Society for the Prevention of Cruelty to Animals ought to take the matter up, for a cabman had often to drive a tired and jaded horse a considerable distance before he could find a place to rest. He had lately brought the subject before the shareholders of the London and North Western Railway Company, and probably it would be more fully discussed at the next meeting. With regard to covered cab-stands, there could be no doubt that a horse would do his work longer, and require less food and less grooming, if sheltered from the weather, and there must now be an enormous sacrifice of capital in this way. Wherever the public required cabs standing-room should be provided.

Mr. Crocker wished to endorse nearly everything that had been said with regard to covered cab-stands, which were most necessary. If covered stands were erected proprietors would send better carriages into the streets; and when once the public understood that, he did not think there would be any objection to them. The question of throwing open the railway-stations was the most prominent one in the minds of the trade, and it demanded the most serious attention, and if the government could give any aid in its settlement it behoved them to do so.

Mr. Haddan said he believed one of the great objections to cab-stands on the part of owners of property was the assemblage of men and cabs together, and he would suggest therefore that, in such places as a West-end square, accommodation should be provided for (say) eight cabs in separate positions; it that way he did not see that any annoyance would be occasioned. With regard to the railway question, if they were to produce any effect upon the government they must treat it as one affecting the public convenience, and show how the railway cab monopoly led to the blocking of the streets. Londonbridge especially, with empty return cabs. The same with regard to general increase of cab-stand accommodation, they must go on the broad ground of public convenience rather than of class interests, if any good was to be effected. Again, with respect to the railways, the case of Waterloo Station was one which should be referred to as an example of what might be done. There, instead of a few cabs paying 5s. a week for a monopoly privilege, the station was open to any one on payment of a penny, the railway reserving to themselves the right of keeping an inspector at the gate, who had the power to refuse admission to any one whose cab he considered unfit for use. If the same thing were suggested to other companies they might perhaps accede to such conditions.

Mr. Crocker said that none of the matters mentioned by Mr. Haddan had escaped the attention of the trade; they had brought them both before railway companies and the government.

The Chairman then announced the next subject for discussion, viz., "Licensing, inspection, &c."

Mr. James (cab-owner and driver) wished to draw attention to a fact that might not have come under the attention of the trade who were more centrally situated than himself, but which seriously affected their interests. All around the outskirts of London there was a class of men, not licensed, but who had been so formerly, and were well acquainted with the trade, who, under a post-horse license, frequented the suburban railway stations with old rattle-trap conveyances and horses to match and, under pretence of being privately engaged to go either to or from the station, in reality plied for hire, deceiving the public, who imagined they were regularly licensed cabs, until, in case of imposition or overcharge, they looked for the number, when they found out that the vehicle had none. He believed that a post-horse license only authorised keeping carriages for hire at the residence of the licensee, and therefore he thought it right to mention what was going on in order that it might be looked into and the evil remedied.

Mr. Cockram did not object to the examination for drivers being as strict as possible; let them have men that could read and write, that could drive, and that knew their way for five miles round Charing-cross. At present, however, the preliminary forms were signed by any chandler's shop-keeper, who might sign for a dozen men. There were differences of opinion about the inspection of cabs; he did not object to government inspection, only let it done by properly qualified persons. How did a soldier who had spent the greater part of his time in India know the difference between iron and steel, wood and varnish, or between a sprain and a splint? Such men were well qualified to keep order on a cab stand, no one could be better, but let the cabs be inspected by some one who understood it. And let the inspection take place in the summer or autumn, not in winter, when they could not get varnish to dry. With regard to lost property, he could not designate the present system as anything better than robbery. If he found a coat in his cab, he had to take it to the police-station, wait until the inspector or serjeant had time to attend to him, then it was tied up and sealed in his presence, and he had to sign a paper and take it home, and if he had not lost it at the end of eighteen months, he was entitled to a shilling. The thing was a farce, and in fact an immense deal of property was destroyed by cabmen rather than go through all this trouble. What he proposed was, that the property should be taken to the police-station, as at present, advertised, a proper description required from the owner, and a percentage on the value paid as a reward, and if not claimed at the end of twelve months, let it be given up to the cabmen.

Mr. Case said he believed the trade generally did not object to the license, but to the manner in which they were treated when they applied for it. If there was to be a competent person appointed to examine the cabs, let the same inspector examine the drivers; they did not like the police. They objected to the badge and the way in which they were persecuted about it. He thought it would be quite sufficient if the badge was produced when called for. With regard to inspection, what many of them objected to was, that after having been once inspected and passed, they should again be subjected to inspection and annoyance a few minutes afterwards by an incompetent person, and yet this was constantly the case if they did not comply with the waterman's demands. Let the inspection be as thorough as they pleased, but once over let them be free. With regard to lost property he had made a proposition, which had been well received by the trade, that lost property should be given up to the cabman if not owned within six months. Many a good coat was left in a cab which would make the driver look quite respectable, but it would be moth-eaten in twelve months; and for every article claimed after six months, 500 were claimed before. Where the articles were claimed the cabman should have ten per cent. upon the value, and he would thus have an inducement to act honestly. Many a shawl or other article was left behind which was valuable to the owner, but would fetch hardly anything in the market; and if some adequate reward were allowed for the cabman's trouble in restoring them, the public would reap the benefit.

Mr. Crocker said there was a considerable difference of opinion in the trade as to the policy of licensing drivers. For himself, he could not agree with Mr. Cockram, for he believed that as long as the present licensing system remained in operation cab owners would never get the class of drivers they desired. True, at at present, a housekeeper had to sign a form, saying he had known the man for four years, but that was a mere

form; one housekeeper would sign ten or twenty forms, and the police simply went through the form of asking if it was his signature; no further questions were asked about the man's character or antecedents. Then, there was the examination as to the driver's knowledge of town, and that was a great obstacle to many men, for the oldest driver in London might be completely puzzled when examined in that way. As a rule, the cab-driver was looked down upon as a low-class man; he was ordered about like a dog, and compelled to wear a badge upon his breast; while this was the case, so long would they find low-class men in the trade. Any man who had lost his character could redeem it at Scotland-yard by buying a shilling form; there was a noble spirit of toleration there, even for returned convicts; there was no difficulty in a discharged policeman or the lowest costermonger obtaining a license, but respectable men would not submit to the indignities they were subjected to. He should like to know who was a better judge of a man than the person who employed him to take out his property. If the proprietor found his own servant, there would be just as much protection to the public as at present, for in all cases the master was responsible, and he would, therefore, look much more sharply into a man's character than the Scotland-yard authorities did. Under the present system, there were a number of men with licenses who brought disgrace upon the whole trade.

The Chairman remarked that there was nothing to prevent a cab-owner from finding a competent person, and putting him in the way of getting a license.

Mr. Crocker said he had done so several times, but respectable men would not submit to the inspection, examination, and regulations to which they were subjected. He had pursuaded several out of their objection to wear a badge, but when they went to Scotland-yard and found how they were treated, they had given it up in disgust. He should like to see the licensing system abolished, and believed the public would soon find the benefit. With regard to the inspection of cabs, he should like to see that also abolished; he believed the effect was to set up a minimum standard, which no one would care to go beyond; that was, if with the aid of putty and varnish the vehicle could be got up to pass an examination, well and good; it was only waste of capital to have anything better. If the inspection were done away with, and free-trade introduced, the public would soon reap the benefit. If inspectors were appointed, however, they should be competent men, men who understood cab-building, and veterinaries for the horses. He knew that many of the trade would object to his next proposal, which was that the inspection should be quarterly, giving 21 days' grace, but it should be at the proprietor's own yard, instead of obliging him to send his vehicle, and having to wait a whole day to have it inspected. In many cases an inspector would feel justified in saying "This cab is fit to run in the streets for three months," when he could not give such a warranty for the year. He agreed with what Mr. Case had said about property left in cabs, but there was another aspect of the lost property question, by which proprietors were made responsible for anything lost from a cab. In such cases he considered the liability should be limited to a certain amount, especially as he had known instances where parties had claimed £30 for a portmanteau and contents, which, having been afterwards traced, were found not to be worth more than £5. At present the cab-owner had no other alternative than to pay the demand, whatever it might be, or go before a jury.

Mr. Smith did not want any licence at all. As he had said before, he was a free-trader. Why should he have to go to Scotland-yard for his servant any more than a gentleman for his coachman, especially as it took no responsibility off his shoulders, but at the same time prevented his engaging men whose character he inquired into? He had had more than one interview with the late Sir Richard Mayne on this subject, and recollected on one occasion, when Captain Fishbourne and Mr. Owen, of the Poor-law Board, were also present, Sir Richard said, as showing the bad character of cab-drivers, —"for instance, Mr. Smith, if we have a bad policeman who has to leave the force, he has no difficulty in getting a cab licence." His reply was, that was just what he always contended; it was not first a cabman and then a bad man; but first a bad man and then the police authorised him to become a cabman. It would hardly be believed, but he had in his hand a list which would prove the fact, that every day, before a cabman set his foot on the cab, he might render himself liable to fines to the amount of £107, and all this after he had been licensed. Surely with such safeguards for his good conduct, the licence could be dispensed with. The badge he considered was no protection to the public, and certainly no advantage to the cabman, although when it was first introduced *Punch* remarked that every cabman would now be sure of a "plate of Whittle's." Very seldom was a cabman summoned by the number of his badge; indeed Alderman Salomons acknowledged to him that he did not remember an instance, and on more than one occasion where it had been done, he had seen the man let off because the policeman found he had summoned the wrong man. He would also abolish inspection; the present system was useless. He had known two cabs rejected one day as unfit for public use, and passed the next day but one in the name of another owner, with a compliment on their excellent quality; and he had had a cab of his own break down empty, having been passed the previous day. Why should he submit his cab to inspection when he was just as much responsible if it broke down and injured anyone as he was before? The present object of the proprietor was, not to get the best cab he could, but to get his cab passed. With regard to lost property, he might mention that there was a penalty of £10 upon any cab-driver who neglected to take anything found in his cab to Scotland-yard or a police-station within twenty-four hours, unless previously owned. He himself always took everything to the station, and the second thing he happened to take under the new Act was a doctor's four-ounce bottle; the inspector seemed surprised at his bringing it, but he told him he had no alternative under the Act, and he therefore claimed one shilling "for his honesty." One of his men on one occasion found £5 10s. in money, which was taken to the police-station, and thence forwarded to Scotland-yard. The owner, on applying for it, was informed that he would have to leave 3s. 6d. in the pound for the cabman, as a reward for his honesty, which was then the regulation in the case of gold and silver, but the driver only received 2s., and he (Mr. Smith) wondered what became of the difference. He thought articles unclaimed within a certain time ought to be given up to the cabman; and he believed the authorities would like it to be so, for the sale of the articles under the present system hardly paid the expenses; the Jew dealers got all the benefit. With regard to luggage lost from cabs, he thought the proprietor should only be liable to a certain amount, unless the owner before starting stated the value, and paid a fixed sum for safe transit.

Mr. Pearce said he had no doubt the licensing system had been adopted with a view to obtaining a better class of drivers, but it had plainly failed to do so. He firmly believed that there would be a superior class of men found driving cabs if the license were abolished, and for this reason: A number of men got licenses now whom no respectable man would associate with, and whom no one would employ if they had the opportunity of getting any one else. He could put his hand on a man who had recently been imprisoned for eighteen months who was now driving a cab; but these men knew that cab-owners must send out their vehicles in their charge or else have them at home, and the proprietor, knowing he cannot take the first respectable man that offers, was obliged to take those who apply, because they were licensed. There

was a remarkable absurdity connected with the renewing of licenses. If a gentleman had had a servant a year, and was satisfied with him, he did not go and ask somebody else what the man's character was; but this was practically what was done by the government in the case of the cab driver. A policeman went to the address given to see if he lived there, and if he did not happen to be at home, was not satisfied with the wife's assurance, but the man himself was required to go to the police-station, in order to satisfy the authorities that he lived with his wife. The whole thing was a farce, for, at the same time that these precautions were taken, he knew numbers of men who were driving under fictitious licenses.

The Chairman said he hoped the meeting would agree with him in thinking that they had pretty well discussed the subject, and that its division into different sections had been a prudent course. He was gratified at finding so good and business-like an attendance, and hoped their proceedings would not end in mere words. Since Mr. Fitzroy's bill was carried, he believed there had been an increase in the goodwill felt by the public towards the cab-drivers; and inasmuch as the questions that had been discussed very nearly affected the comfort and convenience of the whole public, he was quite convinced that the Society of Arts had done well in bringing the matter forward. He did not know whether the trade had had any consultation with the present Commissioner of Police, or whether they would think it wise to do so, but from his knowledge of Colonel Henderson, he felt sure he would not be averse to hearing the opinions of those engaged in the business upon any practical points which they wished to bring before him, especially as he was now engaged in assisting in the preparation of an Act of Parliament for improving the cab regulations. It must be understood that he (the Chairman) had no authority from Col. Henderson to say this; but this was his opinion, and if it was considered desirable that some one connected with the Society of Arts should accompany a deputation for the purpose of explaining matters, he had no doubt it could be arranged, and he would himself be happy to be of any use in the matter. He was quite sure that no one was more desirous of doing full justice to everybody than the present Home Secretary, Mr. Bruce; and if it were considered necessary or desirable he also might perhaps grant them an interview.

Mr. Howard thanked the Chairman very heartily for his kindness, and it was proposed that a meeting of the trade should be held in the course of the week, at which, if thought desirable, a deputation should be appointed, and a course of action determined on.

Mr. Crocker moved a cordial vote of thanks to the Chairman for his great patience and ability in presiding over such a long meeting, and to the Society of Arts for affording them the opportunity for so important and practical a discussion.

Mr. Pearce seconded the resolution, which was carried unanimously.

The Chairman said it had afforded him great pleasure to be of any assistance in this matter. He was convinced that the less government interference there was with cabs the better, and he believed the public would ere long be of the same opinion.

AWARD OF WHITWORTH SCHOLARSHIPS, PRACTICAL EXAMINATION, &c.

1. The Lords of the Committee of Privy Council on Education have, in concert with Mr. Whitworth, made the following rules for awarding the Whitworth Scholarships this year, and for holding the examinations in handicrafts, and in the practical use of tools.

2. It was decided that the scholarships were to be awarded according to the results of the examination of the Science and Art Department in the following subjects, as defined in the Science Directory:—1. Elementary mathematics; 2. Higher mathematics; 3. Theoretical mechanics; 4. Applied mechanics; 5. Practical, plane, and solid geometry; 6. Machine construction and drawing; 7. Acoustics, light, and heat; 8. Magnetism and electricity; 9. Inorganic chemistry; 10. Metallurgy; and according to the skill shown by the competitors in a special examination in the following handicrafts—1. Smiths' work; 2. Turning; 3. Filing and fitting; 4. Pattern making and moulding; or in the use of the following classes of tools—the axe, the saw, and plane, the hammer and chisel, the file, or the forge.

3. Mr. Whitworth desired that the number of marks obtainable in the theoretical subjects, and those obtainable by the most skilled workman, should be about equal. And it was decided that no candidate should be eligible to obtain a scholarship who had not shown a satisfactory knowledge of elementary mathematics, elementary mechanics, and practical plane and solid geometry, passed in freehand drawing, and proved his power to use one at least of the before-mentioned classes of tools.

4. The relative position of candidates, as regards the theoretical subjects, will be determined by affixing the same scale of marks to the several grades of success as is laid down for the competition for Royal exhibitions, viz.:—

	Marks.
For a 3rd class in elementary stage . . .	1
2nd " " . . .	3
1st " " . . .	5
2nd class in advanced stage	5
If previously successful in elementary stage	7
1st class in advanced stage	7
If previously successful in elementary stage	9

And 5, 4, 3, 2, and 1 marks in addition, to the first five candidates in the advanced stage, if they obtain more than 90 per cent. of marks.

	Marks.
For honours—2nd class	14
1st class.	17

"Good" in freehand drawing will count as 1 mark, and "excellent" as 3 marks.

5. The "satisfactory knowledge" required for passing in the subjects mentioned in section 3 will be taken to mean the obtaining of a first-class in the elementary stage of elementary mathematics, a second class in the elementary stage of theoretical or applied mechanics, a second class in the elementary stage of practical plane and solid geometry, and a "good" in freehand drawing.

6. The results of the examination in all the theoretical subjects will be published about the middle of June. It will then be possible to define, within comparatively narrow limits, the candidates amongst whom the competition will really lie. These will be directed to hold themselves in readiness to undergo the practical examination, which will be conducted at a certain number of centres by qualified persons.

7. The practical examination is of two kinds. There is the examination of the handicraftsman or skilled artisan, and there is the qualifying examination in the use of certain tools.

8. The examiners will decide on the number of marks to be awarded, and the position of the skilled artisans, by the rate of wages, &c., which they have been receiving (as vouched by the certificates of their employers), by work specially executed for the occasion, or by an inspection of work upon which they may have been employed.

9. The examination in the use of tools will be the performance of one or more of the following pieces of work:—

The Axe.

a. To square up a block of wood a foot long and six inches in diameter.

b. To make a spoke for a cart wheel.

c. To be able to shaft an axe.

d. To cut out wheel spokes ready for fitting into nave.

The Saw and Plane.

a. To saw from a plank two pieces of timber three feet long and three inches square and plane them up true.

b. To make a box 18 in. long × 9 in. wide × 9 in. deep, planed up true, and the joints dovetailed together.

c. To saw out and plane up two parallel strips 2 ft. × 2 in. × ⅜ in.

The Hammer and Chisel.

a. To chip a piece of cast-iron six inches square over on one of its surfaces, ready for filing.

b. To cut out of sheet iron (any guage) a figure or letter of any size from 1 in. to 6 in.

The File.

a. To file two sides of a cast-iron inch cube as flat as possible with a Stubbs' twelve-inch second cut file, the stroke of the file not being less than nine inches.

b. A wrought-iron hexagonal nut, ½ in. or 1 in., to be filed up true.

c. To file up two parallel strips, iron or steel.

d. To file up pocket square as true as possible.

The Forge.

a. To weld or join together two pieces of iron three quarters of an inch square.

b. To make a pair of smith's tongs.

c. To make the head of a hammer.

d. To make a pick.

e. To make 2 ft. ¾ in. chain with hook and ring.

f. To make a horse-shoe complete.

g. To cut off and draw out chipping chisel or drill, and afterwards harden.

h. To make a pair of small callipers.

i. To make a pocket square.

10. A competitor is not restricted to one only of the handicrafts, nor to the use of one class of tools, but he may show his skill in two or more. His position and the number of marks to be awarded to him will be determined by his general skilfulness as a workman. A skilled mechanic will thus be enabled to obtain credit and improve his position, by showing his power of using those classes of tools not properly belonging to his own handicraft; and the ordinary student may, in like manner, instead of simply qualifying in the use of a certain class of tools, show his skill in one of the handicrafts mentioned.

11. To those who merely qualify in the use of tools, a certain proportion of the marks obtainable for practical workmanship will be given, according to their relative skill. These marks will count towards the general result.

12. The travelling expenses of poor students—second-class railway fare with a personal allowance of 10s. per diem—will be allowed, to enable them to attend at the places where the practical examinations are to be held.

South Kensington, 29th May, 1869.

Manufactures.

Liquid Fuel.—Creosote, oils, and other inflammable liquids of a kindred character, bid fair to effect a speedy and an important revolution in the supply of materials applicable to heating purposes. Mr. D. Dorsett has brought out a system by which not the creosote oil but its distilled vapour, which is more powerful, is made to to do the work of coal in heating iron-plates to the heat necessary for bending them for ships' armour-plating and other similar purposes, where the advantages sought are a very high and at the same time so equal a temperature as that, while producing the required amount of ductility in the material to be operated upon, it shall not be deteriorated in its fibrous tenacity. For some two or three months Mr. Dorsett has been experimenting with his patent fuel in Woolwich Dockyard, and so satisfactorily to the Admiralty authorities, that they have instituted tests at Chatham, with a view to the preparation of the armour-plating of the *Sultan* armour-plated ship now building in that dockyard. The advantages may thus be shortly summed up, as compared with coal:—A greatly-diminished cost and saving of time in producing the required heat of iron, as well as a saving of labour; an absence of refuse, and a surface altogether free from scale. As regards the effect of this new mode of heating upon the metal itself, one of the dockyard operatives declared, somewhat emphatically, that the commonest iron treated by it came out of the furnace as good as the best Low Moor. The apparatus is simple, and inexpensively applicable to existing coal-furnaces. It consists of a reservoir, from which the oil is pumped up as wanted into a receiver, where, by the application of heat, the vapour is generated, and this is passed through pipes into the furnace, and used as fuel in the ordinary way.

Commerce.

Publicans and Grocers' Wine and Spirit Licences.—The *Produce Markets Review* says:—"As the Chancellor of the Exchequer has been considering the general question of licences, the time is opportune for calling attention to the great inequality in the sums paid by publicans and by grocers for selling wines and spirits:—

Publicans' Licences to Sell on Draught, for Consumption on the Premises.

	£.	s.	d.
Spirits	11	0	6
Wine	2	4	1
Beer	3	6	1¾
Total	£16	10	8¾

Grocers' Licences to Sell for Consumption off the Premises.

	£.	s.	d.
Spirits	13	13	0
Wine	10	10	0
Beer	4	8	2¼
Total	£28	11	2¼

The grocer, it is true, can obtain a £3 3s. licence, but this will only allow him to sell less than a dozen at a time, a useless quantity if a man is to do anything like a trade. The grocers' licence ought clearly to be considerably below the publicans', as the latter sell for consumption on the premises, and are, besides, not hampered with the prohibition to sell less than a quart bottle of spirits, nor forced to keep their wines and spirits in different places. We can see no real reason why a grocer should pay a licence for selling bottles of wine any more than he does for selling bottles of pickles. The object of a publican's licence is, we presume, to give the authorities some power to check disorderly proceedings, but we cannot see why a bottled trade should require anything of the kind. At any rate it is clear that a grocer ought, in justice, to pay about half what a publican pays, instead of paying fifty per cent. more."

Publications Issued.

Actualités Scientifiques.—Science Anglais son bilan au mois d'Aout, 1868.—Reunion a Norwich de l'Association Britannique pour l'Avancement des Sciences. (Par M. L'Abbé Moigno, Paris, 1869.) This is a French version, by M. Abbé Moigno, Foreign Associate of the British Association, of the proceedings at Norwich, including the addresses of the president and vice-presidents; the papers read by Professors Huxley and Owen; an analysis of the communications made to the Association, and a report on the proceedings of the Archæological Congress, also held at Norwich, at the same time as the Association; all contained in a small

duodecimo volume of 236 pages. The Abbé Moigno has constituted himself the interpreter to his countrymen, of English scientific proceedings and publications. The volumes of this series include translations of Professor John Tyndall's essays on "Radiation;" Professor Hofmann's work on the "Cohesive Power of Atoms;" Mr. Huggins's "Spectrum Analysis of the Celestial Bodies." *Les Mondes*, of which the Abbé Moigno is editor, also gives great attention to English scientific progress.

Les Industries Agricoles. By M. A. Ronna, engineer. 1 vol., 8vo., with seventy-five engravings, and eight plates (Paris). M. Ronna is known as one of the translators of Dr. Percy's "Metallurgy," and as the author of several works on agricultural chemistry. The new work treats of sugar-making, distillation, brewing, wine-making, the preservation of grain, flour and bread-making, preservation of food, oil manufacture, tanning and leather-dressing, paper making from wood pulp, and the various methods of preserving timber, &c.

Notes.

South Kensington Museum.—The Rev. Alexander Dyce has bequeathed to this museum his important dramatic library, with its unique editions of Shakespeare, and all his pictures, miniatures, antique rings, and other works of art, upon the condition that a suitable room is built to receive them.

French Scientific and Naval Missions. — The French government sends a ship round the world once a year, for the completion of the instruction of the boys who have passed through the course of education in the Imperial Marine School of Brest. The Minister of Public Instruction has recently announced that his colleague, the Minister of Marine, has determined that in future two savants, a physicist and a naturalist, shall accompany the vessel. These gentlemen are to be selected by the Academy of Sciences, and to be furnished with instructions for scientific observation by that learned body. The Minister of Marine also announces that he has organised a special voyage round the world, the main object of which is the study of navigation by sailing ships, with a view to the improvement of the system; and as the vessel will touch at many ports, the minister notifies to the Academy that the voyage will supply the occasion of many important observations, to be made by scientific men appointed and instructed by the Academy.

The Russian Fleet.—The following are the particulars of the Russian fleet, as given in the *Journal of St. Petersburg*, from the report of the Ministry of the Marine:—On the 1st of January, 1869, the fleet counted 230 steamers and 37 sailing vessels. The former consisted of the following armour-plated vessels:—4 frigates, 3 batteries, and 13 monitors. Non-plated vessels—6 ships of the line, 8 frigates, 18 corvettes, 7 clippers, 62 gun boats, 6 vessels called "vapeurs-frigates, 4 imperial yachts, 13 schooners, 22 transports, 48 dispatch boats, and 16 chaloupes. The sailing vessels consisted of 5 yachts, 4 schooners, 15 transports, and 13 chaloupes. Of these, 156 vessels were in the Baltic, 1 in the White Sea, 30 in the Caspian, 41 in the Black Sea, 31 on the Eastern coasts of Siberia, and 22 in the sea of Ural. There were, in addition, 4 plated frigates and a steam yacht on the stocks in the Baltic, and 2 gun-boats on the Siberian coast.

Correspondence.

Pensions to School Teachers.—Sir,—I have been much interested by the address of Mr. Edwin Chadwick, at the deputation to Earl de Grey, on the subject of pensions to aged school teachers, reported in the *Journal* of the 21st May. Mr. Chadwick justly complains of "the disastrous experience, attested by school inspectors, of the wide-spread desertion to less discouraging conditions of the most valuable skilled elementary teachers, reductions of the numbers of pupil teachers, ruinous to the training colleges, a reduction of the quality of the teaching of the children of the wage-classes of the country." He chiefly ascribes this to the severance of the teacher from all direct relationship with the Committee of Council on Education, leaving him exclusively to make the best terms he can with the local school committee. This is not, I think, the only or even the chief cause of the distaste of the schoolmaster for the present condition of things, *i.e.*, the scheme laid down by the notorious Revised Code. I find that young men of spirit treat pretty freely with the committees, I dare say from a conviction that there is at present no danger of any glut in the teaching market, though the change has been most galling to the experienced masters, who have had to submit to the imposition of new terms. But if the present system is persevered in, one of the evils, the scanty supply of teachers, can easily be remedied, inasmuch as any intelligent book-keeper, "passing rich" on £50 or £60 a-year, has ample qualifications for giving all the instruction in the three R's now deemed by the highest educational authority in the State all that is necessary for the mental training of the poor man's child. It is this degradation of the duties of the primary teacher that has done more to alienate him from the occupation than anything else. Possibly, under the pre-Revised Code *régime*, there was too great a temptation to give disproportionate attention to the clever boys, and to base the reputation of the school on their attainments; but surely it was not necessary, in order to check this, to banish all such studies as exercise the faculties of the best scholars. If it is said—as it has been, with a plausible evasion of the real point at issue—that no department of instruction was really banished from the primary schools by the Revised Code, I reply, and the schoolmasters of England will do so also almost as one man, that to make the "three R's" the only subjects on which payments would be made, and the payment on each child so small, that a remunerative amount could only be obtained by a large aggregate mediocrity, practically compels the teacher to give all his energy to this work, to the exclusion of any of a higher order. If this only concerned the teacher and the parties through whose hands his income should pass, one might leave the matter to self-adjustment. But it is a national question just now of vital importance. The Endowed Schools Bill, now before Parliament, wisely contemplates the encouragement of presentations from the lowest schools to the endowed institutions, grammar schools, &c., from which again exhibitions should, with judicious liberality, be made to the colleges connected with the universities. Formerly the best of our primary schools would have been ready with boys to compete for such scholarships; now they are not worth the schoolmaster's consideration. We are stimulating technical instruction, by the aid of Whitworth and other scholarships; we are expending a large sum annually in subsidising science teaching—refusing to pay on any pupils but those of the wage-classes; and, with unaccountable perversity, we ignore the idea of giving any preparation for advanced knowledge in our primary schools, for the permissive clauses, recognising grammar, history, and geography, are virtually useless. Let a commission—a Society of Arts Committee would do the work admirably—undertake the simple task of laying down a course of primary instruction for the children of the wage-classes, having in view the exercise of their powers of observation, and their reasoning faculties—the latter especially—through such obvious phenomena and their laws as any intelligent child can understand, while even the rudimentary instruction should, wherever practicable, keep principles in view; this would give us something tangible to claim of government. In any such committee I should like to

see two experienced certified schoolmasters. I should have no difficulty in naming men whose judgment would be as trustworthy as their knowledge of the average capabilities of boys up to fourteen years of age, and the motives by which they are chiefly actuated. I think also that it is most desirable to have some scheme of secondary schools or classes open to boys after leaving the primary schools, to carry forward the culture, just acquiring some vigour, at the period a lad is entering on an apprenticeship. This must be done in the evening, and is more or less considered in our Mechanics and similar Institutions, but on no definite plan, and here, I believe, some moderate assistance by government, to encourage a good co-ordination of studies, rather than detached subjects, would, in the long run, do a great deal to promote real practical education. But the discussion of the latter topic in detail would extend this to an unreasonable length.—I am, &c., W. H. J. Traice.

Pendleton, May 29th, 1869.

Ventilation of Sewers.—Sir,—Following in the wake of so able a correspondent as Mr. Bridges Adams, I feel some hesitation in addressing you, but, with all due deference to the wisdom contained in his letter, I must dissent from the practicability (within the next century or so) of his proposition of daily collecting the sewage. I doubt not that all your readers, in common with myself, experience a feeling, when paying sewers' rates, which we may reasonably suppose would be shared by a man rewarding a burglar who had carried off the contents of his cash-box. Plainly speaking, we pay the Sewage Commissioners instead of (drainage being properly collected and utilised) their paying us; but, since in the face of the main drainage, we can scarcely live in the hope that sewers will, for a long time, be employed in their proper capacity of carrying off storm waters only, and since sewers being used as they are now, noisome gases must also be of necessity a resultant, it becomes us not to prevent the formation of such gases, but rather to prevent their escape into our dwellings and streets, thereby avoiding the detrimental effects arising from such escape. To produce this desirable object, we have only to turn the almost general up-draught from our traps and gullies into a steady down-draught into them, which could easily be effected by a suitable system of exhaust, and the gases now so ruinous to health and so obnoxious to our nasal organisation (especially on Sunday night, when the authorities seem to consider it profanation of the Sabbath to study the public health), might be, if possible, utilised, but certainly destroyed. I am perfectly aware that the merit of this project does not consist in its novelty, but I feel that it cannot be too frequently brought under notice. —I am, &c., W. F. C.

MEETINGS FOR THE ENSUING WEEK.

Mon.....R. Geographical, 8½. Mr. St. Vincent Erskine, "Exploration of the Lower Course of the Limpopo River."
Social Science Assoc., 8. Mr. Thomas Briggs, "On the Relations of the British Colonies to the Mother-Country, considered from an Agricultural and Commercial point of view."
Tues ...Statistical, 8. Mr. T. A. Welton, "On the Statistics of the English Census."
Anthropological, 8.
Wed ...Meteorological, 7. Annual Meeting.
Thur ...Royal, 8½.
Antiquaries, 8½.
Linnæan, 8. Dr. E. Bureau, "On Plants of the order *Bignoniaceæ*, collected by M. Correa de Méllo in Brazil."
Zoological, 4.
Chemical, 8.
Numismatic, 7. Annual Meeting.
Philosophical Club, 6.
Society of Fine Arts, 8. Lecture by Mr. W. Cave Thomas.
Fri .....Society of Arts, 8. Conference on "Cotton Cultivation and Supply."
Philological, 8½.
R. United Service Inst., 8½. 1. Rear-Adml. Sir John C. D. Hay, "On the Launch of H.M.S. *Northumberland*." 2. Lieut.-Col. Baillie, "On the Application of Photography to Military Reconnaisance."

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb.

Delivered on 14th May, 1869.

97. Bill—Bankruptcy (amended).
98. ,, Imprisonment for Debt (amended).
106. ,, Libel (amended).
104. (I.) Joint-Stock Companies—General Summary.
180. Sligo County Election—Correspondence.
186. Lighthouses, &c.—Reports.
191. Sugar, &c.—Return.
204. Rule of the Road at Sea—Observations.
207. Greenwich Hospital—Correspondence.

Delivered on 15th May, 1869.

98. Bill—Imprisonment for Debt (amended) (corrected copy).
116. ,, Beerhouses, &c. (amended).
121. ,, County Courts (Admiralty Jurisdiction Act, 1868) Amendment.
123. ,, Irish Church (as amended in Committee, and on Consideration, as amended).
125. ,, Sea Birds Preservation—Lords Amendments.
81. (III.) Railway and Canal Bills—Fourth Report.
154. New Palace of Westminster—Correspondence.
184. Salmon Fisheries (England and Wales)—Eighth Annual Report of Inspectors.
202. Army (Supercession of Officers)—Correspondence.
209. Kitchen and Refreshment Rooms (House of Commons)—First Report.

Delivered on 18th May, 1869.

113. Bill—Courts of Justice (New Site).
119. ,, County Administration.
124. ,, Endowed Hospitals, &c. (Scotland) (as amended by the Select Committee.)
127. ,, Titles of Religious Congregations Act Extension.
China (No. 4, 1869)—Correspondence.
China (No. 5, 1869)—Correspondence.
China (No. 6, 1869)—Correspondence.
China (No. 7, 1869)—Correspondence.
China (No. 8, 1869)—Correspondence.
China (No. 9, 1869)—Papers.

Delivered on 21st May, 1869.

109. Bill—Election Commissioners (Expenses).
114. ,, Pier and Harbour Orders Confirmation.
122. ,, Married Women's Property (amended).
124. ,, Endowed Hospitals, &c. (Scotland) (as amended by the Select Committee) (corrected copy.)
131. ,, Petroleum.
China (No. 3, 1869)—Correspondence.
China (No. 10, 1869)—Further Correspondence.
Tornado (No. 2, 1869)—Correspondence.
Public General Acts—Chap. 8 to 13.

Delivered on 22nd May, 1869.

39. (I.) Army Estimates (Vote 21, revised).
177. East India (Communication)—Report.
179. Gun Cotton, &c.—Reports.
188. Life Assurance Companies—Return.
203. Statute Law Commission—Return.
210. Married Women's Property Bill—Report.
211. British Museum—Accounts.
215. Mr. Anketell—Resolutions, &c.
Public Petitions—Twenty-first Report.

Delivered on 26th May, 1869.

118. Bill—Diplomatic Salaries, &c.
197. Factory Acts Extension Act (1867) (Modifications)—Return.
208 Endowed Schools Bill—Report of the Select Committee.
212. Coals—Return.
213. Parliamentary Returns—Return.
214. Bank of England—Returns.

Delivered on 27th May, 1869.

117. Bill—Poor Relief (Ireland) Act (1862) Amendment.

Delivered on 28th May, 1869.

217. Malta—Despatches, &c.
218. New Zealand Loan—Extracts of Correspondence.

Delivered on 29th May, 1869.

77. Bill—Metropolitan Commons Act (1866) Amendment.
200. Hungerford-bridge and Wellington-st. Viaduct—First Report.
220. Crime (Ireland)—Return.

Session 1868.

344. (A XI.) Poor Rates and Pauperism—Return (A).

Delivered on 31st May, 1869.

132. Bill—Customs and Inland Revenue Duties (amended).
133. ,, Civil Offices (Pensions) (amended).
134. ,, Insolvent Debtors and Bankruptcy Repeal.
136. ,, Oxford University Statutes.
137. ,, Pier and Harbour Orders Confirmation (No. 2).
219. Imprisonment for Debt—Returns.

222. Rinderpest—Return.
224. Police (Scotland)—Eleventh Report.
230. Exchequer Bonds—Account.
New Law Courts—Block Plans by G. E. Street, A.R.A.

Delivered on 1st June, 1869.

138. Bill—Companies Clauses Act (1863) Amendment.

Delivered on 2nd June, 1869.

46. (III.) Trade and Navigation Accounts (30th April, 1869).
167. (I.) Trade Accounts (Foreign Countries) (Belgium, Holland, and United States).
225. Railways (Facing Points)—Rules.
226. Naval Savings Banks—Account.
227. Postal Communication (Australia)—Correspondence.
North America (No. 1, 1869)—Correspondence respecting the Negotiations on the Questions of the *Alabama* and British Claims, &c.

Delivered on 3rd June, 1869.

100. Bill—Valuation of Property (Metropolis) (as amended).
130. ,, Salmon Fisheries Law Amendment.
135. ,, County Coroners (amended).
139. ,, Election Commissioners (Expenses) (as amended).
140. ,, Joint-Stock Companies Arrangement.
141. ,, Beerhouses, &c. (as amended in Committee, and on Consideration, as amended).
221. Reformatory and Industrial Schools—Return.
232. Strand Union—Correspondence.

Delivered on 4th June, 1869.

156. County Expenditure—Return (corrected copy).
238. New Courts of Justice—Estimate of Advances, &c.
Turkey—Protocol relative to the Admission of British Subjects to the right of holding Real Property.

Patents.

From Commissioners of Patents' Journal, June 4.

Grants of Provisional Protection.

Agricultural machines, &c.—1578—C. J. Foster.
Boat-detaching apparatus—1567—W. R. Lake.
Boots and shoes, apparatus for cleaning—1624—G. H. Ellis.
Brooms and brushes—1574—J. Platt.
Brushes, machinery for manufacturing—1597—E. T. Hughes.
Carriage wheels—1608—A. McNeile and J. Slater.
Castors—1559—G. Perkin.
Cocks, taps, and valves—1517—J. Norton.
Coffee mills—1565—H. E. Newton.
Driving bands, uniting the ends of—1604—J. Trotman.
Driving bands, &c., clip for uniting the ends of—1592—W. Furness.
Eggs, apparatus for facilitating the opening of—1576—A. M. Clark.
Ejector condensers, &c.—1599—A. Barclay.
Electrical apparatus—1627—E. G. Bartholomew.
Felted cloth, &c.—1545—W. Mitchell.
Fire-arms, breech-loading—1448—A. Henry.
Fire-arms, &c., breech-loading—1547—G. V. Fosbery.
Fire grates, ashpans for—1551—J. Langham.
Gelatine, &c., obtaining—1539—W. R. Lake.
Glass houses for horticultural purposes—1622—J. Cranston.
Glass, &c., tools for cutting—1612—M. Benson.
Gun barrels, &c.—1626—F. H. Lloyd.
Hats—1610—R. Wheble.
Horse-shoe nails, &c—1585—E. T. Hughes.
Hydraulic motive-power, obtaining and applying—1609—L. Roman.
Ice-houses, &c.—1595—W. A. Gilbee.
Iron and steel—1582—H. R. Lumley.
Iron, machinery for casting—1586—G. T. Bousfield.
Lock spindles and door knobs—1563—M. Jarvis and E. Millward.
Locks—1623—J. Bridges.
Looms—1580—J. Hudson and C. Catlow.
Mathematical instruments—1605—W. Jones and T. Sheffield.
Metal, &c., shearing, punching, &c.—1577—W. R. Lake.
Metallic articles, grinding—1593—W. Mitchell.
Motive-power, obtaining—1606—F. T. Blake.
Motive-power, obtaining—1621—C. Hanson and J. Bottomley.
Mowing apparatus—1513—T. Norris.
Musical boxes, albums, &c.—1425—R. F. Hoppe.
Needles, wrappers for—1589—S. Thomas, jun.
Ores, &c., calcining and smelting—1575—C. W. Siemens.
Organs—1571—E. H. Pulbrook.
Paint—1243—A. Borgnet.
Pianofortes—1619—C. F. Chew.
Piers, &c., foundations for—1543—J. E. Dowson, jun., & A. Dowson.
Pneumatic sewage system—1352—C. T. Liernur.
Pottery, &c.—1549—W. McAdam.
Railway carriages, &c., apparatus for receiving and discharging cigar and tobacco ashes in—1611—R. Schomburg.
Railway engines, &c., couplings for—1584—J. Lockwood.
Railway rails, fishes for fishing—1625—R. P. Williams.
Railway trains, communication in—1561—J. Reid.
Railways, connecting and securing together the rails of—1581—W. Morris.
Rolling mills, rolls for—1602—J. Dick.
Sash pulleys—1588—M. Tildesley.
Screw bolts and nuts—1613—W. Palliser.
Screw bolts, machine for nutting—1615—T. Vaughan & E. Watteeu.
Ships' compasses—1587—J. H. Davis.
Spinning and doubling machinery—1541—P. McGregor.
Steam engine governors—1614—H. D. McMaster and A. Dale.
Steam-engine governors, &c.—1598—G. Salt and W. Inglis.
Steam motors—1596—M. H. de Goësbriand.
Telegraphic instruments—1600—J. Brittain.
Tunnelling machinery, &c.—1618—J. D. Brunton.
Turbine-wheels, reacting—1594—B. F. Weatherdon.
Velocipedes—1439—T. Dunn.
Velocipedes—1590—W. H. Bliss.
Velocipedes—1601—R. Richardson.
Velocipedes—1607—G. H. Hoare.
Vessels, propelling and manœuvring—1555—A. L. McGavin.
Window blinds, fittings for—1553—J. Bowman.
Window shutters—1570—S. Jackson.
Wood, &c., producing imitations of and substitutes for—1603—J. H. Johnson.

Inventions with Complete Specifications Filed.

Bolts and nuts, machinery for manufacturing—1647—W. R. Lake.
Peat, &c., machinery for manufacturing—1630—A. Edlmann.
Vehicles, &c., mechanism for propelling and guiding—1682—W. R. Lake.

Patents Sealed.

3700. E. Francillon.
3703. D. Thomson.
3705. H. Denton.
3706. E. K. Dutton.
3710. J. Holmes.
3712. D. H. Paterson.
3719. J. Ridley.
3722. W. R. Lake.
3727. C. Farrar.
3728. A. Mackie.
3734. R. B. Roden.
3735. T. Speir.
3736. T. Speir.
3737. T. Lancaster.
3742. J. Kirk and J. Kirk, jun.
3746. S. S. Anderson.
3754. W. Griffiths.
3758. A. Matthiessen.
3765. W. Dawes & E. A. Ramsden.
3766. J. Pickles, E. Ramsbottom, S. Haggas, S. Foulds, J. Shackleton, & W. Berry.
3768. T. Holder and G. Dover.
3775. J. Millward.
3780. Z. Poirier.
3828. A. M. Clark.
3879. R. Wilson.
3917. B. W. Maughan.

From Commissioners of Patents' Journal, June 8.

Patents Sealed.

3747. J. T. Parlour.
3755. J. Norman.
3764. J. F. Bentley.
3769. H. Carter & G. H. Edwards.
3787. G. A. C. Bremme.
3808. W. Bywater.
3813. M. Brown-Westhead and R Smith.
3821. W. N. Nicholson.
3838. F. Robert-Theurer.
3848. J. Quick, junior, and J. Sampson.
3854. W. F. Thomas.
3912. A. Sezille.
3934. C. D. Abel.
3952. C. D. Abel.
3986. H. E. Newton.
3987. W. E. Newton.
6. T. Green.
7. T. Green, W. Burrows, and R. Turner.
9. F. Perry.
10. M. Henry.
97. S. Jellyman.
128. A. Sehet.
188. F. Lipscombe.
236. C. L. Wood and J. Hockley.
326. J. G. Willans.
632. J. G. Willans.
670. W. E. Gedge.
823. J. C. Ramsden.
899. C. B. Parkinson, A. and J. Metcalf, & W. H. Heald.
1117. J. Kirk.

Patents on which the Stamp Duty of £50 has been paid.

1522. J. H. Johnson.
1570. A. Grivel, jun.
1535. S. Turton.
1539. A. B. Brown.
1548. A. Moncrieff.
1588. D. Cochrane.
1736. W. Clark.
1581. C. H. Murray.
1726. C. E Brooman.
1560. W. Lawrence.
1567. H. Greaves.
1582. H. J. Griswold.

Patents on which the Stamp Duty of £100 has been Paid.

1655. J. King and J. Partington.
1663. J. Whitworth.
1684. G. B. Toselli.

Registered Designs.

5027—May 19—A scarf fastener—H. Tagg, 70, Hatton-garden, E.C.
5028—May 21—A combined letter-balance and calendar—C. Wise, 30, King Edward-place, Birmingham.
5029—June 4—The Staplehurst wrought-iron garden-roller barrow—T. P. Descon, The Limes, Staplehurst, Kent.

Journal of the Society of Arts.

FRIDAY, JUNE 18, 1869.

Announcements by the Council.

India Committee.

This evening (Friday), June 18th, the seventh conference will be held, when the subject of "Cotton Cultivation and Supply" will be discussed. The chair will be taken at 8 o'clock, by John Cheetham, Esq. Members of the Society interested in Indian questions are invited to attend.

Annual Conference.

The Eighteenth Annual Conference between the Council of the Society and the Representatives of the Institutions in Union and Local Boards will be held on Wednesday next, the 23rd inst., at Twelve o'clock, noon. The Chairman of the Council will preside.

The Council will lay before the Conference the Secretary's Report of the Proceedings of the Union for the past year, and the results of the Examinations; and the Programme of Examinations for 1870 will also be brought before the Conference.

The following suggestions of subjects for discussion have been received from various quarters, it being understood that in putting them forward the Council express no opinion whatever upon them :—

1. What arrangements can Mechanics' Institutions make for promoting the systematic Technical Instruction of the people in their several localities.
2. It being in contemplation to call meetings of the members of the Society of Arts and others in corporate towns, for the furtherance of Technical Instruction, how far can the Institutions in Union with the Society aid in promoting the success of such meetings?
3. Does the Endowed Schools Bill, now before Parliament, afford any facilities which can be taken advantage of by Mechanics' Institutions for such purposes, and if not, can any steps be taken for obtaining the insertion of clauses with that object in view?
4. In what way can the advantages of union with the Society of Arts, apart from the Examinations, be made available in the provinces?
5. How can the Society of Arts assist in obtaining the extension of State aid to Night Classes in the Institutions in Union?
6. Is it necessary that the Examinations in the same subjects of Science and Art should be carried on both by the Department of Science and Art and by the Society of Arts?
7. Would the extension of the Final Examinations to Commercial and lower Middle-class Schools produce beneficial results?
8. Is it not desirable that scholars in attendance at Day Schools should be excluded from the Elementary Examinations?

Secretaries of Institutions and Local Boards are requested to send, *immediately*, the names of the Representatives appointed to attend the Conference; and early notice should be given of any other subjects which Institutions or Local Boards may desire their Representatives to introduce to the notice of the Conference.

Secretaries of Institutions are requested to forward *at once*, by book post, copies of the last Annual Reports of their Institutions.

Conversazione.

The Conversazione originally fixed for the 23rd inst. is unavoidably postponed to a later date, which will be announced as soon as the arrangements are completed.

Designs for Channel Steamers.

The Council of the Society of Arts offer the Gold Medal of the Society, and the large Silver Medal of the Society, for the best and the second-best block model of a steamer, which shall afford the most convenient shelter and accommodation to passengers on the deck of the vessel crossing the Channel between France and England. The steamer is not to exceed in tonnage and draught the best vessels now in use between Folkestone and Boulogne, and the model must be on a scale of a quarter of an inch to a foot. The models, marked in cypher, are to be sent in to the Society of Arts' House, John-street, Adelphi, on or before the 1st November, 1869, with a sealed envelope, giving the name and address of the designer.

The Council reserve the right of withholding either or both medals, in case, in their opinion, the models sent in do not possess sufficient merit.

The following particulars of the South-Eastern Channel steamers, *Victoria*, *Albert Edward*, and *Alexandra*, are given for the convenience of competitors, but it is not intended to confine the designs to them, except as to tonnage and draught :—

Length between perpendiculars, 200 ft.
Breadth of beam, 24 ft.
Depth underside of deck amidships, 12 ft. 6 in.
Draught of water, 7 ft.
Bow, clipper.
Stern, elliptic.
Rig, polacca with two masts, lug foresail, gaff mainsail, staysail, and flying jib.
Engines, oscillating.
Paddle wheels, 17 ft. 6 in. diameter.
Tonnage, 568 tons.
Speed, 17 miles an hour.

Subscriptions.

The Lady-day subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

FINAL EXAMINATION, 1869.

PRIZES AND CERTIFICATES AWARDED TO CANDIDATES.

PRIZES.

His Royal Highness the Prince Consort's Prize of Twenty-Five Guineas to

No. 1508—William John Wilson, aged 26, of the Royal Polytechnic Institution, engineer's clerk, who has obtained the following First-class Certificates :—

1867. Animal Physiology—First-class Certificate, with First Prize.
" Domestic Economy—First-class Certificate, with Second Prize.
1868. Arithmetic—First-class Certificate.
" Book-keeping—First-class Certificate.
" Geography—First-class Certificate, with First Prize, and the Royal Geographical Society's Prize of £5.
1869. Magnetism and Electricity—First-class Certificate, with First Prize.
" Civil Government and the Laws of England—First-class Certificate, with First Prize.
" Political Economy—First-class Certificate, with Second Prize of £3.
" Logic and Mental Science—First-class Certificate.

The Council Prize (For Female Candidates) of Ten Guineas to

No. 1407—Elizabeth Backhouse, aged 21, of the Birkbeck Literary and Scientific Institution (no occupation stated), who has obtained the following First-class Certificates :—

1868. English History—First-class Certificate, with Second Prize, and the Prize for Female Candidates.
" Geography—First-class Certificate, with the Prize for Female Candidates.
1869. Domestic Economy—First-class Certificate, with the Prize for Female Candidates.
" English Literature—First-class Certificate.

Arithmetic	1st Prize	£5	To No. 2074—John Ezzard Edward Hooker, 21, Sheerness Dockyard, shipwright
	2nd Prize	3	" 1876—Alfred Weymouth Smith, 19, Portsea Island Young Men's Christian Association, shipwright apprentice
			No Prize for Females awarded.†
Metric System	1st Prize	5	" 1446—James Stoughton Harding, 29, City of London College, clerk
	2nd Prize	3	" 1507—Henry Fisher, 24, Royal Polytechnic Institution, smith's clerk
			No Prize for Females awarded.†
Book-keeping	1st Prize	5	" 2281—William H. Stanier, 20, Wolverhampton (St. Peter's) Inst., railway clerk
	2nd Prize	3	" 1504—Henry Spriggs, 19, Royal Polytechnic Institution, draper
			No Prize for Females awarded.†
Algebra	1st Prize	5	" 1871—James Taylor Milton, 18, Portsea Island Young Men's Christian Association, engineer student
	2nd Prize	3	" 607—James Allington, 17, Devonport Mechanics' Inst., shipwright apprentice
Geometry	1st Prize	5	" 1871—James Taylor Milton, 18, Portsea Island Young Men's Christian Association, engineer student
	2nd Prize	3	" 940—James W. M'Farlane, 20, Glasgow Mechanics' Inst., mechanical draughtsman
Mensuration	1st Prize	5	" 405—John Armstrong, 19, Carlisle Mechanics' Inst., engineer's clerk
	2nd Prize	3	" 647—Andrew J. Walker, 17, Devonport Mechanics' Inst., engineer student
Trigonometry	1st Prize	5	" 1867—William Green, 18, Portsea Island Young Men's Christian Association, engineer student
	2nd Prize	3	" 607—James Allington, 17, Devonport Mechanics' Inst., shipwright apprentice
Conic Sections	1st Prize	5	" 2067—William H. Grieve, 19, Sheerness Dockyard, engineer student
	2nd Prize	3	" 1870—Robert Mayston, 17, Portsea Island Young Men's Christian Association, engineer student

* No other First-class Certificates were given in these subjects, or the Candidates were disqualified for receiving Prizes.
† No Female Candidate qualified to receive Prizes obtained a First-class Certificate in any of these subjects.

Navigation & Nautical Astronomy ..	1st Prize	£5	To No. 1878—James S. West, 17, Portsea Island Young Men's Christian Association, engineer student *No Second Prize awarded.**
Principles of Mechanics	1st Prize	5	„ 607—James Allington, 17, Devonport Mechanics' Inst., shipwright apprentice *No Second Prize awarded.**
Practical Mechanics	1st Prize	5	„ 1622—John A. Bennion, 19, Manchester Mechanics' Inst., engineer
	2nd Prize ..	3	„ 603—Edmond Felix Mondy, 23, Deptford Local Board, shipwright
Magnetism and Electricity	1st Prize	5	„ 1508—William John Wilson, 26, Royal Polytechnic Inst., engineer's clerk
	2nd Prize ..	3	„ 784—John Martin, 18, Popular Evening Classes, Andersonian University, Glasgow, clerk
Light and Heat	1st Prize	5	„ 1628—William H. Greenwood, 23, Manchester Mechanics' Inst., engineer *No Second Prize awarded.**
Chemistry	1st Prize	5	„ 1258—John R. Butterfield, 19, Leeds Mechanics' Inst., chemist's assistant
	2nd Prize ..	3	„ 1243—Frederick H. Burton, 18, Leeds Mechanics' Inst., chemist
Mining and Metallurgy	1st Prize	5	„ 1258—John R. Butterfield, 19, Leeds Mechanics' Inst., chemist's assistant
	2nd Prize ..	3	„ 1244—Oliver Pegler, 21, Leeds Mechanics' Inst., mechanical student
Botany	..	..	*No Prizes awarded in this subject, no Candidate having taken a First-class Certificate.*
Floriculture	1st Prize	5	„ 1942—Michael Middleton, 22, Richmond Parochial Library, gardener
	2nd Prize ..	3	„ 1945—Richard Irwin Lynch, 19, Richmond Parochial Library, gardener
Fruit and Vegetable Culture	1st Prize	5	„ 1942—Michael Middleton, 22, Richmond Parochial Library, gardener
	2nd Prize ..	3	„ 604—Alfred Bradley, 26, Deptford Local Board, gardener
Animal Physiology (in relation to health)	1st Prize	5	„ 183—Thomas W. Bridge, 20, Birmingham and Midland Inst., clerk
	2nd Prize ..	3	„ 1577—Henry Vosper, 19, Manchester Mechanics' Inst., clerk *No Prize for Females awarded.*†
Domestic Economy	1st Prize	5	„ 1866—Thomas G. Coomber, 18, Portsea Island Young Men's Christian Association, engineer student
	2nd Prize ..	3	„ 1408—Eugene Vernon Barrett, 24, Birkbeck Literary Inst., clerk
	Female Prize	2	„ 1407—Elizabeth Backhouse, 21, Birkbeck Literary Inst., of no occupation
Political Economy ..	1st Prize	5	„ 1364—Robert G. Hamber, 17, Birkbeck Literary Inst., clerk
	2nd Prize ..	3	„ 1508—William John Wilson, 26, Royal Polytechnic Institution, engineer's clerk *No Prize for Females awarded.*†
Civil Government and the Laws of England	1st Prize	5	„ 1508—William John Wilson, 26, Royal Polytechnic Institution, engineer's clerk
	2nd Prize ..	3	„ 1458—Hugh Morgan, 22, City of London, College, clerk
Geography	1st Prize	5	„ 1290—John Kidney, 19, Leeds Mechanics' Inst., clerk
	2nd Prize ..	3	„ 644—Joseph T. Treleaven, 24, Devonport Mechanics' Inst., shipwright *No Prize for Females awarded.*†
English History ..	1st Prize	5	„ 2037—William Pollitt, 17, Salford Working Men's College, clerk
	2nd Prize ..	3	„ 548—James E. Hart, 19, Cork Young Men's Catholic Society, clerk *No Prize for Females awarded.*†
English Literature	1st Prize	5	„ 2146—Edward T. Sims, jun., 21, Southampton Athenæum, clerk
	2nd Prize ..	3	„ 1403—Alma M. J. Saegert, 19, Birkbeck Literary Inst., of no occupation
	Female Prize	2	To the preceding candidate
Logic and Mental Science	1st Prize	5	„ 571—Thomas Teasdale, 20, Darlington Christian Inst., clerk
	2nd Prize ..	3	„ 876—Sidney W. Young, 23, Glasgow Athenæum, clerk
Latin and Roman History	1st Prize	5	„ 1998—Thomas Byrne, 25, Salford Working Men's College, debt collector
	2nd Prize ..	3	„ 1590—James Taylor, 20, Manchester Mechanics' Inst., clerk
French	1st Prize	5	„ 858—John R. Cunningham, 20, Glasgow Athenæum, clerk
	2nd Prize ..	3	„ 857—Charles S. Moir, 19, Glasgow Athenæum, salesman *No Prize for Females awarded.*†
German	1st Prize	5	„ 642—William Stanbury, 21, Devonport Mechanics' Inst., clerk
	2nd Prize ..	3	„ 2037—William Pollitt, 17, Salford Working Men's College, clerk *No Prize for Females awarded.*†

* No other First-class Certificates were given in these subjects, or the Candidates were disqualified for receiving Prizes.
† No Female Candidate qualified to receive Prizes obtained a First-class Certificate in any of these subjects.

Italian	1st Prize	£5	To No. 1455—Henry M. M'Crae, 22, City of London College, clerk *No Second Prize awarded.** *No Prize for Females awarded.*†
Spanish	1st Prize	5	„ 1455—Henry M. M'Crae, 22, City of London College, clerk
	2nd Prize	3	„ 195—Richard G. Greening, 18, Birmingham and Midland Inst., clerk *No Prize for Females awarded.*†
Free-hand Drawing	1st Prize	5	„ 1804—James Christie, 22, Paisley Artizans' Inst., clerk
	2nd Prize	3	„ 464—Henry Potter, 19, Chelmsford Literary and Mechanics' Inst., coach painter *No Prize for Females awarded.*†
Practical Geometry	1st Prize	5	„ 1622—John A. Bennion, 19, Manchester Mechanics' Inst., engineer
	2nd Prize	3	„ 2437—William G. Gough, 24, St. Mary's (East Greenwich) National School, shipwright *No Prize for Females awarded.*†
Mechanical Drawing	1st Prize	5	„ 1622—John A. Bennion, 19, Manchester Mechanics' Inst., engineer
	2nd Prize	3	„ 1832—Robert Dack, 20, Patricroft Mechanics' Inst., draughtsman
Theory of Music	1st Prize	5	„ 843—James Young, 20, Popular Evening Classes, Andersonian University, Glasgow, clerk
	2nd Prize	3	„ 1904—Thomas Duckett, 31, Ramsgate Church Inst., builder's foreman *No Prize for Females awarded.*†
Elementary Musical Composition (Tonic Sol-fa System)	1st Prize	5	„ 2547—Albert L. Cowley, 28, Beauvoir College Evening Classes, clerk
	2nd Prize	3	„ 889—William Litster, 21, Glasgow Mechanics' Inst., warehouseman *No Prize for Females awarded.*†

The Prizes offered by the late Mr. Harry Chester, a Vice-President of the Society, to Candidates taking First-class Certificates in Political Economy have been awarded as follows :—

Political Economy	Prize of	£2	To No. 1464—Henry T. Pollard, 21, City of London College, clerk
	Book Prize	1	„ 1366—John T. Baker, 27, Birkbeck Literary Inst., clerk
	„	1	„ 1405—William G. Glennie, 21, Birkbeck Literary Inst., insurance clerk
	„	1	„ 1408—Eugene Vernon Barrett, 24, Birkbeck Literary Inst., clerk

The Prizes offered by Mr. T. Twining, a Vice-President of the Society, to Candidates taking First-class Certificates in Domestic Economy have been awarded as follows :—

Domestic Economy	Prize of	£2	To No. 624—Richard J. Ellis, 24, Devonport Mechanics' Inst., shipwright
	Book Prize	1	„ 618—Robert G. Clark, 30, Devonport Mechanics' Inst., shipwright
	„	1	„ 1450—George D. Hooper, 20, City of London College, clerk
	„	1	„ 1466—William E. Prince, 19, City of London College, builder

The Royal Horticultural Society's Prizes have been awarded as follows :—

Botany	1st Prize	£5	To No. 1943—Frederick W. Burbidge, 21, Richmond Parochial Library, gardener *The other Prizes in Botany were not awarded, the Candidates who obtained Certificates being disqualified from receiving Prizes.*
Floriculture	1st Prize	5	„ 1942—Michael Middleton, 22, Richmond Parochial Library, gardener
	2nd Prize	3	„ 1945—Richard Irwin Lynch, 19, Richmond Parochial Library, gardener
Fruit and Vegetable Culture	1st Prize	5	„ 1942—Michael Middleton, 22, Richmond Parochial Library, gardener
	2nd Prize	3	„ 604—Alfred Bradley, 26, Deptford Local Board, gardener

The Royal Geographical Society's Prize of £5 is awarded to—

No. 1290—John Kidney, 19, Leeds Mechanics' Inst., clerk.

The Prizes offered by the Proprietors of the *Gardeners' Chronicle* were not awarded, no Candidate having fulfilled the required conditions.

* No other First-class Certificates were given in these subjects, or the Candidates were disqualified for receiving Prizes.
† No Female Candidate qualified to receive Prizes obtained a First-class Certificate in any of these subjects.

CERTIFICATES.

The following is an Alphabetical List of the Candidates who have obtained Certificates:—

The numbers following the names give the ages of the Candidates.

(1st) after a subject signifies a First-class Certificate.
(2d) " " Second-class "
(3d) " " Third-class "

(The occupations stated are either present or proposed.)

2076—Abbott, William J., 18, Sheerness Dockyard, engineer student—Arith. (2d)
1412—Abell, Edward G., 20, City of London Coll., clerk—Arith. (2d); Bkpg. (3d)
2106—Aborn, Robert, 17, Slough M.I., carpenter—Freehand Dwg. (3d)
2428—Ackroyd, John, 17, York Inst., monitor—Arith. (2d)
1286—Acomb, Leonard, 18, Leeds M.I., banker's clerk—Arith. (3d); French (3d)
1346—Acton, Henry, 19, Lichfield W. Men's Inst., shoemaker—Arith. (3d); Theor. of Mus. (3d)
1413—Adams, Henry, 23, City of Lond. Coll., engineer—Chem. (1st); Mech. Dwg. (1st); Pract. Mech. (2d)
1414—Adams, William, 21, City of Lond. Coll., engineer—Mech. Dwg. (2d)
1261—Adamson, Samuel A., 23, Leeds M.I., book-keeper at gasworks—Chem. (3d)
2060—Adamson, William E., 18, Scarborough M.I., joiner—Arith. (3d)
1415—Adcock, John H., 21, City of Lond. Coll., teacher—Geom. (3d)
703—Addison, George, 30, Edinb. Watt Inst., warehouseman—Arith. (2d); Chem. (3d)
148—Agnew, Alexander, 20, Belfast Lit. Inst., grocer's assistant—Bkpg. (3d)
2078—Agnew, Thomas, 16, Sheerness Dockyard Inst., engineer (student)—Arith. (1st); Eng. Hist. (2d); Geog. (3d)
391—Ainsworth, Richard, 16, Bury Ath., paper maker—Freehand Dwg. (3d)
1009—Akroyd, Joseph, 20, Halifax W.M. Coll., wire-drawer—Arith. (3d); Bkpg. (3d)
736—Allan, David S., 28, Pop. Evg. Classes, Anderson. Univ. Glasgow, tailor—Theory of Music (2d)
738—Allan, James, 28, Pop. Evg. Classes, Anderson. Univ. Glasgow, clerk—Bot. (3d)
2128—Allcott, James H., 25, Southampton Ath., customs' officer—Mus. Comp. (1st); Bkpg. (2d); Geog. (2d); Algebra (3d)
1490—Alldred, Charles H., 17, Roy. Polyt. Inst., carpenter—Chem. (3d)
1417—Allen, John W., 21, City of Lond. Coll., clerk—French (2d)
607—Allington, James, 17, Devonport M.I., shipwright apprentice—Alg. (1st), with 2nd prize of £3; Trigon. (1st), with 2nd prize of £3; Princ. Mech. (1st), with 1st prize of £5
1817—Allison, Robert St. J., 19, Parsonstown Y. Men's Chris. Assoc., clerk in land agency office—Arith. (1st); Bkpg. (2d)
1982—Alston, Robert, 20, Salford W.M. Coll., clerk—Bkpg. (2d)
1860—Ames, William, 19, Portsmouth Loc. Board, engineer student—Arith (2d); Geog. (2d)
67—Amory, Andrew, 27, Alnwick M.I., wood carver—Freehand Dwg. (2d)
1107—Amos, Robert, 16, Hulme W.M. Inst., junior clerk—Arith. (1st); Chem. (1st)
176—Anderson, Christopher, 23, Belfast Union-place Sci. Sch., clerk—Arith. (1st); Bkpg. (3d); Mensur. (2d)
1802—Anderson, John, 22, Paisley Artiz. Inst., clerk—Arith. (3d); Bkpg. (3d)
174—Anderson, Joseph, 18, Belfast Union-place Sci. Sch., clerk—Arith (3d); Bkpg. (3d)
2079—Anderson, Joseph, 19, Sheerness Dockyard Inst., naval engineer student—Arith. (2d); Geom. (3d)
739—Anderson, Robert, 42, Pop. Evg. Classes, Anderson. Univ. Glasgow, house factor—Mus. Comp. (2d)
903—Anderson, Robert, 21, Glasgow M.I., engineer—Arith. (3d)
1319—Andrews, Richard, 26, Leeds Y. Men's Chr. Assoc., clerk—Free-hd. Dwg. (3d)
1419—Angles, Richard S., 23, City of Lond. Coll., printer—German (1st); French (2d)
347—Anningson, Thirkell, 17, Burnley Ch. of Eng. Lit. Inst., bank clerk—Eng. Hist. (2d); Anim. Phys. (3d)
2191—Appleton, Ralph, 20, Stockton M.I., law clerk—Arith. (1st); Mensur. (3d); Geog. (3d)
1171—Apps, John H., 20, Keswick M.I., law clerk—Arith. (2d); Eng. Hist. (2d)
82—Archbold, James J., 16, Alnwick M.I., chemist's apprentice—Chem. (2d)
1789—Armitage, John, 18, Oldham Lyceum, pattern maker—Prac. Geom. (2d); Geom. (2d)
1231—Armstrong, Edward O., 22, Leeds Ch. Inst., clerk—Bkpg. (2d)
405—Armstrong, John, 19, Carlisle M.I., engineer's clerk—Bkpg. (1st); Mensur. (1st), with 1st prize of £5; Geom. (2d); Prac. Geom. (3d)
1195—Armstrong, John N., 19, Lancaster M.I., teacher—Anim. Phys. (3d)
73—Armstrong, Matthew, 27, Alnwick M.I., mason—Arith. (3d)
414—Armstrong, William J., 16, Carlisle M.I., attorney's clerk—Arith. (3d)
1983—Arnold, Alfred, 22, Salford W. Men's Coll., clerk—Bkpg. (1st)
729—Arnold, Arthur W., 20, Faversham Inst., gas-fitter—Mag. and Elect. (3d)
2142—Arnold, George, 16, Southampton Ath., engineer—Free-hd. Dwg. (3d)
1861—Ash, Alfred A., 18, Portsmouth Loc. Bd., shipwright (apprentice)—Arith. (1st); Alg. (2d)
1761—Ashton, John, 18, Oldham Lyceum, joiner—Mech. Dwg. (3d)
1984—Ashworth, Charles, 16, Salford W. Men's Coll., clerk—Arith. (1st)
1420—Atkinson, Charles H., 28, City of Lond. Coll., of no occupation—French (3d)
345—Atkinson, Edmund, 23, Burnley M.I., weaver—Anim. Phys. (2d)
353—Atkinson, Lawrence, 18, Burnley M.I., weaver—Anim. Phys. (2d)
1492—Aumonier, Frederick, 31, Roy. Polyt. Inst. salesman—French (3d)
1493—Aumonier, Mrs. Jane, 31, Roy. Polyt. Inst., occupation not stated—French (3d)
2541—Austing, George P., 25, Beauvoir Coll. Evg. Classes, comm. clerk—Mus. Comp. (1st)
2151—Axon, William, 18, Stockport M.I., painter—Free-hd. Dwg. (2d)

1407—Backhouse, Elizabeth, 21, Birkbeck Inst., of no occupation—Dom. Econ (1st), with prize for female candidates; Eng. Lit. (1st); and the Council prize of £10 10s.
181—Bagnall, James E., 38, Birm. and Midl. Inst, warehouse clerk—Bot. (2d)
609—Bailey, George, 27, Devonport M.I., shipwright—Dom. Econ. (3d); Met. Syst. (3d)
1795—Bailey, John H., 21, Oldham Lyceum, bank clerk—Eng. Lit. (2d)
1650—Bailey, Robert W., 23, Manchester M.I., piecer—Arith. (3d)
1980—Bailey, Samuel H., 19, Salford W.M. Coll., mechanic—Arith. (3d); Free-hd. Dwg. (3d)
2118—Baker, Frederick G., 29, Southampton Ath., watchmaker—Theory of Mus. (2d)

610—Baker, George H., 17, Devonport M.I., engineer (student)—Mensur. (1st); Geog. (1st); Trigon. (2d)
1159—Baker, Henry F., 18, Ipswich W.M. Coll., clerk—Bkpg. (3d)
329—Baker, James, 22, Bristol Trade School, bookseller—French (3d)
1366—Baker, John T., 27, Birkbeck Inst., clerk—Bkpg. (1st); Pol. Econ. (1st), with prize of books, to the amount of £1.
2542—Baker, Orlando, 35, Beauvoir Coll. Evg. Classes, clerk—Mus. Comp. (2d)
611—Ball, William, 18, Devonport M.I., smith (appr.) Arith. (1st); Mensur. (3d)
1011—Bamford, Thomas, 21, Halifax W.M. Coll., warehouseman—Bkpg. (2d)
612—Banker, Stewart M., 23, Devonport M.I., telegraph clerk—Mag. and Elect. (1st); Chem. (2d); Pract. Mech. (2d)
507—Bannister, John, 33, Chorley, St. George's Church Assoc., book-keeper—Mus. Comp. (2d); Bkpg. (3d)
1849—Barclay, Robert B., 18, Penzance Local Board, pupil teacher—Eng. Hist. (3d); Geog. (3d)
741—Barclay, William, 25, Pop. Evg. Classes, And. Univ., Glasgow, cooper—Bkpg. (3d)
288—Barker, James, 18, Bradford M.I., clerk—Arith. (2d)
2505—Barker, James L., 18, Liverpool Inst., printer—Bkpg. (3d)
124—Barker, Jane, 18, Bacup M.I., weaver—Dom. Econ. (3d)
2194—Barker, Miles, 26, Swinton M.I., cotton mill clerk—Bkpg. (2d)
1647—Barlow, William, 17, Manchester M.I., green-grocer—Anim. Phys. (3d)
1653—Barlow, William, 18, Manchester M.I., grocer's assistant—Arith. (1st)
1885—Barnes, Henry, 22, Preston Inst., house painter—Free-hd. Dwg. (3d)
2173—Barratt, Samuel, 17, Stockport Sunday Sch. Imp. Soc., pupil teacher—Anim. Phys. (2d); Chem. (3d)
2170—Barratt, William, 20, Stockport Sunday Sch. Imp. Soc., warehouseman—Anim. Phys. (3d)
1408—Barrett, Eugene V., 24, Birkbeck Inst., clerk—Arith. (1st); Dom. Econ. (1st), with second prize of £3; Polit. Econ. (1st); Anim. Phys. (1st), with prize of books to the amount of £1.
1213—Barton, Edmund, 20, Lancaster M.I., cabinet maker—Free-hd. Dwg. (3d)
685—Bateman, Isaac, 17, Earlestown Mut. Imp. Soc., clerk—Free-hd. Dwg. (3d)
305—Bates, James, 27, Bradford M.I., warehouseman—French (3d)
1343—Batkin, William, 18, Lichfield W. Men's Inst., brewer's clerk—Bkpg. (2d)
1153—Batty, George, 19, Hyde M.I., watchmaker—Anim. Phys. (3d)
1863—Baxter, Benjamin J., 20, Portsmouth Local Board, engineer student—Conic Sect. (2d)
2155—Baxter, James, 19, Stockport M.I., clerk—Arith. (2d); Bkpg. (3d)
742—Baxter, Peter H., 37, Pop. Evg. Classes, And. Univ., Glasgow, traveller's assistant—Theo. of Mus. (3d)
613—Bayly, John, 32, Devonport M.I., writer (H.M. Dockyard)—Bkpg. (1st); Mens. (2d)
1733—Beale, John W., 18, Northampton Museum, clerk—Mag. and Elect. (2d)
1367—Beard, Fanny, 39, Birkbeck Lit. Inst., governess—Italian (1st); Spanish (1st)
1735—Beattie, Stewart, 19, Northampton Museum, clerk—Civ. Gov. (3d)
1710—Bedford, William, 19, Newton Heath Science Classes, clerk—Arith. (1st); Anim. Phys. (2d)
1643—Beckett, George E., 17, Manchester M.I., clerk—Arith. (3d)
1649—Beckett, William F., 18, Manchester M.I., clerk—French (3d)
1421—Beddow, Frederick, 16, City of Lond. Coll., clerk—Arith. (1st); French (3d)
2135—Beer, Henry, 18, Southampton Ath., clerk—Arith. (3d); Eng. Hist. (2d)
1411—Bell, George, 26, Birkbeck Lit. Inst., water-works inspector—Free-hd. Dwg. (2d)
1318—Bell, James A., 16, Leeds Y.M. Chris. Assoc., manufacturing chemist—Arith. (3d); Geog. (3d)
285*—Bell, William, 20, Bolton Ch. Inst., millwright—Mech. Dwg. (3d)
1084—Benn, Sykes, 19, Huddersfield, M.I., pattern-maker—Free-hd. Dwg. (3d)
2521—Bennet, William, 22, Liverpool Inst., provision dealer—Arith (1st)
1183—Bennett, John, 27, Kinver Y.M. Inst., rate-collector—Chem. (1st); Anim. Phys. (2d)
1622—Bennion, John A., 19, Manchester M.I., engineer—Pract. Geom. (1st), with 1st prize of £5; Pract. Mech. (1st), with 1st. prize of £5; Mech. Dwg. (1st), with 1st prize of £5; Chem. (2d)
1666—Berry, Thomas, 20, Mossley M.I., piecer—Bkpg. (3d)
169—Bertram, William, 19, Glasgow Ath., stationer—Eng. Lit. (2d)
93—Best, Frederic S., 18, S.E. Rail. M.I., engine-fitter—Arith. (1st)
97—Best, William H., 16, S.E. Rail. M.I., railway accountant's clerk—Arith (2d)
2451—Bettinson, John T., 16, Lambeth Evg. Classes, builder's clerk—Pract. Geom. (3d)
449—Betts, Edmund W., 22, St. Mary's Sci. Sch. Chatham, tinsmith — Pract. Geom. (3d); Mensur. (3d)
2515—Beynon, David, 18, Liverpool Inst., boat-builder's appren.—Bkpg. (3d)
2257—Binns, Sarah E., 17, Messrs. Bagnall's Schools, West Bromwich, pupil-teacher—Dom. Econ. (2d)
1989—Birchley, William, 18, Salford W.M. Coll., clerk—French (3d)
2459—Bishop, George, 21, Lambeth Evng. Classes, wheel-wright—Pract. Geom. (3d)
1422—Bishop, William J., 21, City of Lond. Coll., foreign correspondent—Theory of Music (1st)
1280—Blades, Phineas, 18, Leeds M.I., no occupation stated—Arith. (1st); Eng. Hist. (3d); Geog. (3d)
1633—Black, John, 19, Manchester M.I., warehouseman—Bkpg. (1st)
743—Blair, James, 21, Pop. Evg. Classes, Anderson. Univ., Glasgow, clerk—Theory of Music (1st)
744—Blair, John, 18, Pop. Evg. Classes, Anderson. Univ., Glasgow, magazine keeper—Arith. (1st)
947—Blake, Robert, 18, Glasgow M.I., clerk—Bkpg. (2d)
1495—Blake, Samuel, 20, Roy. Polyt. Inst., fruiterer—French (3d)
1772—Blakeman, Thomas, 19, Oldham Lyceum, mill-wright—Mech. Dwg. (3d)
54—Blakemore, George, 22, Farnham Y. Men's Assoc., drawing master—Arith. (1st); Mensur. (3d)
1757—Blakeney, Robert M., 28, Oldham Lyceum, spindle maker—Mech. Dwg. (3d)
871—Blaylock, George, 21, Glasgow Ath., assistant of excise—Arith. (1st)
182—Blaze, Thomas, 17, Birm. and Midl. Inst., gun-smith—Arith. (2d)
1716—Blomeley, John, 18, Newton Heath Sci. Classes, clerk—Arith. (2d); Anim. Phys. (2d)
1709—Blomeley, Samuel, 20, Newton Heath Sci. Classes, letter-press printer—Light and Heat (3d); Anim. Phys. (2d)
1152—Boardman, William, 21, Hyde M.I., clerk—Anim. Phys (3d)
1974—Bold, Clara, 16, Rugby Loc. Bd., no occupation stated—Free-hd. Dwg. (2d); German (3d)

1087—Bolton, Charles, 17, Hull Y. People's Chr. and Lit. Assoc., clerk—Arith. (3d)
2508—Bolton, John, 17, Liverpool Inst., clerk—Arith. (3d); French (3d)
1315—Bolton, John H., 16, Leeds Y. Men's Chr. Assoc., office boy—Arith. (3d)
34—Bolton, Samuel, 19, Accrington M.I., warehouseman—Arith. (3d)
1891—Bond, Henry, 16, Preston M.I., solicitor's clerk—Mag. and Elect. (3d)
2174—Bond, John, 17, Stockport Sund. Sch. Imp. Soc., weaver—Arith. (3d)
2551—Bond, William, 33, Beauvoir Coll. Evg. Classes, schoolmaster—Mus. Comp. (2d)
1712—Booth, Jonathan, 24, Newton Heath Sci. Classes, tin-plate worker—Arith. (3d); Anim. Phys. (3d)
731—Booth, Samuel, 23, Charlesworth M.I., teacher—Arith. (1st); Mensur. (3d)
308—Bottomley, Alfred W., 18, Bradford M.I., worsted spinner—Bkpg. (3d)
2556—Bourke, William R., 27, Beauvoir Coll. Evg. Classes, principal of an academy—Mus. Comp. (2d)
946—Bow, James, jun., 17, Glasgow M.I., clerk—Bkpg. (2d)
1990—Bowker, John B., 20, Salford W.M. Coll., warper—Arith. (2d)
1579—Boyle, John, 23, Manchester M.I., mechanic—Arith. (2d)
1991—Boyd, James D., 18, Salford W.M. Coll., clerk—German (2d)
41—Boyd, Pythagoras, 26, Accrington M.I., clerk—Chem. (1st); Mag. and Elec. (2d); Met. Syst. (2d)
604—Bradley, Alfred, 26, Deptford Loc. Bd., gardener—Floric. (1st); Fruit and Veget. Cult. (1st), with 2nd prize of £3, and the Royal Horticul. Soc. prize of £3
1792—Bradley, James, 17, Oldham Lyc., book-keeper—Arith. (1st)
1079—Bradley, John S., 19, Huddersfield M.I., journeyman chemist—Chem. (2d)
245—Bradley, Thomas, 21, Bollington Useful Know. Soc., cotton piecer—Arith. (2d); Geom. (3d)
523—Bradshaw, George, 28, Compstall M.I., machine joiner—Pract. Geom. (3d)
1905—Bradshaw, Matthew H., 17, Rawtenstall M.I., mechanic—Mech. Dwg. (3d)
151—Brady, John, 36, Belfast Lit. Inst., clerk—Bkpg. (3d)
1500—Brady, William W., 28, Roy. Polyt. Inst., cert. teacher—Anim. Phys. (3d)
1423—Braginton, William, 24, City of London Coll., government clerk—French (2d)
1887—Bramwell, James J., 27, Preston M.I., assistant pawnbroker—Arith. (2d)
1485—Bray, Arthur, 17, Roy. Polyt. Inst., clerk—Chem. (2d)
2298—Brazier, Charles, 38, Woolwich Royal Arsenal M.I., shipwright—Pract. Geom. (3d)
1884—Brennan, Michael, 22, Preston Inst., house-painter—Free-hd. Dwg. (3d)
2513—Brereton, Abraham, 18, Liverpool Inst., sale-room attendant—Bkpg. (3d)
183—Bridge, Thomas W., 20, Birm. and Midl. Inst., clerk—Anim. Phys. (1st), with 1st prize of £5
1340—Brigg, Matthew A., 18, Leeds Y.M. Chris. Assoc., cloth manufacturer—Arith. (3d)
2514—Briggs, James B., 17, Liverpool Inst., junior clerk—Arith. (2d); Bkpg. (3d)
1985—Broderick, William, 16, Salford W.M. Coll., draughtsman—Free-hd. Dwg. (3d)
2081—Bromley, William, 18, Sheerness Dockyard Inst., engineer (student)—Geom. (3d); French (3d)
614—Brook, Sydney R., 18, Devonport M.I., barrister's clerk—Eng. Hist. (1st); Geog. (2d)
1994—Brookes, Edward, 20, Salford W.M. Coll., clerk—Bkpg. (2d)
1496—Brookes, Marion A., 31, Royal Polyt. Inst., governess—German (3d)
461—Brooks, Sidney, 18, Chelmsford Lit. and M.I., cabinet maker—Free-hd. Dwg. (2d)
1358—Brosnahan, William, 33, Birkbeck Lit. Inst., inland revenue office—Light and Heat (2d); Met. Syst. (2d)
1597—Broster, George A. B., 18, Manchester M.I., clerk—Eng. Hist. (2d)
35—Broughton, John W., 20, Accrington M.I., shoemaker—Arith. (1st)
1957—Brown, George, 17, Rugby Inst., of no occupation—Chem. (3d)
2127—Brown, James, 29, Southampton Ath., officer of customs—Geog. (3d)
65—Brown, James, 16, Alnwick M.I., wood carver—Free-hd. Dwg. (1st)
70—Brown, John R., 18, Alnwick M.I., artist—Free-hand Dwg. (1st)
1995—Brown, Robert, 18, Salford W.M. Coll., book-keeper—Botany (3d)
746—Brown, Robert, 24, Pop. Evg. Classes, Anderson. Univ., Glasgow, warper—Anim. Phys.)3d)
506—Brown, Thomas, 43, Chorley, St. George's Ch. Assoc., teacher—Bkpg. (1st); Pract. Mech. (2d); Geom. (2d)
845*-Brown, William, 21, Pop. Evng. Classes, Anderson. Univ. Glasgow, assistant-teacher—Bkpg. (3d); Anim. Phys. (1st)
1784—Brown, William A., 16, Oldham Lyceum, book-keeper—Arith. (3d)
575—Brown, William E., 20, Darlington Ch. Inst. clerk—Logic, &c. (2d)
460—Brown, William E., 18, Chelmsford L. and M.I., architectural pupil—Free-hd. Dwg. (1st)
916—Brownlie, John, 18, Glasgow M.I., clerk—Arith. (3d); French (3d)
2182—Brownsword, John, 18, Stockport Sunday Sch. Impr. Soc., clerk—Arith. (3d)
185—Bryan, Edward B., 18, Birm. and Mid. Inst., clerk—French (3d)
1997—Bryning, Mary, 24, Salford W.M. Col., teacher—Free-hd. Dwg. (2d)
747—Buchanan, Alexander, 24, Pop. Evg. Classes, Anderson. Univ. Glasgow, clerk—Eng. Lit. (3d)
1398—Buck, Ellen L., 27, Birkbeck Inst., no occupation stated—Eng. Lit. (3d)
456—Buckingham, James H., 18, Chatham M.I., shipwright—Arith. (3d)
1781—Buckley, Eli, 25, Oldham Lyceum, machine-fitter, Pract. Mech. (3d)
554—Buckley, Michael, 25, Cork Cath. Y.M. Society—Arith. (3d)
1815—Budds, Thomas, 18, Parsonstown Y.M. Chr. Assoc., clerk—Arith. (2d); Bkpg. (3d)
1162—Bugg, Samuel, 16, Ipswich W.M. Coll., solicitor's clerk—Bkpg. (2d)
1943—Burbidge, Frederick W., 21, Richmond Par. Lib., gardener—Bot. (3d), with Royal Hort. Soc. Prize of £5; Free-hd. Dwg. (3d)
687—Burchall, Charles, 21, Earlstown Mut. Imp. Soc., clerk—Pract. Geom. (3d)
1368—Burgoyne, William, 22, Birkbeck Inst. clerk—Metric System (1st)
1425—Burke, Charles, 19, City of London Coll., clerk—German (2d)
407—Burns, Thomas, 18, Carlisle M.I., pupil-teacher—Arith. (2d)
1352—Burr, Augustus P., 27, Beauvoir Coll., commercial clerk—Theory of Music (1st); Mus. Comp. (1st)
324—Burridge, Edward, 19, Bristol Trade and Min. Sch., clerk—Arith. (2d)
615—Burt, Harry P., 16, Devonport M.I., engin. student—French (3d)
708—Burton, Ella, 23, Edinburgh Local Board, teacher—German (1st); Eng. Lit. (3rd)

1243—Burton, Frederick H., 18, Leeds M.I., chemist—Chem. (1st), with 2d prize; Metric Syst. (3d)
371—Burton, Hugh, 16, Burrage-road Sci. Classes, locksmith—Mech. Dwg. (3d)
253—Bury, John, 19, Bolton Church Inst., warehouseman—Arith. (3d)
252—Bury, Oswald, 21, Bolton Church Inst., warehouseman—Arith. (3d)
1845—Butler, George, 17, Pembroke Dock M.I., shipwright apprentice—Alg. (2d)
1229—Butler, Henry, 17, Leeds Church Inst., clerk—Bkpg. (2d)
900—Butler, Robert, 20, Glasgow M.I., engine fitter—Pract. Mech. (3d)
1258—Butterfield, John R., 19, Leeds M.I., chemist's assist.—Mining and Met. (1st), with 1st prize of £5; Chem. (1st), with 1st prize of £5; Geog. (3d)
2359—Byatt, Horace, 25, St. Michael's, Woolwich, Sci. Sch., science teacher—Pract. Geom. (2d); Mech. Dwg. (3d)
1998—Byrne, Thomas, 25, Salford W.M. Coll., debt collector—Latin and Roman Hist. (1st), with 1st prize of £5

904—Cable, William, 19, Glasgow M.I., engineer—Arith. (1st)
549—Cahill, Edward, 22, Cork Young Men's Society, tin smith—Italian (3d); French (3d)
1426—Camp, Thomas, 40, City of Lond. Coll., clerk—Mus. Comp. (2d); Theory of Music (2d)
748—Campbell, Archibald, 27, Pop. Evg. Classes, Anderson. Univ. Glasgow, chemist—Mag. and Elect. (2d); Pol. Econ. (3d); Anim. Phys. (3d)
906—Campbell, Archibald, 20, Glasgow M.I., clerk—Arith. (1st)
1800—Campbell, William, jun., 23, Oldham Lyceum, draper's assist.—Geog. (3d)
175—Campbell, William J., 24, Belfast, Union-place Sci. Sch., carpenter—Arith. (3d)
2490—Card, Thomas E., 32, Handsworth W.M. Club, carpenter and joiner—Freehand Dwg. (3d)
1964—Cardiff, Jane, 16, Rugby Local Board no occupation stated—Dom. Econ. (3d)
1189—Cardwell, Edward, 24, Lancaster M.I., chemist and druggist—Chem. (3d)
2533—Cargill, David, 27, Liverpool Inst., gardener—Floric. (3d)
186—Carlyle, Thomas, 16, Birm. and Midl. Inst., clerk—Chem. (2d)
751—Carmichael, John, 17, Pop. Evg. Classes, Anderson. Univ., Glasgow, teacher—Arith. (3d)
1100—Carney, John, 26, Hulme (Christchurch) Inst., maker-up—Arith. (3d)
83—Carr, Edward, 19, Alnwick M.I., druggist's assistant—Chem. (2d)
1603—Carter, Claude, 17, Manchester M.I., mech. engineer—Mech. Dwg., (1st); Prac. Geom. (3d)
1662—Carter, Joseph, 19, Mossley M.I., warehouseman—Bkpg. (3d)
1390—Carter, Louisa H., 29, Birkbeck Inst., hat-trimmer—Bkpg. (3d)
2314—Carter, Robert A., 23, Woolwich R. Arsenal M.I., shipwright—Mensur. (3d); Prac. Geom. (3d)
2139—Carter, Robert, 28, Southampton Ath., clerk, ordnance survey—Free-hd. Dwg. (3d)
488—Carter, William, 16, Whitworth Sch. of Sci., Cheltenham, blacksmith—Min. and Met. (2d)
1012—Carter, William H., 20, Halifax W.M. Coll., mechanic—Eng. Lit. (3d)
187—Caswell, Charles Benj., 18, Birm. and Midl. Inst., printer—Mag. and Elect. (3d)
154—Cather, Smith, 22, Belfast Lit. Inst., in a linen warehouse—Bkpg. (3d)
1728—Cave, William, 16, Northampton Museum, engine-fitter—Mag. and Elect. (3d)
859—Chalmers, David, 20, Glasgow Ath., warehouseman—French (3d)
2289—Chamberlain, Charles, 30, Woolwich R. Arsenal M.I., fitter—Mech. Dwg. (3d)
2463*—Chambers, Thomas, 20, Lambeth Evg. Classes, assistant master—Arith. (2d); Geom. (2d)
1426*—Champion, Walter E., 19, City of Lond. Coll., solicitor's clerk—Arith. (2d); Mensur. (3d)
617—Chapple, Samuel, 18, Devonport M.I., accountant—Arith. (3d)
1377—Chatterley, Robert J., 22, Birkbeck Inst., clerk—Arith. (3d); Eng. Hist. (2d)
2162—Charlesworth, James, 27, Stockport M.I., clerk at cotton mill—Eng. Hist. (2d)
2394—Charlesworth, Thomas, 24, St. Thomas' School, Woolwich, teacher—Prac. Geom. (3d)
2381—Charlsworth, William, 18, St. Thomas's School, Woolwich, office boy—Pract. Geom. (3d)
2462—Child, Thomas, 28, Lambeth Evg. Classes, blacksmith—Pract. Geom. (3d); Mech. Dwg. (3d)
1804—Christie, James, 22, Paisley Artiz. Inst., clerk—Free-hd. Dwg. (1st), with 1st prize of £5
2448—Churchill, Charles, 18, St. Mary's (East Greenwich) Nat. Sch., clerk—Pract. Geom. (2d)
1427—Clark, Arthur, 22, City of London Coll., clerk—Bkpg. (1st)
1175—Clark, Charles, 20, Keswick M.I., joiner—Arith. (3d)
2385—Clark, Charles J., 20, St. Paul's Inst., Deptford, engineer—Mech. Dwg. (2d)
618—Clark, Robert G., 30, Devonport M.I., shipwright—Dom. Econ. (1st), with prize of books to the amount of £1; Metric Syst. (1st)
2126—Clark, Samuel, 18, Southampton Ath., merchant's clerk—Bkpg. (3d)
2234—Clark, Sidney, 18, Walsall Ch. Inst., brushmaker—Arith. (3d)
1688—Clark, William, 17, New Swindon M.I., clerk—Bkpg. (2d)
502—Clark, William, 17, Chorley M.I., clerk—Arith. (2d)
1999—Clarke, Albert, 16, Salford W.M. Coll., painter—Bkpg. (2d)
2465—Clarke, Thomas, 23, Dudley M.I., schoolmaster—Theo. of Mus. (1st); Anim. Phys. (2d)
2000—Clarke, Thomas R., 17, Salford W.M. Coll., warehouseman—Geog. (2d); Free-hd. Dwg. (2d)
1428—Clayton, James, 35, City of Lond. Coll., Post-office employé—German (1st)
1278—Clayton, W. W., 19, Leeds M.I., fitter—Mech. Dwg. (2d); Mag. and Elect. (3d); Pract. Mech. (3d)
968—Clegg, Edwin, 18, Glodwick Inst., mechanic—Arith. (3d)
1013—Clegg, Jonah, 18, Halifax W.M. Coll., warehouseman—Arith. (2d); Bkpg. (3d)
753—Clelland, Michael, 24, Pop. Evg. Classes, Anderson. Univ., Glasgow, iron moulder—Arith. (2d)
168—Clements, John, 18, Belfast, Union-place Sci. Sch., teacher—Arith. (1st); Mensur. (3d)
1968—Cleminshaw, Mary J., 16, Rugby Local Board, no occupation—German (2d); Free-hd. Dwg. (3d)
1353—Clift, William C. N., 23, Beauvoir Coll., surgical instrument maker—Theo. of Music (1st); Mus. Comp. (2d)
559—Clough, John, 18, Darlington Ch. of Eng. Inst., fitter—Logic, &c. (2d)
1924—Coates, Alfred, 20, Rawtenstall M.I., mechanic—Mech. Dwg. (2d)
754—Cochran, John, 31, Pop. Evg. Classes, Anderson. Univ., Glasgow, warehouseman—Theo. of Music (2d)
1043—Cock, John, 28, Bredbury Inst., clerk—Polit. Econ. (2d)
84—Cockburn, James, 23, Alnwick M.I., clerk—Arith. (1st); Chem. (2d)
1371—Cocking, Alfred Edmund, 18, Birkbeck Inst., clerk—Arith. (3d); Bkpg. (3d); Met. Sys. (1st)
1670—Coe, Samuel, jun., 22, New Mills M.I., cotton spinner—Arith. (3d)

1230—Colbeck, William R. 19, Leeds Ch. Inst., organist and teacher—Theory of Music (3d)
2355—Coldwell, Robert W., 30, St. Michael's, Woolwich, Sci. Sch., schoolmaster—Theory of Music (1st)
2086—Coleman, Walter, 16, Sheerness Dockyard Inst., engineer student—Arith (1st)
1225—Collett, Charles E., 18, Leeds Ch. Inst., pupil teacher—Arith. (3d)
1104—Collier, Thomas, 18, Hulme (Christchurch) Inst., builder—Arith. (2d); Bkpg. (3d)
1714—Collinson, Charles N., 23, Newton Heath Sci. Classes, warehouseman—Anim. Phys. (3d)
846—Colquhoun, Andrew S. D., 26, Glasgow Ath., merchant—French (1st)
1430—Calthrup, Alfred, 21, City of Lond. Col., clerk—Bkpg. (2d)
2362—Coltman, Henry W., 18, St. John's Inst., Woolwich, carpenter—Pract. Geom. (3d); Anim. Phys. (3d)
1224—Columbine, Herbert, 35, Leeds Ch. Inst., schoolmaster—Arith. (1st); Theo. of Mus. (1st); Geog. (2d); Free-hd. Dwg. (3d)
1383—Comley, William, 20, Birkbeck Inst., clerk—Bkpg. (2d)
1431—Cook, George B., 21, City of Lond. Coll., clerk—Bkpg. (1st)
2315—Cook, Reuben J., 18, Woolwich Royal Arsenal M.I., turner—Pract. Geom. (3d)
1864—Cook, William, 18, Portsmouth Loc. Bd., engineer student—Arith. (1st); Alg. (3d)
2001—Cooke, Edwin, 23, Salford W.M. Coll., mechanic—Mech. Dwg. (3d)
1865—Cooke, George H., 18, Portsmouth Loc. Bd., engineer student—(Arith. (1st)
1588—Cooke, Robert, 21, Manchester M.I., warehouseman—Bkpg. (2d)
257—Cooke, Stephen, 24, Bolton Ch. Inst., teacher—Mensur. (3d); Prin. Mech. (3d); Mag. and Elect. (3d)
1866—Coomber, Thomas G., 18, Portsmouth Loc. Bd., engineer student—Arith. (1st); Dom. Econ. (1st) with 1st prize of £5; Geog. (2d)
189—Coombes, Ada, 20, Birm. and Midl. Inst., private teacher—French (2d)
88—Cooper, Harry, 18, S.E. Rail. M.I., pupil teacher—French (2d)
2235—Cooper, John R., 21, Walsall Ch. Inst., attorney's clerk—Arith. (3d)
1337—Cooper, William H., 18, Leeds Y.M. Christ. Assoc., manufacturing chemist—Free-hd. Dwg. (2d)
2226—Corscadden, John, 21, Wakefield M.I., mat maker—Arith. (3d)
654—Cosgrave, Charles, 16, Droylsden Educ. Inst., pupil teacher—Arith. (3d)
2097—Costello, John, 16, Sheerness Dockyard Inst., shipwright's apprentice—Arith. (1st); Geom. (3d)
1190—Cottam, William P., 18, Lancaster M.I., druggist's apprentice—Anim. Phys. (3d)
2112—Coulbert, Joseph, 22, Southampton Ath., clerk—Eng. Hist. (2d)
1036—Court, William W., 19, Halifax W.M. Coll., letter carrier—Bkpg. (3d)
2321—Courtman, Reuben S., 19, Woolwich R. Arsenal M.I., turner—Prac. Geom. (3d)
1081—Couzens, Thomas P., 18, Huddersfield M.I., woollen manufacturer—Chem. (3d)
1594—Cowburn, Thomas W., 26, Manchester M.I., gasfitter—Chem. (2d)
2537—Cowell, Charles, 20, Newcastle Ch. Inst., clerk—Arith. (2d); Bkpg. (2d)
2547—Cowley, Albert L., 28, Beauvoir Coll. Evg. Classes, clerk—Mus. Comp. (1st), with 1st prize of £5
1979—Cowlishaw, John C., 16, Salford W.M. Coll., no occupation stated—Arith. (1st)
1432—Cownley, Alfred J., 18, City of Lond. Coll., clerk—Arith. (1st); Bkpg. (1st)
1387—Cox, James E., 24, Birkbeck Inst., clerk—Bkpg. (1st); Geog. (2d)
1360—Craig, James, 29, Birkbeck Inst., teacher—French (2d)
880—Craig, John, 19, Glasgow Inst., clerk—Chem. (1st)
171—Craig, William, 21, Belfast Union-place Sci. Sch., clerk—Arith. (3d)
2534—Craine, Edward, jun., 17, Liverpool Inst., clerk—Arith. (2d); Eng. Hist. (3d)
2518—Craine, Thomas, 19, Liverpool Inst., clerk—Geog. (3d)
1433—Cranston, Edwin, 23, City of London Coll., clerk—Arith. (3d); Geog. (3d)
1529—Crebbin, James C., 18, Stepney Deanery Loc Bd., clerk—Arith. (1st)
860—Crichton, James, 28, Glasgow Ath., commercial traveller—Pol. Econ. (1st)
1723—Crick, Alfred W., 23, Northampton Museum, fitter—Mag. and Elect. (3d)
1330—Critchison, Josiah, 16, Leeds Y.M. Christ. Assoc., draper—Arith. (3d)
942—Crookston, Andrew W., 18, Glasgow M.I., civil and mining engineer—Arith. (2d); Mensur. (2d)
912—Crookston, George B., 16, Glasgow M.I., grain and comm. merchant—Bkpg. (3d)
907—Crookston, William, 23, Glasgow M.I., clerk—Bkpg. (2d)
1226—Cross, Thomas, 28, Leeds Ch. Inst., schoolmaster—Free-hd. Dwg. (3d)
190—Cross, William J., 16, Birm. and Midl. Inst., cabinet gun and pistol-case maker—Latin, &c. (2d)
2002—Crossfield, Francis W., 17, Salford W.M. Coll., warehouseman—Arith. (2d); Bkpg. (2d)
1061—Crossley, John B., 16, Huddersfield M.I., bookseller's assist.—Chem. (3d)
343—Crossley, Jonas, 22, Burnley M.I., weaver—Arith. (1st)
1260—Crosthwaite, Jesse, 19, Leeds M.I., photographer—Chem. (3d)
1236—Crowther, Herbert, 28, Leeds M.I., clerk—Bkpg. (3d)
1305—Crowther, Sam, 16, Leeds Y.M. Christ. Assoc., woodcarver—Free-hd. Dwg. (3d)
2114—Cruickshank, David, 17, Southampton Ath., pupil teacher—Arith. (3d)
1890—Cryer, Joseph, 28, Preston Inst., clerk—Anim. Phys. (2d)
1052—Cryer, Thomas, 19, Holbeck M.I., mechanic—Eng. Hist. (1st); Mech. Dwg. (2d)
1347—Cullingford, James N., 22, Beauvoir College, schoolmaster—Mus. Comp. (1st); Theo. of Music (1st)
619—Cumming, Charles H., 20, Devonport M.I., chemist and dentist—Chem. (1st)
2073—Cummings, George R. T., 18, Sheerness Dockyard Inst., engineer student—Mensur. (2d)
858—Cunningham, John R., 20, Glasgow Ath., clerk—French (1st), with first prize of £5.
2509—Curd, Edward J., 24, Liverpool Local Board, schoolmaster—Mus. Comp. (1st)
396—Cussons, George, 22, Bury Ath., turner—Free-hd. Dwg. (3d)
326—Cutter, John, 17, Bristol Y.M. Chr. Assoc., clerk—Arith. (2d); Bkpg. (3d)

1832—Dack, Robert, 20, Patricroft M.I., draughtsman—Mech. Dwg. (1st), with 2nd prize.
42—Dale, John, 34, Alderley Edge M.I., science teacher—Theo. of Mus. (2d); Mech. Dwg. (2d); Mus. Comp. (3d); Mensur. (3d)
1114—Dalton, Alfred, 26, Hulme (Christ Church) Inst., clerk—Bkpg. (3d)
1720—Dalton, John, 28, Northampton Museum, shoemaker—Mag. and Elect. (3d)

2098—Darton, Mathias J., 27, Sheerness Dockyard Inst., shipwright—Arith. (1st); Mensur. (2d)
2159—Davenport, Thomas, 33, Stockport M.I., science teacher—Pract. Mech. (3d)
351—Davies, Edward, 23, Burnley M.I., fitter and turner—Mech. Dwg. (2d); Free-hd. Dwg. (3d)
478—Davies, George, 19, Whitworth Sci. Sch., Cheltenham, waiter—Anim. Phys. (3d)
2064—Davies, Lewis G., 17, Sheerness Dockyard Inst., shipwright's apprentice—Arith. (2d); Mensur. (2d); Princ. Mech. (2d)
1677—Davison, James E., 19. New Swindon M.I., engine fitter—Bkpg. (3d); Mech. Dwg. (3d)
1223—Davis, George, 21, Leeds Ch. Inst., salesman—Arith. (2d)
2102—Davis, George E., 18, Slough M.I., bookbinder—Chem. (1st); Metric Syst. (2d); Mag. and Elect. (3d)
500—Davis, Thomas H., 18, Whitworth Sci. Sch., Cheltenham, house decorator—Chem. (2d); Anim. Phys. (2d); Pract. Mech. (3d)
620—Dawe, Thomas, 18, Devonport M.I., clerk—Bkpg. (1st); Algebra (1st); Trigon. (2d)
1838—Dawkins, William, 16, Pembroke Dock M.I., pupil teacher—Arith. (1st)
661—Dawson, George, 16, Droylsden Educ. Inst., pupil teacher—Free-hd. Dwg. (3d)
1097—Dawson, William, 20, Hulme (Christ Church) Inst., putter-out—Arith. (2d)
1736—Deacon, William, 22, Northampton Museum, printer—Mag. and Elect. (3d)
2370—Dean, Charles J., 29, St. John's Inst., Woolwich, pattern maker—Mech. Dwg. (3d)
1228—Dean, Edward, 19, Leeds Ch. Inst., mechanic—Free-hd. Dwg. (2d)
1074—Dearden, Fred W., 19, Huddersfield M.I., clerk—Arith. (1st); Bkpg. (1st); French (1st)
1085—Dearman, William, 26, Hull Young Peop. Chr. and Lit. Assoc., clerk—Bkpg. (3d)
321—De Brito, André Joaquim, 18, Bristol Trade and Min. Sch., accountant—French (3d)
1434—Denington, George, 22, City of London Coll., clerk—Bkpg. (2d).
339—Denn, John E., 19, St. Mark's Sci. Sch., New Brompton, joiner—Pract. Geom. (3d)
569—Dent, Richard, 18, Darlington Church Inst., accountant—Logic, &c. (3d)
1196—Derham, Joseph Thomas, 23, Lancaster M.I., cabinet maker—Anim. Phys. (2d)
312—Derisley, James G., 19, Bristol Y.M. Christ. Assoc., clerk—Bkpg. (3d)
982—Dewey, George J., 16, Gloucester Sch. of Art, clerk—French (3d)
1070—Dickinson, Walter, 17, Huddersfield M.I., railway clerk—Eng. Lit. (3d)
1965—Dixon, Susan, 16, Rugby Loc. Bd., no occupation—Arith. (3d); Latin, &c. (3d)
409—Dobson, Thomas H., 17, Carlisle M.I., clerk—Arith. (3d)
888—Docharty, Alexander, 20, Glasgow M.I., joiner—Mus. Comp. (3d)
2004—Dodge, Alfred M., 16, Salford W.M. College, draughtsman—Mech. Dwg. (3d)
2395—Dodridge, John P., 36, St. Thomas Sch., Woolwich, blacksmith—Mech. Dwg. (3d)
545—Dooly, Thomas J., 20, Cork Y. Men's Society, accountant—Eng. Hist. (3d)
1939—Donald, James, 17, Richmond Par. Lib., clerk—Arith. (2d); Freehand Dwg. (3d)
48—Donaldson, Thomas, 34, Aldershot and Farnham Local Board, Corporal 26th Regt.—Arith. (1st)
2003—Douglas, Anne P., 32, Salford W.M. Col., schoolmistress—French (2d)
2080—Douglas, William, 17, Sheerness Dockyard Inst., shipwright apprentice—Arith. (3d); Geom. (3d)
2291—Dow, William, 19, Woolwich Arsenal M.I., turner—Pract. Mech. (3d)
191—Dowling, John N., 20, Birm. and Midl. Inst., clerk—French (2d)
384—Downham, John, jun., 16, Bury Ath., draughtsman—Freehand Dwg. (3d); Mech. Dwg. (3d)
2516—Dowson, John, 22, Liverpool Inst., letter-carrier—Alg. (2d); Conic Sec. (3d); Geom. (3d)
147—Drennan, Alexander, 26, Belfast Lit. Inst., teacher Eng. Lit. (1st); Trigon. (2d)
1484—Dronfield, John, 26, Royal Polyt. Inst., assistant-schoolmaster—Chem. (2d); Geog. (2d); Min. and Met. (3d)
1904—Duckett, Thomas, 31, Ramsgate Ch. Inst., builder's foreman—Theo. of Mus. (1st), with 2d prize of £3; Mus. Comp. (2d)
287*—Duckworth, Walter, 22, Bolton Ch. Inst., clerk—Bkpg. (3d); Pol. Econ. (3d); Geog. (3d)
929—Dudgeon, George B., 19, Glasgow M.I., engineer apprentice—Pract. Mech. (3d)
2467—Dudley, Joseph H., 17, Dudley M.I., office clerk—Arith. (2d)
1512—Duffy, Frederick, 29, Roy. Polyt. Inst., city missionary—Anim. Phys. (2d)
2131—Duncan, John, 21, Southampton Ath., architect and surveyor—Arith. (3d)
759—Duncan, Robert, 18, Pop. Evg. Classes, Anderson. Univ., Glasgow, engineer—Geom. (3d)
897—Dunlop, James, 18, Glasgow M.I., engineer—Arith. (2d)
951—Dunlop, James, 24, Glasgow M.I., engineer—Arith. (2d)
173—Dunlop, Samuel, 26, Belfast Union-place Sci. Sch., teacher—Arith. (1st); Mensur. (3d)
568—Dunn, John, 22, Darlington Church Inst., ironmonger's assistant—Logic, &c. (3d)
1399—Dexter, Thomas P., 34, Birkbeck Inst., schoolmaster—Anim. Phys. (3d)
1015—Dyson, Henry, 19, Halifax W.M. Coll., clerk—Bkpg. (2d)

2006—Earl, William H., 19, Salford W.M. Coll., junior clerk—Arith. (2d)
1016—Eastwood, Edward, 16, Halifax W.M. Coll., woolsorter—Bkpg. (3d)
33—Eastwood, Henry, 20, Accrington M.I., weaver—Arith. (3d)
2125—Eden, James J., 22, Southampton Ath., architect's clerk—Arith. (3d)
136—Edwards, John W., 18, Bacup M.I., spinner—Anim. Phys. (3d)
1684—Edwards, Joseph J., 20, New Swindon M.I., clerk—Bkpg. (2d)
2007—Edwards, William, 20, Salford W.M. Coll., mechanic—Pract. Geom. (3d)
621—Elbrow, George, 16, Devonport M.I., engineer (student)—Navig., &c. (2d)
100—Elgar, Alfred J., 21, S.E. Rail. M.I., railway accountant's clerk—Arith. (3d)
101—Elgar, Charles W., 17, S.E. Rail. M.I., coachmaker—Arith. (2d)
1602—Elgood, Thomas S., 24, Manchester M.I., draughtsman—Theory of Mus. (2d); Pract. Mech. (2d); Pract. Geom. (3d); Princ. Mech. (3d)
2388—Ellercamp, Henry G., 28, St. Thomas's Schools, Woolwich, assist. teacher—Pract. Geom. (2d)
1695—Elliott, Alfred, 18, New Swindon M.I., occupation not stated—Mech. Dwg. (3d)
1436—Elliott, William S., 34, City of Lond. Coll., clerk in Admiralty Registry, Doctor's-commons—Bkpg. (2d)
622—Ellis, Alfred, 17, Devonport M.I., clerk—Bkpg. (2d)
192—Ellis, Alfred, 20, Birm. and Midl. Inst., turner—Met. Syst. (2d)
2378—Ellis, Alfred, 23, St. Thomas's Schools, Woolwich, writer (and teacher)—Prac. Geom. (2d)
623—Ellis, Charles J., 29, Devonport M.I., shipwright—Mensur. (1st)

624—Ellis, Richard J., 24, Devonport M.I., shipwright—Dom. Econ. (1st), with 3rd prize of £2; Princ. Mech. (2d); Pract. Geom. (3d); Pract. Mech. (3d)
25—Eltoft, Thomas, 23, Accrington M.I., shop assistant—Mag. and Elect. (3d); Anim. Phys. (2d)
493—Enson, Edward, 24, Whitworth School of Science, Cheltenham, teacher—Mag. and Elect. (3d)
270—Entwistle, Ethelbert, 17, Bolton Ch. Inst., millwright—French (3d); Mech. Dwg. (3d)
2005—Evans, Thomas, 21, Salford W.M. Coll., druggist—Latin, &c. (2d)

264—Fairhurst, Edward, 19, Bolton Ch. Inst., mechanic—Arith. (3d)
902—Fairley, George, 16, Glasgow M.I., shipbroker's clerk—Arith. (3d)
761—Fairley, James, 21, Pop. Evg. Classes, Anderson. Univ., Glasgow, ironmonger's assistant—Anim. Phys. (3d)
762—Fairlie, James, 29, Pop. Evg. Classes, Anderson. Univ., Glasgow, paper agent—Theo. of Mus. (1st)
1682—Falconer, George, 18, New Swindon M.I., fitter apprentice—Bkpg. (3d)
1679—Falconer, William, 21, New Swindon M.I., fitter—Bkpg. (2d)
121—Fallows, Thomas. 18, Ashton and Dukinfield M.I., piecer—Eng. His. (2d)
1437—Fantham, Thomas, 28, City of Lond. Coll., clerk—Bkpg. (1st)
366—Farlie, John L., 24, Burrage-road Science Class, writer (science teacher)—Prac. Geom. (2d)
886—Faulds, Alexander, 20, Glasgow M.I., warehouseman—Mus. Comp. (2d); Theo. of Mus. (2d)
735—Fearon, William, 21, Gilford Mut. Imp. Assoc., book-keeper—Arith. (3d)
268—Feather, Samuel, 31, Bolton Ch. Inst., book-keeper—French (3d)
467—Featherstone, William, 18, Chelmsford L. & M.I., iron turner—Free-hd. Dwg. (3d)
1391—Feddon, John T., 22, Birkbeck Inst., clerk—Arith. (3d); Bkpg. (3d); Metric Sys. (1st)
2238—Fellows, Noah, 18, Wednesbury (St. John's) Inst., millman—Eng. Hist. (3d)
37—Fenton, Henry, 35, Accrington M.I., cloth looker Arith. (3d)
2195—Fenton, John, 18, Tottington Lit. Inst., book-keeper—Arith. (3d); Bkpg. (3d)
1888—Ferguson, John A., 30, Preston Inst., clerk—Anim. Phys. (2d)
177—Ferguson, Robert, 17, Belfast Union-place Sci. Sch., teacher—Arith. (2d)
2009—Ferneley, Thomas M., 17, Salford W.M. Coll., pupil teacher—Geog. (1st); Arith. (3d)
2258—Field, Eleanor S., 18, Messrs. Bagnalls' Schools, West Bromwich, pupil teacher—Dom. Econ. (3d)
1526—Finch, Charles T., 16, St. Stephen's (Westm.) Evg. Sch., barrister's clerk—Arith. (2d)
625—Firks, Wm. J. C., 17, Devonport M.I., engineer (student)—Geog. (2d)
2008—Fish, Joseph M., 18, Salford W.M. Coll., book-keeper—Bkpg. (3)
1507—Fisher, Henry, 17, Roy. Polyt. Inst., smith's clerk—Arith. (3d); Bkpg. (1st); Metric Syst. (1st), with 2nd prize of £3; Anim. Phys. (1st)
349—Flack, William H. D., 17, Burnley M.I., civil service (proposed)—Arith. (1st); Eng. Hist. (1st); Anim. Phys. (2d)
1373—Flegg, Robert, 18, Birkbeck Inst., clerk—Arith. (2d); Eng. Hist. (2d); Free-hd. Dwg. (2d); Geog. (2d)
1522—Fleming, Charles S., 16, St. Stephen's (Westm.) Evg. Sch., pupil-teacher—Arith. (2d); Geom. (3d)
849—Fleming, Robert, 19, Glasgow Ath., warehouseman—French (2d)
601—Fleming, William H., 22, Sheerness Dockyard Inst., shipwright—Arith. (3d)
2093—Fletcher, Edward J., 16, Sheerness Dockyard Inst., shipwright apprentice—Arith. (1st); Geom. (3d)
1068—Flint, Edward, 16, Huddersfield M.I., mechanic—Free-hd Dwg. (2d)
2265—Flower, Alfred E., 19, Albert Inst., Weston-super-Mare, solicitor's clerk—Arith. (3d); Bkpg. (3d)
1179—Floyd, William, 18, King's Lynn Ath., solicitor's clerk—Latin, &c. (2d)
543—Flynn, James C., 18, Cork Y.M. Society, accountant—Eng. Hist. (1st)
346—Folen, James H., 17, Burnley M.I., bank clerk—Anim. Phys. (3d)
2346—Folkes, Oswald O., 21, Woolwich Roy. Arsenal M.I., wheeler—Arith. (3d)
909—Forbes, Daniel W., 21, Glasgow M.I., engineer—Mech. Dwg. (2d)
1146—Forbes, James, 16, Hyde M.I., clerk—Anim. Phys. (3d)
2283—Forbes, Robert, 19, Wolverhampton (St. Peter's), engine-fitter—Princ. Mech. (3d)
707—Forbes, Robert G. M., 21, Edinb. Watt Inst., lighthouse service—Prac. Geom. (3d); Prac. Mech. (3d); Mech. Dwg. (3d)
626—Ford, Francis, 21, Devonport M.I., engineer—Metric System (1st)
895—Forsyth, William, 16, Glasgow M.I., clerk—Bkpg. (3d)
2335—Foss, Robert, 35, Woolwich Roy. Arsenal M.I., writer—Chem. (3d)
1018—Foster, Frederick, 16, Halifax W.M. Coll., clerk—Bkpg. (3d)
492—Fowler, Elijah A., 16, Whitworth Sch. of Sci., Cheltenham, pupil teacher—Geog. (3d); Free-hd. Dwg. (3d)
1576—France, James, 22, Manchester M.I., clerk—Bkpg. (1st); French (3d)
913—Frame, John R., 18, Glasgow M.I., warehouseman—Eng. Lit. (3d)
1955—Freeman, Arthur, 18, Rugby Inst., clerk—Arith. (2d)
1585—Frith, Henry, 22, Manchester M.I., warehouseman—Bkpg. (3d)
1078—Frost, Joe, 26, Huddersfield M.I., dyer—Chem. (2d)
2339—Frost, Reuben C., 25, Woolwich Roy. Arsenal M.I., engineer—Chem. (3d)
2461—Fryer, Charles, 28, Lambeth Evg. Classes, florist—Floric. (3d)
1348—Fuller, Alfred, 23, Beauvoir College, organ builder—Theo. Mus. (1st)
2456—Furniss, Thomas S., 19, Lambeth Evg. Classes, engineer appr.—Pract. Geom. (3d); Mech. Dwg. (3d)
933—Fyfe, Joseph, 18, Glasgow M.I., clerk—Eng. Lit. (3d)

2237—Garbett, John, 16, Wednesbury (St. John's), pupil teacher—Eng. Hist. (2d); Free-hd. Dwg. (3d)
1002—Gardam, William, 17, Halifax M.I., book-keeper—Arith. (3d)
1499—Gardiner, Thomas, 29, Roy. Polyt. Inst., teacher—Anim Phys. (3d)
486—Gardner, Charles, 26, Whitworth Sch. of Sci., Cheltenham, dentist's assist.—Chem. (2d)
1639—Garside, Alfred, 22, Manchester M.I., clerk—Bkpg. (1st)
193—Gasby, Thomas S., 18, Birm. and Midl. Inst., brass scale-beam filer—Arith. (3d)
1172—Gate, Daniel, 17, Keswick M.I., purser's clerk—Arith. (3d)
2341—Gaze, Edward H. J., 21, Woolwich Royal Arsenal M.I., turner and fitter—Chem. (3d)
6—Gedles, Alexander, 25, Aberdeen M.I., draper—French (3d)
1856—Geoffroi, Henry M., jun., 16, Penzance Loc. Bd., clerk—Free-hd. Dwg. (3d)

2263—George, Susannah, 17, Messrs. Bagnall's Schools, West Bromwich, no occupation stated—Dom. Econ. (3d)
1438—George, William J., 17, City of Lond. Coll., clerk—German (2d)
683—Gibbins, Frank, 19, Earlestown Mut. Imp. Soc., millwright—Free-hd. Dwg. (3d); Mech. Dwg. (3d)
938—Gibbons, James, 17, Glasgow M.I., millwright—Mech. Dwg. (3d)
539—Gibbons, John, 18, Cork Y.M. Soc., clerk—Eng. Hist. (3d)
310—Gibbs, Henry, 16, Bristol Y.M. Chr. Assoc., farmer—Arith. (1st)
1269—Gibson, William, 17, Leeds M.I., chemist and druggist (apprentice)—Chem. (3d)
1960—Gilbert, Esther M., 19, Rugby Inst. Evg. Classes, dressmaker—Arith. (3d)
1212—Gilchrist, William, 16, Lancaster M.I., coach-body maker—Free-hd. Dwg. (3d)
627—Gill, Edward J., 19, Devonport M.I., clerk—Bkpg. (2d)
1439—Gill, Walter, 20, City of Lond. Coll., clerk—Bkpg. (3d)
2116—Gilloley, Thomas, 17, Southampton Ath., clerk—Freehd. Dwg. (3d)
451—Ginn, Alfred F., 22, St. Mary's Sci. Sch. Chatham, clerk—Mech. Dwg. (3d)
2140—Glasspool, Edwin T., 16, Southampton Ath., no occupation stated—Arith. (3d); Geom. (3d)
1405—Glennie, William G., 21, Birkbeck Inst., insurance clerk—Pol. Econ. (1st), with prize of books to the amount of £1
2267—Golby, Thomas, 21, Wolverhampton (St. Peter's), clerk—Chem. (2d.)
1308—Goodall, Francis F., 17, Leeds Y.M. Chr. Assoc., clerk—Free-hd. Dwg. (2d)
1242—Goodall, Hamilton, 20, Leeds M.I., mechanic—Chem. (2d); Mech. Dwg. (2d); Trigon. (3d); Pract. Mech. (3d)
2275—Goodman, Thomas, 20, Wolverhampton (St. Peter's), carpenter—Arith. (3d)
1173—Gordon, James H., 17, Keswick M.I., ironmonger—Arith. (3d)
2172—Gosling, George E., 16, Stockport Sund. Sch. Impr. Society, bookkeeper—Freehd. Dwg. (3d)
1310—Gough, James, 22, Leeds Y.M. Christ. Assoc., painter—Free-hd. Dwg. (2d)
2437—Gough, William G., 24, St. Mary's (East Greenwich) Nat. Sch., shipwright—Pract. Geom. (1st), with 2d prize of £3.
247—Goulding, Ebenezer, 19, Bolton M.I., clerk—Free-hd. Dwg. (3d)
552—Goulding, Michael, 26, Cork Y.M. Soc., clerk—Bkpg. (3d)
304—Graham, Albert, 16, Bradford M.I., clerk—Arith. (2d)
2512—Graham, William J., 17, Liverpool Inst., clerk—Bkpg. (3d)
769—Grant, John, 28, Pop. Evg. Classes, Anderson. Univ., Glasgow, clerk—Anim. Phys. (3d)
355—Grant, John H., 17, Burnley Ch. of Eng. Lit. Inst., teacher—Alg. (3d); Trigon. (3d)
342—Grant, William L., 20, Burnley Ch. Lit. Inst., teacher—French (3d)
1178—Graves, Joseph M., 20, Keswick M.I., draper—Eng. Hist. (1st); Arith. (3d)
705—Gray, Andrew, 21, Edinburgh Watt Inst., stonemason—Alg. (3d); Geom. (3d)
887—Gray, David, 25, Glasgow M.I., pattern maker—Theo. of Mus. (1st); Mus. Comp. (3d)
1796—Greaves, John W., 18, Oldham Lyceum, warehouseman—Arith. (1st); Bkpg. (2d); Metric Syst. (3d)
1331—Greaves, William, 20, Leeds Y.M. Christ. Assoc., machine printer—Arith. (3d)
2552—Green, Charles E., 25, Beauvoir Col. Evg. Classes, cabinet maker—Mus. Comp. (2d)
1443—Green, Henry G., 28, City of Lond. Coll., draper—Geom. (3d)
1867—Green, William, 18, Portsmouth Loc. Bd., engineer student—Trigon. (1st), with 1st prize of £5; Conic Sect. (2d); Princ. Mech. (2d)
1444—Green, William T., 23, City of Lond. Coll., no occupation given—Bkpg. (2d)
1019—Greenhalgh, John, 18, Halifax W.M. Coll., assistant teacher—Chem. (1st); Arith. (2d); Geog. (3d)
195—Greening, Richard G., 18, Birm. and Midl. Inst., clerk—Spanish (1st), with 2nd prize of £3
2519—Greenshields, Thomas J., 20, Liverpool Inst., engineer—Arith. (2d); Chem. (3d)
995—Greenwood, William H., 20, Halifax M.I., woolsorter—Bkpg. (3d)
1628—Greenwood, William H., 23, Manchester M.I., engineer—Light and Heat (1st), with 1st prize of £5; Conic Sect. (2d); Princ. Mech. (2d); Alg. (3d)
140—Greenwood, Wilson, 18, Bacup M.I., mule-spinner—Anim. Phys. (1st); Arith. (2d)
1202—Gregson, Robert, 26, Lancaster M.I., schoolmaster—Anim. Phys. (1st)
2010—Gretton, John J., 21, Salford W.M. Coll., bookkeeper—Geog. (2d); Bkpg. (3d)
2067—Grieve, William H., 19, Sheerness Dockyard Inst. engineer (student)—Conic Sect. (1st), with 1st prize of £5; Geom. (2d)
1840—Griffiths, William, 17, Pembroke Dock M.I., shipwright (apprentice)—Arith (3d)
196—Grundy, Harriette, 32, Birm. and Midl. Inst., assistant mistress—Latin, &c. (2d)
1105—Grundy, Mark, 35, Hulme W.M. Inst., railway porter—Arith. (3d)
2392—Guy, Charles J. D., 17, St. Thomas's School, Woolwich, architect's clerk—Geog. (2d)

2244—Hackwood, William F., 17, Wednesbury, St. John's Inst., pupil teacher—Eng. Hist. (1st); Geog. (2d); Freehand Dwg. (3d)
935—Haddow, Robert, 21, Glasgow M.I., millwright—Mech. Dwg. (3d)
1394—Haggitt, Catherine S., 43, Birkbeck Inst., teacher—German (1st); Italian (2d)
966—Hague, Charles, 17, Glodwick Inst., knotter—Arith. (3d)
1661—Haigh, James, 20, Mossley M.I., maker-up—Bkpg. (3d)
1326—Haigh, John W., 16, Leeds Y.M. Christ. Assoc., clerk—Arith. (3d); Freehand Dwg. (2d)
1040—Hall, George H., 24, Hastings M.I., shopman—Bkpg. (3d)
315—Hall, John, 16, Bristol Y.M. Christ. Assoc., clerk—Arith. (3d)
566—Hall, John S., 17, Darlington Ch. of Eng. Inst., accountant—Logic (2d)
1793—Hall, William H., 18, Oldham Lyceum, warehouseman—Arith. (2d)
1799—Halliwell, Benjamin, 20, Oldham Lyceum, warehouseman—Arith. (2d); Bkpg. (3d); Metric Syst. (3d)
2011—Halsall, Thomas, 22, Salford W.M. Coll., millwright—Mech. Dwg. (3d)
628—Hambly, Samuel, 19, Devonport M.I., drysalter—Mag. and Elect. (3d); Chem. (3d).
2122—Hamilton, James T., 20, Southampton Ath., assurance clerk—Arith. (1st); Eng. Hist. (1st)
1445—Hamilton, William F., 20, City of Lond. Coll., clerk in civil service—Bkpg. (1st)
1966—Hammond, Jane E., 17, Rugby Loc. Bd., no occupation stated—Free-hd. Dwg. (3d)
2243—Hammond, Lois Jane, 16, Wednesbury (St. John's), pupil teacher—Free-hd. Dwg. (3d)
1868—Hamon, Joseph T. D., 17, Portsmouth Loc. Bd., engineer (student)—Arith. (1st); Geom. (2d); Mensur. (3d)

115—Hampson, John, 20, Ashton and Dukinfield M.I., hatter's apprentice—Arith. (3d)
1814—Hampton, John, 17, Parsonstown Y.M. Christ. Assoc., clerk—Arith. (3d)
1165—Hancock, Arthur E., 16, Ipswich W.M. Coll., clerk—Arith. (1st)
2165—Hand, John E., 21, Stockport M.I., mechanic—Arith. (1st)
2295—Hanlan, John W., 21, Woolwich Roy. Arsenal M.I., machinist—Mech. Dwg. (2d); Pract. Mech. (3d)
163—Hanna, James, 18, Belfast Acad., no occupation stated—Alg. (1st); Arith. (2d); Geom. (2d).
1397—Harbud, Daniel, 18, Birkbeck Inst., clerk—Arith. (2d)
1446—Harding, James S., 29, City of Lond. Coll., clerk—Metric System (1st) with 1st prize of £5
1818—Harding, Richard, 37, Parsonstown Y.M. Christ. Assoc., book-keeper—Bkpg. (3d)
695—Hardisty, Frederick, 26, Edinburgh Loc. Bd., gardener—Flor. (2d); Fruit and Veg. Cult. (2d)
2012—Hardman, James, 24, Salford W.M. Col., book-keeper—Arith. (2d); Geog. (2d)
1520—Hardy, Frederick J., 20, Roy. Polyt. Inst., clerk—Bkpg. (1st)
1936—Hargreaves, John W., 20, Irwell Inst., Rawtenstall, book-keeper—Eng. Hist. (2d)
1932—Hargreaves, Holden, 17, Irwell Inst., Rawtenstall, warehouse boy—Chem. (3d)
853—Harley, Joan Helen, 19, Glasgow Ath., governess—French (3d)
1247—Harries, Richard E., 31, Leeds M.I., schoolmaster—Chem. (2d)
102—Harris, George E., 17, S.E. Railway M.I., railway accountant's clerk—Arith. (2d)
1726—Harrison, James, 17, Northampton Museum, pupil teacher—Mag. & Elec. (3d)
55—Hart, Christopher, 16, Farnham Y.M. Assoc., no occupation stated—Arith. (1st); Bkpg. (3d); French (3d); Geom. (3d)
548—Hart, James E., 19, Cork Y.M. Soc., clerk—Arith. (1st); Eng. Hist. (1st), with 2nd prize of £3; Geog. (2d); French (3d)
2554—Hartley, Joseph J. E., 29, Beauvoir Coll. Evg. Classes, certificated teacher—Mus. Comp. (2d)
2352—Hartley, Joseph J. E., 29, Woolwich Roy. Arsenal M.I., certificated teacher—Chem. (2d)
772—Harvey, Andrew, 19, Pop. Evg. Classes, Anderson. Univ., Glasgow, clerk—Arith. (3d)
1039*—Harwood, William N., 27, Hastings M.I., shopman—Arith. (3d)
1370—Haskins, George P., 22, Birkbeck Inst., solicitor's clerk—Metric Syst. (1st)
773—Hastie, George, 20, Pop. Evg. Classes, Anderson. Univ., Glasgow, teacher—Arith. (1st); Latin, &c. (3d)
2239—Hatfield, Charles A., 17, Wednesbury (St. John's), clerk—Arith. (3d); Bkpg. (3d); Free-hd Dwg. (3d)
199—Hathaway, Frederick, 23, Birm. & Midl. Inst., clerk—Arith. (1st)
1806—Hattrick, Alexander, 25, Paisley Artiz. Inst., smith—Theo. of Mus. (2d)
1246—Hawkesworth, William, 36, Leeds M.I., book-keeper—Chem. (2d)
1743—Haworth, Ambrose J., 21, Oldham Analytic Lit. Inst., pattern maker—Mech. Dwg. (3d)
557—Haworth, John, 17, Crawshawbooth L. and M.I., labourer—Arith. (1st)
2090—Hay, David, 17, Sheerness Dockyard Inst., shipwright's apprentice—Arith. (3d)
629—Heath, John, 17, Devonport M.I., clerk—Arith. (3d); French (3d)
1364—Hember, Robert G., 17, Birkbeck Inst., clerk—Polit. Econ. (1st); with 1st prize of £5
1191—Hemingway, Joseph, 17, Lancaster M.I., no occupation stated—Chem. (2d); Anim. Phys. (3d)
630—Hendry, Alexander S., 32, Devonport M.I., schoolmaster—German (1st)
1282—Hennessy, John F., 16, Leeds M.I., hatter—Arith. (1st); Eng. Hist. (1st); Geog. (2d); Alg. (3d)
43—Henshaw, David, 23, Alderley-edge Educ. Inst., wheelwright—Dom. Ecom. (3d); Free-hd. Dwg. (3d)
1447—Hensler, William H., 26, City of Lond. Coll., clerk—Metric Syst. (1st)
243—Henville, Harry W., 16, Blandford Lit. Inst., house decorator—French (3d)
2419—Hepburn, Richard, 25, Rectory-place School, Woolwich, engineer & teacher—Mech. Dwg. (3d)
1262—Hepworth, Charles R., 17, Leeds M.I., chemist—Chem. (2d)
505—Herring, William J., 24, Chorley M.I., schoolmaster—Arith. (2d); Theo. of Mus. (2d); Polit. Econ. (1st)
1668—Hewitt, Samuel, 22, New Mills W.M. Inst., self-actor minder—Arith. (3d)
1005—Heyhurst, Phineas, 19, Halifax M.I., cabinet maker—Arith. (2d); Mensur. (2d)
508—Hibbert, Henry F., 18, St. George's Ch. Assoc., Chorley, clerk—Arith. (2d)
605—Hicking, Philip H., 16, Milford Evg. Sch. (Derby), monitor—Arith. (1st); Eng. Hist. (2d); Mensur. (3d)
2268—Hickman, George, 19, Wolverhampton (St. Peter's), clerk—Arith. (1st)
2101—Hicks, David, 19, Slough M.I., painter—Prac. Geom. (3d); Free-hd. Dwg. (3d)
2545—Hicks, William J., 31, Beauvoir Coll. Evg. Classes, pianoforte maker—Mus. Comp. (2d)
2527—Higgin, Richard B., jun., 17, Liverpool Inst., office clerk—Bkpg. (2d)
1381—Higgins, Arthur A., 16, Birkbeck Inst., clerk—Bkpg. (3d)
1323—Higgins, George H., 16, Leeds Y.M. Christ. Soc., dispenser—Arith. (3d)
2124—Higgs, John C., 28, Southampton Ath., gardener—Floric. (2d)
988—Higgs, Samuel S., 16, Gloucester Sch. of Art, clerk—French (3d)
1214—High, Richard, 16, Lancaster M.I., plumber—Free-hd. Dwg. (3d)
2517—Hill, Edward R., 22, Liverpool Inst., clerk—Eng. Hist. (3d)
1448—Hill, George, 26, City of Lond. Coll., clerk—Arith. (1st); Bkpg. (1st); Geom. (2d)
908—Hill, Thomas N., 17, Glasgow M.I., measurer and surveyor—Arith. (3d)
1044—Hills, Henry G., 26, Hertford Lit. and Sci. Inst., printer—Mensur. (2d)
108—Hilton, Maria, 27, Ashton and Dukinfield M.I., winder—Eng. Hist. (3d)
1787—Hilton, William, 21, Henshaw-street Mut. Imp. Soc., Oldham, self-actor minder—Arith. (2d)
1039—Hindle, Nathan, 21, Haslingden M.I., clerk—Arith. (2d)
60—Hindmarsh, William R., 30, Alnwick M.I., draper—Free-hd. Dwg. (2d)
1058—Hirst, William, 27, Huddersfield M.I., book-keeper—Chem. (3d)
1449—Hobbs, William H., 26, City of Lond. Coll., warehouseman—Bkpg. (2d)
1634—Hockley, Alfred, 16, Manchester M.I., clerk—Bkpg. (1st)
1176—Hodgson, Isaac, 18, Keswick M.I., mason—Arith. (3d)
1174—Hodgson, Thomas H., 19, Keswick M.I., draper—Eng. Hist. (1st); Eng. Lit. (2d)
973—Hodgson, William, 26, Glodwick Inst., planer—Arith. (3d)
2137—Hoey, Henry J., 18, Southampton Ath., clerk, Ordnance Survey Office—Geog. (3d)
1410—Hoffmeister, John M., 20, Birkbeck Inst., fitter—Arith. (2d)

1683—Hofield, John T., 20, New Swindon M.I., clerk—Arith. (1st); Theo. of Mus. (2d)
538—Hogan, Denis, 19, Cork Y.M. Soc., clerk—Arith. (3d); Eng. Hist. (2d)
1675—Hogarth, Thomas O., 18, New Swindon M.I., pattern-maker (apprentice)—Arith. (3d)
1599—Hogg, Samuel, 23, Manchester M.I., mechanic—Pract. Mech. (3d)
273—Holden, Edward H., 20, Bolton Ch. Inst., clerk—Arith. (2d); Eng. Hist. (2d); Mensur. (3d); Geog. (3d)
1021—Holder, George, 17, Halifax W.M. Coll., manufacturer's apprentice—German (3d)
1020—Holder, Henry W., 18, Halifax W.M. Coll., manufacturer's clerk—Arith. (1st); Chem. (3d); Mensur. (3d)
1776—Hollingworth, George H., 16, Oldham Lyceum—book-keeper—Geom. (3d)
254—Holstead, Thomas, 44, Bolton Ch. Inst., no occupation stated—Anim. Phys. (3d)
1112—Holt, Charles W., 25, Hulme (Christchurch) Inst., clerk—Bkpg. (3d)
2015—Holt, Samuel, 17, Salford W.M. Coll., draughtsman—Mech. Dwg. (3d)
2016—Homer, Lilly, 19, Salford W.M. Coll., pupil teacher—Free-hd. Dwg. (2d); Arith. (3d).
2017—Homer, Mary E., 27, Salford W.M. Coll.—Free-hd. Dwg. (3d)
1537—Honey, Robert, 18, Stepney Deanery Loc. Bd., engineer—Arith. (3d)
1369—Hood, Thomas W., 20, Birkbeck Inst., clerk—Arith. (2d); Metric Syst. (1st)
2074—Hooker, John E. E., 21, Sheerness Dockyard Inst., shipwright—Arith. (1st) with 1st prize of £5; Mensur. (2d)
1450—Hooper, George D., 20, City of Lond. Coll., clerk—Dom. Econ. (1st), with prize of books to the amount of £1.
774—Hope, Cornelius, 21, Pop. Evg. Classes, Anderson. Univ., Glasgow, clerk—Bkpg. (2d)
1536—Hope, William, 19, Stepney Deanery Loc. Bd., engineer—Arith. (3d)
1648—Hope, William R., 16, Manchester M.I., clerk—Bkpg. (2d)
2336—Hoppen, William H., 25, Woolwich Roy. Arsenal M.I., time-keeper—Chem. (3d)
2059—Hopper, William, 20, Scarborough M.I., joiner—Arith. (3d)
1329—Horne, William, 21, Leeds Y.M. Christ. Assoc., clerk—Bkpg. (1st)
1451—Hough, John, 23, City of Lond. Coll., editor's assistant—Bkpg. (2d); French (2d)
1623—Howard, Joseph B., 22, Manchester M.I., mechanic—Pract. Mech. (3d)
138—Howarth, John W., 27, Bacup M.I., clerk—Theo. of Mus. (2d)
1023—Howarth, George, 19, Halifax W.M. Coll., wool sorter—Arith. (3d)
1656—Howarth, Thomas, 19, Manchester M.I., warehouseman—Arith. (2d)
1844—Howell, James, 18, Pembroke Dock M.I., shipwright's apprentice—Dom. Econ. (2d); Mensur. (2d); Arith. (3d)
693—Howie, William L., 22, Edinb. Watt. Inst., druggist's assistant—Chem. (2d)
2087—Howlett, William A., 19, Sheerness Dockyard Inst., engineer (student)—Geom. (3d)
39—Hoyle, William H., 23, Accrington M.I., teacher—Metric Syst. (1st)
1194—Huggett, Sydney, 17, Lancaster M.I., chemist (apprentice)—Chem. (3d)
2070—Hugo, John, 18, Sheerness Dockyard Inst., shipwright's apprentice—Arith. (1st); Mensur. (2d)
1981—Hulme, Edward B., 22, Salford W.M. Coll., no occupation stated—Chem. (1st)
1765—Hulme, Stephen, 18, Henshaw-street Mut. Imp. Soc., Oldham, under-carder—Arith. (3d)
697—Hume, Robert, 20, Edinburgh Watt Inst., bookseller's clerk—Arith. (3d)
1574—Humphreys, William H., 18, Manchester M.I., clerk—Bkpg. (2d)
1316—Hunn, Allen, 20, Leeds Y.M. Christ. Assoc., compositor—Arith. (3d)
2504—Huther, Alfred, 18, Liverpool Inst., clerk—Bkpg. (2d)

998—Illingworth, Thomas, 19, Halifax M.I., mechanic—Arith. (2d)
399—Ingham, James, 19, Bury Ath., mechanic—Pract. Geom. (3d)
296—Ingham, John, 20, Bradford M.I., warehouseman—Eng. Hist. (2d)
2103—Inglis, Henry J., 16, Slough M.I., watchmaker—Free-hd. Dwg. (3d)
910—Inglis, Neil, 18, Glasgow M.I., apprentice mechanic—Arith. (3d)
1452—Ingram, John H., 26, City of Lond. Coll., clerk—Eng. Lit. (3d)
1783—Ingham, William, 19, Oldham Lyceum, engineer—Arith. (2d); Pract. Mech. (3d); Geom. (3d)
1361—Imeson, William A., 23, Birkbeck Lit. Inst., clerk—Arith. (3d); Eng. Hist. (3d); French (3d)
777—Ireland, John, 30, Pop. Evg. Classes, Anderson. Univ. Glasgow, warehouseman—Mus. Comp. (1st)
1801—Isherwood, Peter, 26, Over Darwen M.I., colour mixer—Anim. Phys. (3d)
2331—Ivatts, Charles, 29, Woolwich Roy. Arsenal M.I., labourer—Chem. (3d)

49—Jacks, Isaac, 27, Aldershot and Farnham Loc. Bd., private R.H.A.—Arith. (3d)
2218—Jackson, James, 23, Wakefield M.I., mat weaver—Arith. (2d)
2018—Jackson, Joseph R., 22, Salford W.M. Coll., clerk—Geog. (3d)
2177—Jackson, Samuel, 19, Stockport Sund. Sch. Imp. Soc., piecer—Arith. (3d); Free-hd. Dwg. (3d)
1007*—Jackson, Thomas, 17, Halifax M.I., clerk—Arith. (2d); Bkpg. (3d)
1386—Jackson, William, 22, Birkbeck Inst., clerk—Bkpg. (3d)
1607—Jackson, William, 20, Manchester M.I., shirt cutter—Bkpg. (3d)
1847—James, Thomas, 16, Pembroke Dock M.I., shipwright (apprentice)—Arith. (3d)
1846—James, William, 18, Pembroke Dock M.I., shipwright (apprentice)—Arith. (1st); Alg. (1st); Geom. (2d); Chem. (3d)
11—Jameson, Thomas, 21, Aberdeen M.I., clerk—Chem. (2d)
2325—Jefferson, Henry, 20, Woolwich Roy. Arsenal M.I., writer—Chem. (3d)
1291—Jefferson, John C., 18, Leeds M.I., mechanic—Arith. (1st); Eng. Hist. (2d); Alg. (3d); Geom. (3d)
1977—Jenaway, Mary Anne, 17, Rugby Loc. Bd., no occupation stated—German (2d); Free-hand Dwg. (3d)
411—Jobling, William, 17, Carlisle M.I., clerk—Chem. (2d)
204—Jennings, Elizabeth, 36, Birm. and Midl. Inst., governess—Latin, &c. (2d)
1843—John, Alfred, 16, Pembroke Dock M.I., shipwright apprentice—Arith. (2d)
290—Johnson, Arthur, 17, Bradford M.I., spinner's clerk—Arith. (3d)
1188—Johnson, Edmund, 27, Lancaster M.I., schoolmaster—Anim. Phys. (2d)
1834—Johnson, John A., 20, Patricroft M.I., draughtsman—Mech. Dwg. (1st); Prac. Geom. (3d)
1573—Johnson, John W., 23, Manchester M.I., clerk—Geog. (2d); French (3d)
920—Johnston, Charles S. S., 19, Glasgow M.I., architect—Free-hd. Dwg. (1st)

2361—Johnston, James, 28, St. Thomas' Sch., Woolwich, carpenter—Prac. Geom. (3d)
1559—Jones, Charles E., 17, South London W.M. Coll., engineer—Free-hd. Dwg. (2d)
1071—Jones, Frederick W., 16, Huddersfield M.I., tailor—Free-hd. Dwg. (3d)
1575—Jones, Morgan, 16, Manchester M.I., clerk—Arith. (1st)
2020—Jones, Robert, 20, Salford W.M. Coll., warehouseman—Arith. (3d)
2539—Jones, William C., 45, Beauvoir Coll. Evg. Classes, fellmonger (and teacher of Sol-fa class)—Mus. Comp. (2d)
1268—Joy, Douglas G., 19, Leeds M.I., engineering student—Chem. (3d)
470—Joyner, Frederick W., 16, Cheltenham W.M. Club, no occupation given—Geog. (3d)

2024—Kay, Andrew, 19, Salford W.M. Coll., clerk—Geog. (1st)
2023—Kay, David, 21, Salford W.M. Coll., salesman—Arith. (1st); Geog. (1st)
2021—Kay, Herbert, 16, Salford W.M. Coll., clerk—Arith. (2d)
1651—Kay, James, 22, Manchester M.I., clerk—Arith. (1st); Bkpg. (1st)
2022—Kay, Reuben, 23, Salford W.M. Coll., clerk—Geog. (2d); French (3d)
146—Keenan, Richard Lee, 26, Belfast Lit. Inst., gardener—Anim. Phys. (1st); Pol. Econ. (2d)
779—Kelley, James M., 29, Pop. Evg. Classes, Anderson. Univ., Glasgow, cutler—Anim. Phys. (3d)
1227—Kemmy, George, 25, Leeds Ch. Inst., mechanic—Arith. (2d); Free-hd. Dwg. (3d)
1067—Kendall, Thomas, 19, Huddersfield M.I., engraver—Free-hd. Dwg. (2d)
2317—Kennard, Richard, 21, Woolwich Roy. Arsenal M.I., stair-case builder—Mech. Dwg. (3d)
92—Kennedy, Thomas R., 19, S.E. Rail. M.I., engine fitter—Arith. (1st)
166—Kennedy, William, 22, Belfast Acad., teacher—Metric Syst. (1st); Geom. (1st)
780—Kent, James S., 42, Pop. Evg. Classes, Anderson. Univ., Glasgow, warper—Anim. Phys. (3d)
2367—Ker, Andrew J., 17, St. John's Inst., Woolwich, engineer—Mech. Dwg. (3d)
971—Kershaw, Jonathan, 33, Glodwick Inst., machine pattern maker—Mech. Dwg. (2d)
118—Kershaw, Jude, 20, Ashton-under-Lyne M.I., weaver—Arith. (3d)
2085—Kevi, James J., 18, Sheerness Dockyard Inst., engineer (student)—Eng. Hist. (1st); Geog. (2d)
1545—Kidd, George W., 18, Stepney Deanery Loc. Bd., engineer (apprentice)—Arith. (1st)
1290—Kidney, John, 19, Leeds M.I., clerk—Bkpg. (2d); Mensur. (2d); Geog. (1st), with 1st prize of £5, and the Roy. Geog. Society's prize of £5
2091—Killpatrick, George H., 16, Sheerness Dockyard Inst., engineer (student)—Arith. (2d)
2025—King, Charles, 21, Salford W.M. Coll., putter-out—Arith. (2d); Bkpg. (3d)
1519—Kingston, Robert C., 22, Roy. Polyt. Inst., assist. in herbarium, Kew—Geog. (2d); French (3d)
1221—Kingston, William T., 17, Leeds Ch. Inst., share broker's clerk—Free-hd. Dwg. (3d)
632—Kinsman, John S. G., 18, Devonport M.I., joiner (apprentice)—Arith. (1st)
1051—Kirby, Nathaniel T., 19, Holbeck M.I., mechanic—Arith. (3d)
1000—Kitchen, Cooper, 16, Halifax M.I., ironmonger—Arith. (1st); Eng. Hist. (2d)
2528—Kitchen, Frederick, 16, Liverpool Inst., clerk—Bkpg. (3d)
1001—Kitchen, Thomas, 19, Halifax M.I., wool sorter—Arith. (3d); Bkpg. (3d)
1007—Knowles, John W., 21, Halifax M.I.—pianoforte maker—Eng. Hist. (3d)
556—Knowles, Joshua, 18, Crawshawbooth L. and M.I., clerk in a printing machine room—Arith. (2d)

873—Laidlaw, Robert, 27, Glasgow Ath., medical student—Logic, &c. (2d)
2332—Laing, John, 19, Woolwich Roy. Arsenal M.I.—writer—Chem. (1st); Anim. Phys. (3d)
1532—Lamacroft, Henry, 18, Stepney Deanery Loc. Bd., cabinet maker—Arith. (2d)
1156—Lamb, Emanuel, 23, Hyde M.I., warehouseman—Anim. Phys. (3d)
206—Lancaster, Cornelius J., 17, Birm. and Midl. Inst., laboratory assistant—Metric System (1st); Anim. Phys. (2d); Mag. and Elect. (3d)
205—Lancaster, William J., 22, Birm. and Mid. Inst., optician—Metric System (1st); Chem. (2d); Anim. Phys. (2d); Mag. and Elect. (3d)
20—Lane, Andrew, 18, Aberdeen M.I., clerk—Bkpg. (3d)
443—Lane, George W., 18, Chatham M.I., shipwright (apprentice)—Arith (2d)
4—Lane, William, 19, Aberdeen M.I., clerk—Arith. (2d)
1350—Langley, Isaac, 24, Beauvoir College, carpenter—Theo. of Mus. (2d); Mus. Comp. (3d)
1869—Langmaid, Joseph, 17, Portsmouth Loc. Bd., engineer (student)—Pract. Mech. (2d)
1380—Lascaridi, Peter T., 17, Birkbeck Inst., clerk—Geog. (3d)
1520*—Last, Walter, 27, Royal Polyt. Inst., wood engraver—Dom. Econ. (3d); Anim. Phys. (3d)
2500—Latham, William B., 16, Crewe M.I., fitter and turner (apprentice)—Arith. (3d); Geog. (3d)
1503—Law, Charles A., 27, Roy. Polyt. Inst., clerk—German (2d); French (3d)
2026—Law, Edwin, 24, Salford W.M. Coll., no occupation stated—French (3d)
1729—Law, William A., 17, Northampton Museum, printer—Mag. and Elect. (3d)
1090—Lawton, Charles, 25, Hull Christ. and Lit. Assoc., gardener—Floric. (1st); Fruit and Veg. Cult. (2d)
1665—Lawton, Fred., 18, Mossley M.I., minder—Bkpg. (3d)
2077—Layton, John G., 16, Sheerness Dockyard Inst., engineer (student)—Arith. (1st)
2278—Lead, Henry P., 18, Wolverhampton (St. Peter's), clerk—Arith. (3d); Anim. Phys. (3d)
2280—Lead, John E., 20, Wolverhampton (St. Peter's), railway clerk—Bkpg. (1st), with 1st prize of £5; Metric Syst. (1st); Trigon. (2d); Geom. (2d)
2303—Ledingham, John M., 20, Woolwich Roy. Arsenal M.I., iron turner—Mech. Dwg. (3d)
532—Lee, Abel, 25, Compstall Ath., weaver—Arith. (2d); Anim. Phys. (3d)
1811—Lee, Charles H., 17, Paisley Artiz. Inst., clerk—Arith. (2d); Theory of Mus. (2d)
1810—Lee, James, 25, Paisley Artiz. Inst., joiner—Theory of Mus. (1st)
1235—Lee, William, 19, Leeds M.I., mechanic—Conic Sect. (1st); Met. Syst. (2d)
1959—Leeson, Mary, 20, Rugby Inst. Evg. Classes, milliner—Arith. (2d)
1393—Le Hunte, Francis, 35, Birkbeck Inst., commercial traveller—Italian (2d)
170—Lemmon, William A., 24, Belfast Union-place Sci. Sch., house carpenter—Arith. (3d); Mensur. (3d)
1606—Levy, Myer, 16, Manchester M.I., junior-assistant—Arith. (3d); Bkpg. (1st)
1839—Lewis, Louis, 18, Pembroke Dock M.I., shipwright (apprentice)—Arith. (1st); Alg. (3d)
2259—Lewis, Phebe, 17, Messrs. Bagnalls' Schools, West Bromwich, pupil teacher—Dom. Econ. (2d)
1528—Lightly, Anthony H., 17, Stepney Deanery Loc. Bd., pupil teacher—Arith. (2d)
298—Lindon, Greenwood, 20, Bradford M.I., clerk—Arith. (2d); Bkpg. (3d); French (3d)

943—Lindsay, James, 19, Glasgow M.I., clerk—Bkpg. (2d)
72—Lingwood, George, junr., 19, Alnwick M.I., plumber—Arith. (3d)
1951—Linnell, William H., 18, Rugby Inst., solicitor's clerk—Free-hd. Dwg. (2d)
2396—Lintell, Benjamin, 30, St. Thomas' Sch., Woolwich, fitter—Mech. Dwg. (3d)
701—Linton, Ralph T., 21, Edinburgh Watt. Inst., druggist—Chem. (2d)
1453—Lintott, Edward, 21, City of Lond. Coll., clerk—Arith. (2d); Bkpg. (1st)
1252—Lister, Robert, 19, Leeds M.I., chemist and druggist—Chem. (2d)
889—Litster, William, 21, Glasgow M.I., warehouseman—Mus. Comp. (1st), with 2d prize.
410—Little, Thomas J., 18, Carlisle M.I., pupil teacher—Arith. (3d)
633—Littleton, William, 19, Devonport M.I., joiner—Arith. (1st)
2543—Livermore, Charles, 31, Beauvoir Coll. Evg. Classes, accountant—Mus. Comp. (1st)
924—Lockie, John, 16, Glasgow M.I., [engineer (apprentice)—Arith. (3d)
1803—Lockie, Joseph, 25, Paisley Artiz. Inst., dyer—Theo. of Mus. (1st)
1953—Lockington, James, 17, Rugby Inst., pupil teacher—Eng. Hist. (2d)
1063—Lodge, Alfred, 17, Huddersfield M.I., lithographer—Free-hd. Dwg. (3d)
1341*-Lodge, Jabez, 19, Leeds Y.M. Christ. Assoc., clerk—French (3d)
2319—Lomas, Charles H., 26, Woolwich Roy. Arsenal M.I., brass moulder—Pract. Geom. (3d)
586—Lomax, James, 19, Dean Mill Inst., grocer—Arith. (3d)
585—Lomax, Thomas B., 16, Dean Mills Inst., knotter—Arith. (3d)
1314—London, Thomas, 27, Leeds Y.M. Christ. Assoc., schoolmaster—Arith. (1st); Eng. Hist. (1st); Geog. (2d); Free-hd. Dwg. (3d)
1501—Long, Charles, 18, Roy. Polyt. Inst., draughtsman—Free-hd. Dwg. (2d)
635—Long, James, 22, Devonport M.I., assistant-surveyor of taxes—Dom. Econ. (2d)
106—Longhurst, Alphonsine L., 17, S.E. Rail. M.I., no occupation stated—Bkpg. (3d)
2198—Lord, Joseph, 18, Tottington Lit. Inst., warehouseman—Arith. (1st); Geog. (2d)
207—Lovett, William J., 16, Birm. and Midl. Inst., rose-engine turner—Mag. and Elect. (3d)
1502—Lowe, Alfred J. G., 16, Roy. Polyt. Inst., analytical chemist—Chem. (2d)
1644—Lowe, Thomas, 17, Manchester M.I., clerk—Arith. (2d); Bkpg. (1st)
1389—Lowrie, Harry E., 19, Birkbeck Inst., clerk—Bkpg. (3d)
29—Lucas, John, 35, Accrington M.I., schoolmaster—Anim. Phys. (2d)
2027—Lucas, William, 25, Salford W.M. Coll., druggist's assistant—Chem. (1st); Anim. Phys. (3d)
261—Lumb, John, 22, Bolton Ch. Inst., millwright—Mech. Dwg. (3d)
1945—Lynch, Richard I, 19, Richmond Par. Lib., gardener—Floric. (1st), with 2nd prize of £3, and the Roy. Hort. Soc. prize of £3; Bot. (2d)
2028—Lyon, James, 28, Salford W.M. Coll., clerk—Bkpg (3d)

927—Macdougall, Alexander, 20, Glagow M.I., clerk—Bkpg. (2d)
874—Macdougall, John S., 20, Glasgow Ath., clerk—Logic, &c. (1st)
856—Macfadyen, Daniel R., 20, Glasgow Ath., warehouseman—French (2d)
1400—Macgillivray, Robert, 27, Birkbeck Inst., joiner—Anim. Phys. (3d)
803—Mackenzie, Charles, 30, Pop. Evg. Classes, Anderson. Univ., Glasgow, collector—Arith. (3d)
905—Mackenzie, Donald, 22, Glasgow M.I., clerk—Bkpg. (1st)
53—Mackintosh, James A., 20, Aldershot and Farnham Loc. Bd., usher—Mensur. (2d)
1043*-Maclean, John, 23, Hatherlow M.I., teacher—Arith. (1st); Theo. of Mus. (1st)
925—Maclean, Malcolm, 19, Glasgow M.I., clerk—Bkpg. (2d)
2121—Macpherson, John, 23, Southampton Ath., gardener—Fruit and Vegt. Cult. (3d)
291—Mallinson, Dan, 23, Bradford M.I., grocer's assist.—Arith. (1st); Mensur. (3d)
2498—Mann, Henry, 16, Crewe M.I., apprentice fitter—Arith. (3d); Eng. Hist. (3d)
2138—Marchant, John, 23, Southampton Ath., brewery clerk—Bkpg. (3d)
1664—Marland, James W., 22, Mossley M.I., cotton weaver—Bkpg. (1st)
19—Marr, Alexander, 24, Aberdeen M.I., clerk—Arith. (1st)
2030—Marriott, Tom, 18, Salford W.M. Coll., clerk—Arith. (1st)
1756—Marsden, Thomas, 22, Oldham Lyceum, millwright—Arith. (3d); Pract. Mech. (3d)
2510—Marsh, William, 23, Liverpool Loc. Bd., dentist—Mus. Comp. (2d)
915—Marshall, William, 18, Glasgow M.I., clerk—Bkpg. (3d)
782—Marshall, William B., 18, Pop. Evg. Classes Anderson. Univ., Glasgow, engineer (pupil)—Theo. of Mus. (1st)
1655*-Marsland, George E, 24, Manchester M.I., clerk—Mus. Comp. (3d)
1362—Marston, Emma L., 32, Birkbeck Inst., teacher—Arith. (3d); Eng. Hist. (2d)
784—Martin, John, 18, Pop. Evg. Classes Anderson. Univ., Glasgow, clerk—Mag. and Elect. (1st) with 2nd prize of £3
2108—Massy, Anna L., 16, Southampton Ath., of no occupation—French (3d)
2110—Massy, Charles, 21, Southampton Ath., engineer's clerk—Light and Heat (2d); Metric Syst. (2d); Geog. (2d)
2109—Massy, William L., 22, Southampton Ath., clerk H.M. customs—Metric Syst. (1st); Geog. (1st); Trigon. (2d)
1454—Mathieson, George, 24, City of Lond. Coll., clerk—French (3d)
2423—Matson, James, 18, York Inst., lithographic printer—Free-hd. Dwg. (3d)
1531—May, Andrew T., 19, Stepney Deanery Loc. Bd., shipwright (apprentice)—Arith. (1st)
473—May, James, 17, Cheltenham W.M. Club, pupil teacher—Arith. (2d); Eng. Hist. (3d); Geog. (3d)
1870—Mayston, Robert, 17, Portsmouth Loc. Bd., engineer (student)—Trigon. (2d); Conic Sect. (1st) with 2d. prize of £3; Mensur. (1st); Princ. Mech. (2d)
1659—McAlister, John, 26, Middlesbro' M.I., teacher—Bkpg. (3d)
795—McAlister, Robert, 22, Pop. Evg. Classes, Anderson. Univ., Glasgow, baker—Theo. of Mus. (2d)
890—McAlister, Robert, 21, Glasgow M.I., baker—Mus. Comp. (3d)
870—McAlpine, John, 18, Glasgow Ath., warehouseman—Arith (1st); Eng. Lit. (1st)
796—McCallum, William, 16, Pop. Evg. Classes, Anderson. Univ., Glasgow, clerk—Chem. (3d)
537—McCarthy, Edward, 17, Cork Y.M. Society, no occupation stated—Arith. (3d)
535—McCarthy, Patrick, 17, Cork Y.M. Society, draper—Eng. Hist. (2d)
172—McCaw, Hugh, 25, Belfast Union-place Sci. Sch., writing clerk—Arith. (2d)

797—McCalman, Dugald, 33, Pop. Evg. Classes, Anderson. Univ., Glasgow, chemist—Mag. and Elect. (3d)
150—McChisney, Joseph, 30, Belfast Lit. Inst., clerk—Bkpg. (2d)
798—McClure, Robert, 18, Pop. Evg. Classes, Anderson. Univ., Glasgow, bookseller—Mag. and Elect. (3d)
911—McConechy, Neil, 21, Glasgow M.I., occupation not stated—Bkpg. (3d)
852—McCormick, John, 20, Glasgow Ath., clerk—French (3d)
1455—McCrea, Henry M., 22, City of Lond. Coll., clerk—Italian (1st) with 1st prize of £5; Spanish (1st) with 1st prize of £5
2529—McCully, John, 16, Liverpool Inst., glass painter—Bkpg. (1st); French (3d)
2063—McDonald, John N., 17, Sheerness Dockyard, shipwright (apprentice)—Arith. (2d); Geom. (3d)
940—McFarlane, James W., 20, Glasgow M.I., mechanical draughtsman—Geom. (1st), with 2nd prize of £3
1635—McFarlane, William F., 25, Manchester M.I., warehouseman—Bkpg. (2d)
872—McFee, John, 33, Glasgow Ath., outdoor officer H.M. customs—Arith. (3d)
882—McGhie, Daniel, 26, Glasgow M.I., weighing clerk Mus. Comp. (1st)
936—McGlashan, James, 17, Glasgow M.I., engineer apprentice—Mech. Dwg. (2d)
800—McGregor, James, 22, Pop. Evg. Classes, Anderson. Univ., Glasgow, engineer—Arith. (1st)
5—McGregor, Joseph, 16, Aberdeen M.I., clerk—French (3d)
801—McKay, Richard, 29, Pop. Evg. Classes, Anderson. Univ., Glasgow, compositor—Mag. and Elect. (2d)
1705—McKendrick, William, 21, Newcastle M.I., clerk Theo. of Mus. (2d)
52—McKie, Robert, 26, Aldershot and Farnham Loc. Bd., private 25th Regiment—Arith (2d)
2187—McKinley, George, 20, Stockport Sund. Sch. Imp. Soc., storekeeper—Anim. Phys. (3d)
877—McLean, Hector, 22, Glasgow Ath., clerk—Logic, &c. (2d)
2532—McLeece, John, 17, Liverpool Inst., engineer—Arith. (3d)
804—McLellan, Donald, 18, Pop. Evg. Classes, Anderson. Univ., Glasgow, clerk—Arith. (2d)
847—McLeod, Annie, 19, Glasgow Ath., no occupation stated—French (2d)
1816—McManus, William, 24, Parsonstown Y.M. Christ. Assoc., teacher—Geom. (2d)
806—McMurtrie, John, 22, Pop. Evg. Classes, Anderson. Univ., Glasgow, clerk—Anim. Phys. (2d)
939—McNab, Robert, 25, Glasgow M.I., teacher—Alg. (3d)
926—McNicol, Robert, 17, Glasgow M.I., civil engineer and architect—Free-hd. Dwg. (3d)
807—McNiven, Donald, 17, Pop. Evg. Classes, Anderson. Univ., Glasgow, draper's assistant—Anim. Phys. (3d)
1457—Medhurst, John T., 22, City of Lond. Coll., clerk—Bkpg. (1st); Metric Syst. (1st); Anim. Phys. (3d)
162—Megarry, James, 20, Belfast Acad., church (proposed)—Arith. (1st); Alg. (2d); Geom. (2d)
1786—Mellalieu, William, 20, Oldham Lyceum, bookkeeper—Arith. (3d); Anim. Phys. (2d)
113—Mellor, George, 18, Ashton-under-Lyne M.I., spindle-maker—Arith. (2d); Eng. Hist. (2d)
786—Merrylees, James, 44, Pop. Evg. Classes, Anderson. Univ., Glasgow, manufacturer—Mus. Comp. (1st)
787—Merrylees, Mrs. Rachel, 35, Pop. Evg. Classes, Anderson. Univ., Glasgow, no occupation—Theo. of Mus. (2d)
1652—Metcalf, Edward, 23, Manchester M.I., warehouseman—Arith. (2d)
1477—Meyer, Conrad, 33, Roy. Polyt. Inst., national schoolmaster—Anim. Phys. (2d); Chem. (3d)
636—Michell, William H., 17, Devonport M.I., engineer (student)—Arith. (1st)
1942—Middleton, Michael, 22, Richmond Par. Lib., gardener—Floric. (1st) with 1st prize of £5, and the Roy. Hort. Soc. prize of £5; Fruit and Veg. Cult. (1st) with 1st prize of £5, and the Roy. Hort. Soc. prize of £5.
637—Micklewood, Edmund H., 18, Devonport M.I., engineer (student)—Mag. and Elect. (2d)
788—Millar, Alexander H., 21, Pop. Evg. Classes, Anderson. Univ., Glasgow, upholsterer—Theo. of Mus. (2d)
789—Miller, James, 37, Pop. Evg. Classes, Anderson. Univ., Glasgow, cloth lapper—Theo. of Mus. (2d)
582—Miller, Joseph, 16, Dean Mills Inst., warehouse boy—Arith. (3d)
56—Millichap, William, 19, Farnham W.M. Inst., clerk—Arith. (3d); Bkpg. (2d)
1167—Mills, Albert E., 17, Ipswich Loc. Bd., pupil teacher—Arith. (1st)
2031—Mills, George, 23, Salford W.M. Coll., warehouseman—Free-hd. Dwg. (1st)
993—Mills, John Elliott, 19, Gloucester Sch. of Art, bank clerk—French (3d)
1384—Mills, Samuel H., 26, Birkbeck Inst., clerk—Bkpg. (3d)
1209—Milne, Edward P., 17, Lancaster M.I., upholsterer—Free-hd. Dwg. (3d)
1871—Milton, James T., 18, Portsmouth Local Board, engineer (student)—Alg. (1st) with 1st prize of £5; Geom. (1st), with 1st prize of £5.
2117—Mitchell, James F., 18, Southampton Ath., clerk (ordinance survey)—Eng. Hist. (1st)
690—Mitchell, John L., 22, Edinburgh Watt Inst., analytical chemist—Chem. (2d)
494—Mellis, John, 23, Whitworth Sch. of Sci., Cheltenham, broker's assistant—Anim. Phys. (2d)
2337—Molloy, Charles H., 28, Woolwich Roy. Arsenal M.I., labourer—Chem. (3d)
857—Moir, Charles S., 19, Glasgow Ath., salesman—French (1st), with 2nd prize of £3; Spanish (3d)
603—Mondy, Edmond F., 23, Deptford Loc. Bd., shipwright—Geom. (1st); Prac. Mech. (1st), with 2nd prize of £3; Trigon. (2d); Navig. &c. (2d)
1054—Moody, Elwand, 26, Huddersfield M.I., woodcarver—Free-hd. Dwg. (2d)
142—Moore, Emmanuel, 18, Bacup M.I., pupil teacher—Arith. (1st)
1062—Moore, Francis, 18, Huddersfield M.I., book-keeper Free-hd. Dwg. (3d)
1886—Moore, Francis A., 16, Preston M.I., draughtsman (apprentice)—Free-hd. Dwg. (3d)
967—Moore, Octavius, 18, Glodwick Inst., mechanic—Arith. (3d); Eng. Hist (3d)
1481—Morgan, Charles G., 21, Roy. Polyt. Inst., hatter—Mag. and Elect. (3d)
1458—Morgan, Hugh, 22, City of Lond. Coll., clerk—Civ. Govt. (1st), with 2d prize of £3; Metric Syst. (2d); Logic, &c. (2d)
1534—Morgan, Richard, 19, Stepney Deanery Loc. Bd., ship joiner—Arith. (3d)
299—Morley, Thomas, 23, Bradford M.I., solicitor's clerk—Arith. (3d)
444—Morley, Thomas, 23, Chatham M.I., shipwright—Mensur. (2d); Geom. (3d); Pract. Geom. (3d)
1562—Morris, James F. W., 18, South Lond. W.M. Coll., pattern maker—Arith. (3d); Pract. Mech. (3d)
686—Morris, John W., 19, Earlestown M.I. Society, smith—Free-hd. Dwg. (3d)
1103—Morris, Thomas, 25, Hulme (Christ Church) Inst., clerk—Arith. (2d); Bkpg. (3d)
1591—Morris, William H., 19, Manchester M.I., clerk—Bkpg. (2d); German (2d)

167—Morrison, James, 22, Belfast Union-place Sci. Sch., clerk—Arith. (2d); Bkpg. (3d)
208—Morton, Ernest, 31, Birm. and Midl. Inst., electro-plate manufacturer—Chem. (1st)
1459—Mountjoy, R. A., 26, City of Lond. Coll., clerk—Arith. (2d); Eng. Hist. (2d); Geog. (2d)
1205—Muckett, Robert, 18, Lancaster M.I., joiner—Freehand Dwg. (3d)
1872—Mullinger, William J., 17, Portsmouth Loc. Bd., engineer (student)—Arith. (1st)
1641—Munn, William W., 21, Manchester M.I., clerk—French (2d); Dom. Econ. (3d); Spanish (3d)
793—Munro, John, 47, Pop. Evg. Classes, Anderson. Univ. Glasgow, goods' measurer—Mus. Comp. (2d)
9—Munro, John M., 19, Aberdeen M.I., druggist's apprentice—Chem. (3d)
485—Mumford, Francis C., 24, Whitworth School of Sci., Cheltenham, dispenser of medicine—Chem. (3d)
356—Murgatroyd, Robert, 18, Burnley M.I., clerk—Anim. Phys. (3d)
1855—Murphy, John J., 16, Penzance Loc. Bd., engineer—Free-hd. Dwg. (3d)
551—Murphy, Thomas, 24, Cork Y.M. Soc., accountant—Eng. Hist. (2d)
794—Murray, James M., 19, Pop. Evg. Classes, Anderson. Univ., Glasgow, clerk—Bkpg. (2d)
694—Murray, Robert, 23, Edinburgh Watt Inst., clerk—Arith. (3d); Mensur. (3d); Geom. (3d)
413—Murray, William, 21, Carlisle M.I., no occupation stated—Arith. (3d)
1827—Musgrave, John T., 18, Patricroft M.I., draughtsman—Mech. Dwg. (2d); Pract. Geom. (3d)
105—Mutton, Osborn J., 16, S.E. Rail. M.I., railway accountant's clerk—Arith. (1st)
2323—Myatt, Frederick, 16, Woolwich Roy. Arsenal M.I., fitter—Mensur. (3d); Pract. Geom. (3d)
32—Myers, John B., 16, Accrington M.I., rope and twine maker—Arith. (3d)
1254—Myers, William B., 18, Leeds M.I., draughtsman—Chem. (3d)

2389—Nash, Joseph M. 21, St. Paul's Sch. Deptford, fitter—Mech. Dwg. (3d)
2188—Nattrass, James C., 16, Stockton M.I., clerk—Arith. (1st)
1746—Needham, Robert, 18, Oldham Analytical Lit. Inst., piecer—Arith. (3d)
1281—Nedwill, D. B. L., 16, Leeds M.I., no occupation stated—Arith. (3d); Eng. Hist. (2d); Geog. (2d)
1497—Nerney, John T., 23, Roy. Polyt. Inst., clerk—French (3d)
1059—Nettleton, William, 31, Huddersfield M.I., grocer—Floric. (2d); Chem. (1st)
1976—Newall, Henrietta, 16, Rugby Loc. Bd., no occupation stated—German (3d)
2033—Nichols, William, 17, Salford W.M. Coll., clerk—Geog. (3d)
2333—Nightingale, James, 21, Woolwich Roy. Arsenal M.I., laboratory assistant—Chem. (2d)
255—Nightingale, Thomas, 19, Bolton Ch. Inst., warehouseman—Anim. Phys. (3d)
699—Nisbet, John, 18, Edinburgh Watt Inst., pianoforte tuner—French (3d)
1184—Nisbett, Thomas, 19, Kinver Y.M. Inst., clerk—Arith. (3d); Chem. (3d)
1805—Niven, David C., 27, Paisley Artiz. Inst., collector of gas rates—Bkpg. (2d)
2034—Noar, Herbert, 17, Salford W.M. Coll., clerk—Arith. (3d); Bkpg. (3d).
1460—Noakes, Francis M., 21, City of Lond. Coll., pocket-book maker—Metric Syst. (2d)
2287—Norris, Frank, 22, Woolwich Roy. Arsenal M.I., fitter and turner—Mech. Dwg. (3d)
1539—North, Clifford T., 18, Stepney Deanery Loc. Bd. no occupation stated—Arith. (3d)
1300—North, Wesley, 21, Leeds Y.M. Christ. Assoc., woodman—Pract. Mech. (3d)
1547—Notman, James, 17, Stepney Deanery Loc. Bd., engineer—Arith. (1st)
1637—Nuttall, Edward B., 19, Manchester M.I., clerk—Spanish—(3d)
38—Nuttall, John, 22, Accrington M.I., labourer—Arith. (1st); Anim. Phys. (1st); Pol. Econ. (2d)

2540—Oakey, George, 27, Beauvoir Coll. Evg. Classes, clerk—Mus. Comp. (1st)
1349—Oakey, John, 24, Beauvoir Coll., carpet salesman, Mus. Comp. (1st); Theory of Mus. (1st)
2066—Oare, James C., 20, Sheerness Dockyard, engineer (student)—Conic Sec. (3d); Princ. Mech. (3d)
879—Oatts, Thomas M., 22, Glasgow Ath., no occupation stated—Logic, &c. (2d)
2555—O'Brien, Edward, 26, Beauvoir Coll. Evg. Classes, law-stationer—Mus. Comp. (3d)
536—O'Connell, John, 21, Cork Y.M. Soc., accountant—Arith. (1st); Bkpg. (3d)
540—O'Connor, Jeremiah J., 26, Cork Y.M. Soc., city rate office clerk—Bkpg. (3d)
1045—Odle, Samuel, 16, Hertford Lit. and Sci. Inst., solicitor's clerk—Arith. (3d)
114—Ogden, John A., 16, Ashton-under-Lyne M.I., warehouse clerk—Eng. Hist. (2d)
1050—Oldfield, George, 19, Holbeck M.I., mechanic—Arith. (2d); Geog. (3d)
1571—O'Donnell, Elizabeth, 21, Manchester M.I., no occupation stated—Dom. Econ. (3d)
1461—Ogle, William S., 24, City of Lond. Coll., clerk—French (1st); Spanish (1st)
1233—Oldroyd, James B., 23, Leeds Ch. Inst., bank clerk—Bkpg. (3d)
1182—Ollett, Frederic, 20, King's Lynn Ath., merchant's clerk—Bkpg. (1st)
2260—Onions, Mary, 16, Messrs. Bagnall's Sch., West Bromwich, pupil-teacher—Dom. Econ. (3d)
1956—Orchard, John, 17, Rugby Inst., railway clerk—Arith. (3d)
445—Osborn, Susanna M., 21, Chatham (St. Mary's Sch.), no occupation stated—Free-hd. Dwg. (3d)
948—Osborne, John C., 19, Glasgow M.I., warehouseman—French (3d)
2538—Oswald, Joseph, 18, Newcastle Ch. Inst., architect's pupil—Arith. (3d); Mensur. (3d)
1952—Over, Henry W., 18, Rugby Inst., clerk—Arith. (3d); Free-hd. Dwg. (2d)
1099—Owen, John, 34, Hulme (Christchurch) Inst., clerk—Bkpg. (3d)
1160—Oxborrow, Walter S., 18, Ipswich W.M. Coll., clerk—Bkpg. (2d)

1296—Page, John W. 25, Leeds Y.M. Chr. Assoc., post-office clerk—Arith. (2d)
1338—Palliser, John W., 20, Leeds Y.M. Christ. Assoc., librarian—Free-hd. Dwg. (1st); Pract. Geom. (3d)
1332—Palliser, Thomas A., 17, Leeds Y.M. Christ. Assoc., lithographer—Free-hd. Dwg. (2d)
475—Palmer, George H., 25, Cheltenham W.M. Club, ironmonger's assistant—French (3d)
1963—Palmer, Mary L., 16, Rugby Loc. Bd., no occupation stated—Dom.Econ. (3d); Free-hd. Dwg. (3d)
1689—Palmer, Thomas, 24, New Swindon M.I., clerk—Theo. of Mus. (1st); Mus. Comp. (3d)
2266—Panes, George, 18, Albert Inst., Weston-super-Mare, solicitor's clerk—Arith. (2d); Bkpg. (1st)
336—Park, James, 29, St. Mark's Sci. School, New Brompton, millwright—Mech. Dwg. (3d)
139—Parker, John, 17, Bacup M.I., weaver—Arith. (3d); Anim. Phys. (3d)
2245—Parker, John, 16, Wednesbury (St. John's), copying clerk—Arith. (3d); Free-hd. Dwg. (3d)

1193—Parker, William, 18, Lancaster M.I., chemist (apprentice)—Chem. (3d)
1540—Parkes, Henry G., 16, Stepney Deanery Loc. Bd., clerk—Arith. (3d)
1655—Parkes, Robert, 18, Manchester M.I., engraver—Arith. (1st); Bkpg. (2d)
1626—Parkes, Walter, 20, Manchester M.I., solicitor's clerk—Bkpg. (2d); Anim. Phys. (2d)
1663—Parkin, William, 17, Mossley M.I., piecer—Bkpg. (3d)
1604—Parkins, Sydney, 17, Manchester M.I., photographic artist—Bkpg. (3d)
24—Parkinson, Joseph, 20, Accrington M.I., druggist—Anim. Phys. (2d)
2524—Parkinson, William, 28, Liverpool Inst., gardener—Floric. (3d); Fruit and Veg. Cult. (3d)
1790—Partington, Henry, 20, Oldham Lyceum, railway servant—Arith. (3d)
1325—Parsonson, John E., 19, Leeds Y.M. Christ. Assoc., woollen draper—Eng. Hist. (2d); Eng. Lit. (3d)
1372—Pashler, Thomas, 19, Birkbeck Inst., clerk—Arith. (1st); Metric Syst. (1st)
18—Paterson, James S., 21, Aberdeen M.I., teacher—Alg. (3d)
244—Payne, James, jun., 31, Blandford Lit. Inst., solicitor's clerk—Civ. Gov. (2d)
380—Peaker, George, 30, Burrage-road Sci. Class, turner—Mech. Dwg. (2d)
495—Pear, Thomas, 17, Whitworth Sci. Sch., Cheltenham, pupil teacher—Free-hd. Dwg. (3d)
1363—Pearce, Frederic J., 19, Birkbeck Inst., clerk—Bkpg. (3d)
1852—Pearce, James J. G., 16, Penzance Inst., railway clerk—Eng. Hist. (2d): Eng. Lit. (3d)
813—Peat, David, 25, Pop. Evg. Classes Anderson. Univ., Glasgow, engineer—Arith. (2d)
814—Peebles, Robert, 27, Pop. Evg. Classes, Anderson. Univ., Glasgow, railway clerk—Arith. (1st); Bkpg. (3d)
2228—Pedley, William, 22, Walsall Ch. Inst., teacher—Anim. Phys. (3d)
1244—Pegler, Oliver, 21, Leeds M.I., mechanical student—Min. and Met. (1st) with 2d prize; Pract. Mech. (3d)
277—Pendlebury, James, 16, Bolton Ch. Inst., weaver Arith. (3d)
463—Pennach, Thomas, 18, Chelmsford L. and M.I., carpenter—Freehand Dwg. (2d)
375—Pennal, John, 26, Burrage-road Sci. Classes, turner—Pract. Geom. (3d)
2374—Penney, George F., 21, St. Paul's Sch., Deptford, engineer—Mech. Dwg. (3d)
284*—Pennington, Robert T., 24, Bolton Ch. Inst., warehouseman—Bkpg. (3d)
2035—Percival, Thomas, 19, Salford W. M.Coll., clerk—Arith. (3d); Bkpg. (2d)
1767—Perry, Thomas, 18, Oldham Lyceum, draughtsman—Mech. Dwg. (3d)
850—Pettigrew, Thomas, 20, Glasgow Ath., clerk—French (2d)
2390—Phillips, John W., 20, St. Paul's Sch., Deptford, engineer (apprentice)—Mech. Dwg. (2d)
1950—Phillips, Martha, 17, Rugby Loc. Bd., no occupation stated—Latin, &c. (3d)
1572—Phillips, Richard C., 22, Manchester M.I., sorter in post-office—Mus. Com. (3d)
2242—Phillips, William, 29, Wednesbury (St. John's) schoolmaster—Theo. of Mus. (3d)
1523—Phillpott, George E., 20, St. Stephen's (Westminster) Evg. Sch., clerk—Arith. (3d)
1003—Pickard, Sam, 22, Halifax M.I., railway clerk—Bkpg. (2d)
1514—Pickering, Edward, 18, Roy. Polyt. Inst., clerk—Mag. and Elect. (1st); Italian (2d)
286—Pickering, William F., 19, Bolton Ch. Inst., pawnbroker—Free-hd. Dwg. (2d); Anim. Phys. (3d)
1809—Pinkerton, William, 20, Paisley Artiz. Inst., house-painter—Theo. of Mus. (3d)
1462—Pickett, George, 26, City of Lond. Coll., clerk—Arith (2d); French (3d)
1263—Pickles, John J., 17, Leeds M.I., wholesale druggist's assistant—Chem. (3d)
1088—Pickwell, Robert, 19, Hull Young Peop. Chr. and Lit. Assoc., engineer (student)—Mensur. (3d); Princ. Mech. (3d)
119—Pike, Charles H., 22, Ashton and Dukinfield M.I., mechanic—Mech. Dwg. (3d)
1463—Pike, Evan V., 18, City of Lond. Coll., clerk—Arith. (1st); Bkpg. (1st)
2197—Pilkington, Joseph, 16, Tottington Lit. Inst., clerk—Arith. (3d)
2196—Pilkington, Thomas, 19, Tottington Lit. Inst., weaver—Arith. (3d)
141—Pilling, James, 19, Bacup M.I., weaver—Arith. (2d); Anim. Phys. (2d)
134—Pilling, John R., 20, Bacup M.I., book-keeper—Arith. (1st); Bkpg. (2d); Geog. (2d)
131—Pilling, William, 18, Bacup M.I., weaver—Arith. (3d); Anim. Phys. (3d)
1294—Pillow, Edward, 16, Leeds M.I., tool-maker—Eng. Hist. (2d)
209—Pilter, William T., 17, Birm. and Midl. Inst., paper salesman—Anim. Phys. (2d)
2468—Pinnock, Thomas, 20, Dudley M.I., clerk—French (3d)
75—Pitt, Michael, 19, Alnwick M.I., draper—Arith. (3d)
2036—Plant, Clement W. F., 20, Salford W.M. Coll., clerk—Free-hd. Dwg. (2d); Spanish (2d)
2215—Platt, James H., 26, Wakefield M.I., clerk—Bkpg. (3d)
1745—Platt, John, 21, Oldham Analytic Lit. Inst., turner—Pract. Geom. (3d)
2316—Poke, George H., 24, Woolwich Roy. Arsenal M.I., engineer—Mech. Dwg. (2d)
1464—Pollard, Henry T., 21, City of Lond. Coll., clerk—Pol. Econ. (1st) with 3rd prize of £2
1302—Pollard, William, 22, Leeds Y.M. Christ. Assoc., jeweller's assistant—Free-hd. Dwg. (3d)
2037—Pollitt, William, 17, Salford W.M. Coll., clerk—German (1st) with 2nd prize of £3; Eng. Hist. (1st) with 1st prize of £5; Free-hd Dwg. (2d)
2038—Poole, James H., 20, Salford W.M. Coll., salesman—Geog. (1st)
2—Pope, Samuel, 30, Aberdeen M.I., teacher of writing—Free-hd. Dwg. (1st)
464—Potter, Henry, 19, Chelmsford L. & M.I., coach-painter—Free-hd. Dwg. (1st), with 2d prize of £3
2535—Porteous, Joseph, 25, Newcastle Ch. Inst., tailor—Mus. Comp. (2d); Theo. of Music. (2d)
2133—Powell, Charles, 22, Southampton Ath., clerk—Bkpg. (2d); Alg. (3d); Light and Heat (3d)
2421—Powell, Edmund, 19, Worcester Mut. Imp. Assoc., clerk—Eng. Hist. (1st); Logic, &c. (1st); Eng. Lit. (3d)
1465—Powell, Henry B. T., 21, City of Lond. Coll., clerk—Bkpg. (2d)
210—Powell, Samuel R., 18, Birm. and Midl. Inst., clerk—Arith. (3d)
57—Preece, John, 27, Aldershot and Farnham Loc. Bd., private soldier—Arith. (2d)
211—Preston, Charles, 29, Birm. and Midl. Inst., clerk—Pract. Mech. (3d)
1483—Preston, Francis W., 23, Roy. Polyt. Inst., clerk—Mag. and Elect. (3d); Chem. (3d)
40—Preston, James, 20, Accrington M.I., book-keeper—Arith. (2d); Bkpg. (3d); Metric Syst. (3d)
26—Preston, Richard, 19, Accrington M.I., dyer—Arith. (2d); Metric Syst. (3d)
734—Priestley, George, 18, Gilford Loc. Bd., clerk—Arith. (2d)

2185—Prestwich, David, 16, Stockport Sund. Sch. Imp. Soc., factory operative—Arith (3d)
1466—Prince, William E., 19, City of Lond. Coll., builder—Arith. (1st); Dom. Econ. (1st), with prize of books to the amount of £1
323—Pritchard, William, 24, Bristol Y.M. Christ. Assoc., clerk—Bkpg. (3)
2040—Probert, Frederick, 20, Salford W.M. Coll., clerk—Arith. (2d); Free-hd. Dwg. (3d)
1108—Procter, George, 21, Hulme W.M. Inst., dyer—Chem. (2d)
2377—Prophet, William, 20, St. Paul's Sch., Deptford, engineer—Pract. Geom. (3d)
1024—Proven, John, 21, Halifax W.M. Coll., mechanic—Arith. (1st); Eng. Lit. (3d)
1660—Pullister, Thomas, 18, Middlesborough M.I., clerk—French (3d)
1288—Pullon, Joseph T., 18, Leeds M.I., mechanic—Mech. Dwg. (3d)
815—Purdie, Alexander H., 21, Pop. Evg. Classes Anderson. Univ., Glasgow, clerk—Bkpg. (3d)
2324—Purnell, William J., 22, Woolwich Roy. Arsenal M.I., turner—Pract. Geom. (3d); Mech. Dwg. (3d)

2306—Quick, James, 21, Woolwich Roy. Arsenal M.I., shipwright—Chem. (1st); Metric Syst. (3d); Anim. Phys. (3d)

816—Raitt, William, 23, Pop. Evg. Classes, Anderson. Univ., Glasgow, teacher—Chem. (2d)
1211—Ralph, William J., 20, Lancaster M.I., architect—Free-hd. Dwg. (2d)
332—Ramsay, Charles W., 34, St. Mark's Sci. Sch., New Brompton, sergeant, R.E.—Mech. Dwg. (3d)
2132—Ramsay, James D., 22, Southampton Ath., engineer—Mech. Dwg. (1st)
885—Rankin, William, 27, Glasgow M.I., mason—Mus. Comp. (3d); Theo. of Mus. (3d)
2153—Rathbone, Thomas H., 28, Stockport M.I., bookkeeper—Dom. Econ. (1st)
2473—Raybould, Thomas, 18, Dudley M.I., clerk—Anim. Phys. (3d)
2340—Reavill, George, 19, Woolwich Roy. Arsenal M.I., turner and fitter—Chem. (2d)
94—Reece, William, 19, S.E. Rail. M.I., engine smith—Arith. (3d)
1525—Rees, Turner J., 20, St. Stephen's (Westminster) Evg. Sch., assistant teacher—Bkpg. (3d)
2371—Rees, William, 29, St. John's Inst., Woolwich, pattern-maker—Mech. Dwg. (3d)
2492—Reeves, Walter, 30, Handsworth W.M. Club, glass painter—Free-hd. Dwg. (2d)
41*—Redhead, David, 19, Accrington M.I., labourer—Arith. (1st)
455—Relf, Joseph T., 18, Chatham M.I., fitter—Arith. (3d)
922—Rennie, John, 17, Glasgow M.I., clerk—Arith. (2d)
152—Renton, William, 18, Belfast L.I., flax dresser—Bkpg. (3d)
2432—Revell, Joe, 17, York Inst., glass stainer—Theo. of Mus. (3d); Free-hd. Dwg. (3d)
1093—Rhind, Edwin, 18, Hulme (Christ Church) Inst., assistant salesman—Arith. (3d)
1857—Richards, Barnes, 20, Penzance Inst., auctioneer's clerk—Free-hd. (2d); Mech. Dwg. (3d)
2496—Richards, Jeremiah, 26, Crewe M.I., engine-fitter—Arith. (2d)
1841—Richards, Joseph, 18, Pembroke Dock M.I., pupil teacher—Eng. Hist. (2d)
1309—Richardson, James, 23, Leeds Y.M., Christ. Assoc., mason—Free-hd Dwg. (3d)
1467—Richardson, John E., 22, City of Lond. Coll., clerk—Arith. (1st); Eng. Hist. (1st); Metric System (2d); Geog. (2)
1157—Ridyard, James, 16, Hyde M.I., joiner—Mag. and Elect. (3d)
1717—Ridyard, Robert, 19, Newton Heath Sci. Classes, clerk—Anim. Phys. (2d)
2553—Ridge, Thomas H., 27, Beauvoir Coll. Evg. Classes, solicitor's clerk—Music Comp. (1st)
1467*—Rigg, Thomas, 23, City of Lond. Coll., clerk—Civ. Gov. (2d); Eng. Lit. (3d)
1102—Riley, Aaron, 29, Hulme W.M. Inst., plumber—Anim. Phys. (3d)
2041—Riley, Thomas, 32, Salford W.M. Coll., clerk—Spanish (2d)
1374—Riorden, George J., 18, Birkbeck Inst., engraver—Arith. (1st)
1494— ——— also of the Roy. Polyt. Inst.—French (2d)
700—Ritchie, William, 22, Edinb. Watt Inst., gardener—Fruit and Veg. Cult. (2d); Arith. (3d)
215—Rock, Rose S., 21, Birm. and Midl. Inst., no occupation given—Latin and Roman Hist. (2d)
1401—Robbins, George F., 24, Birkbeck Inst., lithographer—French (3d)
2042—Roberts, Hugh, 16, Salford W.M. Coll., letter-press printer—Arith. (3d)
2044—Roberts, John, 27, Salford W.M. Coll., warehouseman—Free-hd. Dwg. (3d)
2043—Roberts, John C., 18, Salford W.M. Coll., pupil teacher—Arith. (3d); Geog. (2d)
213—Roberts, Thomas, 25, Birm. and Midl. Inst., chemist—Met. Syst. (1st); Mag. and Elect. (3d)
2550—Robertshaw, Frank L., 26, Beauvoir Coll. Evg. Classes, agent—Mus. Comp. (2d)
638—Robins, Samuel J., 17, Devonport M.I., engineer (student)—Arith. (1st); Mensur. (2d)
1025—Robinson, Charles T., 17, Halifax W.M. Coll., grocer's assistant—Chem. (2d)
145—Robinson, James, 16, Belfast Peop. Lit. Inst., no occupation stated—Bkpg. (3d)
1245—Robinson, John, 16, Leeds M.I., pawnbroker—Chem. (3d)
458—Robinson, Robert, 22, St. Mary's Science School, Chatham, joiner—Pract. Geom. (3d)
2045—Robinson, Robert H., 24, Salford W.M. Coll., agent—Arith. (3d)
51—Robinson, William, 29, Aldershot and Farnham Loc. Bd., private R.H.A.—Mensur. (3d)
891—Roddie, William S., 23, Glasgow M.I., engraver—Mus. Comp. (2d), Theo. of Mus. (2d)
1498—Rodmell, George, 18, Roy. Polyt. Inst., clerk—Mag. and Elect. (3d); Anim. Phys. (3d); Free-hd. Dwg. (3d)
2089—Rogers, Isaac M., 16, Sheerness Dockyard Inst., caulker (apprentice)—Arith. (3d)
1359—Rogulski, Edward, 24, Birkbeck Lit. Inst., warehouseman—French (2d)
1049—Rookby, Ralph, 18, Hertford Lit. and Sci. Inst., upholsterer's apprentice—Arith. (3d)
2046—Roles, John, 18, Salford W.M. Coll., warehouseman—Arith. (3d)
530—Rose, Robert, 18, Compstall Lit. and Reading Soc., self-actor minder—Arith. (2d); Anim. Phys. (3d)
531—Rose, Samuel, 21, Compstall Ath., self-actor minder—Anim. Phys. (3d)
1627—Rosenberg, Harry, 17, Manchester M.I., clerk—German (2d); Bkpg. (3d)
820—Ross, George, 34, Pop. Evg. Classes, Anderson. Univ., Glasgow, tailor—Botany (3d)
1703—Ross, John A. G., 28, Newcastle M.I., draughtsman—Mech. Dwg. (2d); Pract. Geom. (3d)
855—Ross, Walter, 20, Glasgow Ath., clerk—French (2d)
821—Ross, Zachary M. H., 17, Pop. Evg. Classes, Anderson. Univ., Glasgow, librarian—Arith. (1st)
1038—Rostron, Edward C., 21, Haslingden M.I., warehouseman—Arith. (2d); Eng. Lit. (3d)
2279—Rowley, John, 16, Wolverhampton, St. Peter's Inst., teacher—Arith. (3d); Eng. Hist. (2d)

2065—Rule, Thomas, 17, Sheerness Dockyard Inst., engineer (student)—Arith. (2d); Eng. Hist. (1st); Alg. (3d)
2167—Rushton, Cephas M., 19, Stockport Sund. Sch. Impr. Soc., factory operative—Arith. (3d)
292—Rushworth, Aquilla, 19, Bradford M.I., overlooker Arith. (3d)
2233—Russell, John, 19, Walsall Ch. Inst., clerk—Mag. and Elect. (2d)
216—Russell, Samuel, 17, Birm. and Midl. Inst., weighing-machine filer—Arith. (3d)
462—Raven, Arthur J., 18, Chelmsford L. and M.I., house painter (apprentice)—Free-hd. Dwg. (2d)
1469—Ryan, Andrew J., 23, City of Lond. Coll., clerk—Bkpg. (1st)

1403—Saegert, Alma M. J., 19, Birkbeck Inst., no occupation stated—Eng. Lit. (1st) with 2d prize of £3, and also the prize for female candidates of £2
822—Sandeman, Boswell, 22, Pop. Evg. Classes, Anderson. Univ., Glasgow, salesman—Eng. Lit. (3d)
823—Sandeman, Mary Ann, 32, Pop. Evg. Classes, Anderson. Univ., Glasgow, no occupation stated—Theo. of Mus. (1st)
1755—Sands, Joshua, 24, Oldham Analytic Lit. Inst., pattern-maker—Pract. Geom. (3d)
824—Saunders, James, 19, Pop. Evg. Classes, Anderson. Univ., Glasgow, clerk—Eng. Lit. (3d)
733—Schofield, Alfred E., 18, Freetown W.M. Inst., printer—Arith. (3d)
555—Schofield, James H. 19, Crawshawbooth Lit. and M.I., clerk—Arith. (3rd); Bkpg. (3d)
1584—Scholes, Thomas, 25, Manchester M.I., bookkeeper—Anim. Phys. (3d)
826—Scouller, John, 23, Pop. Evg. Classes, Anderson. Univ., Glasgow, clerk—Mus. Comp. (2d); Theo. of Mus. (2d)
892—Scobbie, Andrew, 20, Glasgow M.I., smith—Mus. Comp. (3d); Theo. of Mus. (3d)
2246—Scott, Edward M., 22, Wednesbury (St. John's) clerk—Free-hd. Dwg. (3d)
825—Scott, George, 21, Pop. Evg. Classes, Anderson. Univ., Glasgow, watchmaker—Mag. and Elect. (3d); Anim. Phys. (3d)
2229—Scott, John, 17, Walsall Ch. Inst., clerk—Geog. (2d)
415—Scott, William, 17, Carlisle M.I., clerk—Arith. (1st)
1875—Scotten, William, 19, Portsmouth Loc. Bd., engineer (student)—Chem. (1st); Mag. and Elect. (2d)
2084—Scutt, George E., 16, Sheerness Dockyard Inst., shipwright (apprentice)—Arith. (3d)
1115—Seddon, William, 20, Hulme W.M. Inst., calligrapher—Chem. (3d)
573—Sedgwick, Thomas T., 25, Darlington Ch. Inst., grocer—Logic, &c. (2d)
12—Selbie, William, 18, Aberdeen M.I., clerk—Arith. (2d); Bkpg. (3d)
217—Sellman, Edward George, 19, Birm. and Midl. Loc. Bd., civil service—Eng. Hist. (2d)
1470—Sentance, Edmund F., 23, City of Lond. Coll., clerk—French (1st)
1241—Severs, Samuel T., 22, Leeds M.I., druggist—Chem. (3d)
2307—Shackleton, Henry, 24, Woolwich Roy. Arsenal M.I., iron turner—Pract. Geom. (3d); Pract. Mech. (3d); Mech. Dwg. (3d)
639—Shapcott, Richard A., 17, Devonport M.I., engineer (student)—French (3d)
1066—Shaw, John Edward, 20, Huddersfield M.I., warehouseman—Free-hd. Dwg. (1st)
1032—Shaw, Joseph, 24, Halifax W.M. Coll., weaver—Eng. Hist. (3d)
560—Shaw, William, 19, Darlington Ch. of Eng. Inst., accountant—Logic, &c. (2d)
1630—Shaw, William J., 18, Manchester M.I., clerk—Bkpg. (2d)
1322—Sheard, John, 18, Leeds Y.M. Christ. Assoc., porter—Arith. (3d)
2285—Shekelton, John H., 22, Wolverhampton (St. Peter's), clerk—Anim. Phys. (3d)
2232—Sheldon, Arthur E., 18, Walsall Ch. Inst., chemist and druggist—Chem. (2d)
706—Shepherd, David L., 22, Edinburgh Watt Inst., telegraph clerk—French (3d)
3—Shepherd, James, 20, Aberdeen M.I., merchant—French (3d)
1774—Shepherd, Joe, 17, Oldham Lyceum, mechanic—Mech. Dwg. (3d)
180—Shepherd, John, 24, Bewdley and Wribbenhall W.M. Inst., grocer's assistant—Arith. (3d)
1027—Shepherd, Sam, 20, Halifax W.M. Coll., overlooker—Arith. (3d)
178—Shepherd, Walter, 17, Bewdley and Wribbenhall W.M. Inst., draughtsman—Arith. (3d)
1158—Sheppard, Alfred, 19, Ipswich W.M. Coll., clerk—Bkpg. (1st)
828—Shirra, Robert, 27, Pop. Evg. Classes, Anderson. Univ., Glasgow, draper's assistant—Anim. Phys. (2d)
1874—Shirvell, James, 17, Portsmouth Loc. Bd., engineer (student)—Arith. (1st)
640—Showan, Thomas, 23, Devonport M.I., teacher—Eng. Hist. (1st)
2522—Shore, William J., 16, Liverpool Inst., assistant ship and comm. agent—Arith. (3d); Eng. Hist. (2d); Geog. (2d)
2050—Shorrocks, Walter, jun., 19, Salford W.M. Coll., warehouseman—Bkpg. (3d)
2471—Sidaway, Joseph, 18, Dudley M.I., pupil-teacher—Anim. Phys. (3d)
2462*—Side, Bartram, 16, Lambeth Evg. Classes, carpenter—Arith. (2d)
218—Sidley, William H., 23, Birm. and Midl. Inst., clerk—Arith. (3d)
301—Silverwood, Leonard, 20, Bradford M.I., clerk—Bkpg. (1st); Geog. (3d)
8—Sim, John, 16, Aberdeen M.I., law clerk—French (3d)
2049—Simmons, Henry, 23, Salford W.M. Coll., clerk—Bkpg. (2d)
501*—Simmons, Thomas C., 26, Whitworth Sci. Sch., Cheltenham, teacher of drawing—Free-hd. Dwg. (1st); Pract. Geom. (3d); Mech. Dwg. (3d)
984—Simmons, Thomas H., 22, Gloucester Sch. of Art, printer—French (3d)
219—Simpkin, Samuel J., 19, Birm. and Midl. Inst., pupil-teacher—Chem. (2d)
285—Simpson, Jonathan, 18, Bolton Ch. Inst., surveyor—Free-hd. Dwg. (2d)
862—Simpson, William, 19, Glasgow Ath., clerk—Bkpg. (2d)
2146—Sims, Edward T., jun., 21, Southampton Ath., clerk—Eng. Lit. (1st) with 1st prize of £5; Logic, &c. (1st); Mag. and Elect. (2d)
2047—Simister, Anne B., 32, Salford W.M. Coll., teacher—Free-hd. Dwg. (2d)
7—Singer, William, 21, Aberdeen M.I., railway clerk—Eng. Lit. (3d)
994—Siveter, William A., 21, Gloucester Sch. of Art, solicitor's clerk—French (3d)
21—Skea, William, 21, Aberdeen M.I., compositor—Eng. Lit. (3d)
2144—Skeats, Frank J., 23, Southampton Ath., clerk—Arith. (1st); Eng. Hist. (2d); Geog. (3d)
496—Slatter, George W., 17, Whitworth Sci. Sch., Cheltenham, plumber—Anim. Phys. (2d); Chem. (3d)
682—Slee, John, 19, Earlestown Mut. Imp. Soc., millwright—Free-hd. Dwg. (3d); Mech. Dwg. (3d)
863—Sloan, James R., 20, Glasgow Ath., manufacturer—Bkpg. (2d)

459—Smee, Alfred, 26, Chelmsford Lit. & Mech. Inst., clerk in a provident office—Bkpg. (2d)
2240—Smith, Alfred B., 17, Wednesbury (St. John's), fitter and turner—Free-hd. Dwg. (3d)
1719—Smith, Alfred J., 22, Northampton Museum—Mag. and Elect. (3d)
1876—Smith, Alfred W., 19, Portsmouth Loc. Bd., shipwright (apprentice)—Arith. (1st) with 2nd prize of £3; Alg. (1st)
1283—Smith, Arthur, 16, Leeds M.I., civil service (proposed—Arith. (1st); Eng. Hist. (2d); Geog. (2d)
1028—Smith, David, 20, Halifax W.M. Coll. wool sorter—Bkpg. (3d)
2338—Smith, George, 17, Woolwich Roy. Arsenal M.I., laboratory assistant—Chem. (1st); Mag. and Elect. (3d)
1385—Smith, George L., 21, Birkbeck Inst., clerk—Bkpg (2d)
2327—Smith, Henry H., 22, Woolwich Roy. Arsenal M.I., turner—Chem. (2d); Mag. and Elect. (3d)
294—Smith, James, 23, Bradford M.I, clerk—Polit. Econ. (2d)
1946—Smith, John, 27, Richmond Par. Lib., gardener—Flori. (1st); Fruit and Veg. Cult. (1st)
830—Smith, John H., 25, Pop. Evg. Classes, Anderson. Univ., Glasgow, traveller—Anim. Phys. (3d)
287—Smith, Joseph, 22, Bolton Ch. Inst., assistant schoolmaster—Arith. (1st); Eng. Hist. (2d); Geog. (3d); Free-hd. Dwg. (3d)
1029—Smith, Joseph, 17, Halifax W.M. Coll., warehouseman—Bkpg. (3d)
1406—Smith, Martha, 23, Birkbeck Inst., no occupation stated—Arith. (2d); Anim. Phys. (2d); Bkpg. (3d)
1089—Smith, Thomas, 18, Hull Christ. and Lit. Assoc., gardener—Fruit and Veg. Cult. (2d); Floric. (3d); Bkpg. (3d)
295—Smith, Thomas, 17, Bradford M.I., painter—Arith. (2d)
2466—Smith, Walter, 18, Dudley M.I., solicitor's clerk—Arith. (1st); Bkpg. (3d)
381*-Smith, William R., 19, Burrage-road Sci. Sch., writer—Anim. Phys. (1st)
335—Snaden, John, 25, St. Mark's Sci. Sch., New Brompton, sergeant Royal Engineers—Mech. Dwg. (2d); Pract. Geom. (3d)
1057—Snaith, William A., 36, Huddersfield M.I., schoolmaster—Chem. (3d)
832—Sneddon, James, 35, Pop. Evg. Classes, Anderson. Univ., Glasgow, time-keeper—Mus. Comp. (2d)
333—Snowdon, John, 26, St. Mark's Sci. Sch., New Brompton, engine fitter—Mech. Dwg. (3d)
833—Somerville, George, 18, Pop. Evg. Classes, Andersonian Univ., Glasgow, power-loom tenter—Bkpg. (2d); Anim. Phys. (2d)
834—Sommerville, Joseph, 23, Pop. Evg. Classes, Anderson. Univ. Glasgow, joiner—Anim. Phys. (3)
641—Soper, Thomas, 17, Devonport M.I., engineer (student)—Arith (1st); Mensur. (1st)
2099—Spears, Alexander, 16, Sheerness Dockyard Inst., pattern maker—Eng. Hist. (2d)
221—Spencer, John, 23, Birm. and Midl. Inst., clerk—Bkpg. (3d)
2464—Spencer, Mary, 22, Dudley M.I., schoolmistress—Anim. Phys. (2d)
1880—Spencer, Richard, 17, Preston M.I., pupil teacher—Freehand Dwg. (3d)
63—Spink, William, 25, Alnwick M.I., clerk—Freehand Dwg. (2d)
1504—Spriggs, Henry, 19, Roy. Polyt. Inst., draper—Arith. (1st); Bkpg. (1st), with 2d prize of £3
1402—Spyker, Catherine, 22, Birkbeck Inst., no occupation stated—French (2d)
1392—Spyker, John, 36, Birkbeck Inst., clerk—Polit. Econ. (1st)
1237—Stables, W. S., 17, Leeds M.I., chemist and druggist—Chem. (2d)
642—Stanbury, William, 21, Devonport M.I., clerk—German (1st), with 1st prize
89—Standing, William B., 18, S.E. Railway M.I., engine-turner's apprentice—Arith. (3d)
1169—Stanley, Morley, 17, Keswick M.I., draper—Arith. (3d)
468—Stannard, Charles R., 16, Chelmsford L. & M.I., grocer—Free-hd. Dwg. (3d)
2284—Stanier, Thomas W., 21, Wolverhampton (St. Peter's) Inst., railway clerk—Alg. (2d)
2281—Stanier, William H., 20, Wolverhampton (St. Peter's), Inst., railway clerk—Bkpg. (1st), with 1st price of £5; Metric Syst. (1st); Geom. (2d); Trig. (2d)
1031—Stansfield, William, 18, Halifax W.M. Coll., wool-sorter—Bkpg. (2d)
2360—Stanton, George, 27, St. Michael's, Woolwich, Sci. Sch., metal-turner—Prac. Geom. (3d)
1210—Stanton, John S., 16, Lancaster M.I., mechanic—Mech. Dwg. (3d); Free-hd. Dwg. (3d)
1092—Starr, Edward, jun., 19, Hull Christ. and Lit. Inst., architect's pupil—Free-hd. Dwg. (3d)
222—Steed, Augustus J., 18, Birm. and Midl. Inst., lawyer's clerk—Geom. (3d)
2051—Steele, Thomas, 23, Salford W.M. Coll., mercantile clerk—Bkpg. (2d)
306—Stephenson, Albert, 19, Bradford M.I., clerk—Arith. (3d)
574—Stephenson, John T., 23, Darlington Ch. Inst., accountant—Logic, &c. (2d)
1086—Stephenson, William, 24, Hull Y. People's Christ. and Lit. Assoc., clerk—Arith. (1st); Bkpg. (1st); Mensur. (2d); Geog. (2d)
865—Stewart, James, 17, Glasgow Ath., clerk—Arith. (2d)
2549—Stevenson, Henry, 33, Beauvoir Coll. Evg. Classes, jewel-case maker—Mus. Comp. (1st)
898—Stevenson, John, junr., 20, Glasgow M.I., mech. engineer—Arith. (2d)
2190—Stokeld, Joseph T., 18, Stockton M.I., printer—Arith. (3d)
1215—Stockdale, Thomas, 16, Lancaster M.I., pupil teacher—Free-hd. Dwg. (3d)
45—Stokes, Richard G., 19, Alderley Edge M.I., —Theo. of Mus. (3d)
2397—Stone, John W., 16, St. Thomas' School, Woolwich, writer—Prac. Geom. (3d)
1109—Stoneley, William, 20, Christ Church (Hulme) Inst., maker-up—Arith. (3d)
720—Stott, Henry, senr., 29, Failsworth M.I., science teacher—Pract. Geom. (2d)
724—Stott, Henry, junr., 22, Failsworth M.I., science teacher—Pract. Geom. (3d)
1101—Stott, Thomas, 19, Hulme W.M. Inst., agent—Chem. (2d); Anim. Phys. (2d)
893—Stirling, James, 42, Glasgow M.I., hatter—Mus. Comp. (2d)
1471—Stubbs, John, 37, City of Lond. Coll., teacher of charity school—French (3d)
1797—Sugden, Thomas, 19, Oldham Lyceum, mechanic—Mech. Dwg. (2d); Pract. Mech. (3d)
1181—Suggett, Samuel, 16, King's Lynn Ath., merchant's clerk—Arith. (1st)
2088—Sullivan, Timothy, 17, Sheerness Dockyard Inst., engineer (student)—Alg. (2d)
132—Sutcliffe, George W., 20, Bacup Mech. Inst., warehouseman—Pract. Geom. (3d); Pract. Mech. (2d)
133—Sutcliffe, John, junr., 16, Bacup M.I., weaver—Pract. Geom. (3d); Mech. Dwg. (3d); Bkpg. (3d)
1030—Sutcliffe, Joseph A., 19, Halifax W.M. Coll., maker up—Bkpg. (3d)
2180—Sutton, Henry, 18, Stockport Sunday Sch. Imp. Society, warehouseman—Anim. Phys. (3d)
490—Sutters, William, 16, Whitworth Sch. of Sci., Cheltenham, no occupation stated—Free-hd. Dwg. (3d)

1548—Swain, Thomas, 17, Stepney Deanery Loc. Bd., engineer (apprentice)—Arith. (2d)
1669*-Swann, William, 16, New Mills M.I., tenter—Arith. (1st)
1376—Sweeting, Robert D., 25, Birkbeck Inst., teacher—Arith. (2d)
2184—Swindells, William, 22, Stockport Sun. Sch. Imp Soc., watchmaker—Free-hd. Dwg. (3d)
1833—Swirles, Arthur, 17, Patricroft M.I., mill hand—Arith. (3d)
1320—Sykes, Thomas, 17, Leeds Y.M. Christ. Assoc., clerk—Free-hd. Dwg. (3d)
1883—Syms, Thomas, 18, Preston Inst., wine merchant—Anim. Phys. (1st); Arith. (2d)

2342—Tailby, William, 20, Woolwich Roy. Arsenal M I, carpenter—Arith. (3d)
13—Tait, James, 27, Aberdeen M.I., clerk—German (3d)
276—Talbot, Thomas, 16, Bolton Ch. Inst., pattern maker—Arith. (3d)
1521—Tapp, George W. H., 20, St. Stephen's (Westm.) Evg. Sch., clerk—Bkpg. (2d)
2525—Tate, Walter, 23, Liverpool Inst., clerk—Chem. (1st)
1506—Taylor, Frederick, 22, Roy. Polyt. Inst., clerk—Bkpg. (2d)
2129—Taylor, Henry P., 19, Southampton Ath., clerk—Arith. (3d); Free-hd. Dwg. (2d)
1072—Taylor, Herbert, 16, Huddersfield M.I., office-boy—Free-hd. Dwg. (3d)
1590—Taylor, James, 20, Manchester M.I., clerk—Latin and Rom. Hist. (1st) with 2nd prize of £3
137—Taylor, James H., 20, Bacup M.I., roller-coverer—Anim. Phys. (3d)
1608—Taylor, John, 21, Manchester M.I., warehouseman—Bkpg. (2d)
400—Taylor, Joseph, 18, Bury Ath., mechanic—Free-hd. Dwg. (3d)
2149—Taylor, Samuel, 18, Stockport M.I., book-keeper Arith. (1st)
382—Taylor, William, 19, Bury Ath., dyer—Arith. (2d); Eng. Hist. (2d)
1748—Taylor, William, 16, Oldham Analytic Lit. Inst., warehouseman—Arith. (1st); Mensur. (3d)
571—Teasdale, Thomas, 20, Darlington Ch. Inst., clerk—Logic, &c. (1st) with 1st prize.
1592—Teggin, Edward, 17, Manchester M.I., mechanical engineer—Bkpg. (1st); Mech. Dwg. (3d)
1048—Tekell, John S., 17, Hertford Lit. & Sci. Inst., clerk—Arith. (1st)
2416—Tench, Richard J., 20, Rectory-place Sch., Woolwich, engineer (student)—Arith. (2d)
1533—Terrell, George J., 18, Stepney Deanery Loc. Bd., shipwright (apprentice)—Arith. (2d)
1535—Terrell, James, 16, Stepney Deanery Loc. Bd., clerk—Arith. (2d)
293—Terry, Sam, 18, Bradford M.I., woolsorter—Arith. (3d)
1098—Tetlow, Walter F., 17, Christchurch Inst., Hulme, warehouseman—Arith. (3d)
1297—Thackrah, Walter W., 19, Leeds Y.M. Chr. Assoc., teacher—Arith. (3d); Free-hd. Dwg. (3d)
1967—Theed, Sophia J., 16, Rugby Loc. Bd., of no occupation—Dom. Econ. (3d); Free-hd. Dwg. (3d)
883—Thom, Andrew H., 19, Glasgow M.I., assistant teacher—Mus. Com. (1st); Theo. of Mus. (1st)
1080—Thomas, Joel, 17, Huddersfield M.I., gilder—Free-hd. Dwg. (3d)
2313—Thomas, Joseph H., 18, Woolwich Roy. Arsenal M.I., draughtsman—Mech. Dwg. (2d)
2507—Thomas, Walter W., 18, Liverpool Inst., clerk—Free-hd. Dwg. (3d)
1721—Thompson, Beeby, 20, Northampton Museum—Mag. and Elect. (3d)
350—Thompson, James, 27, Burnley M.I., book-keeper—Prac. Geom. (3d); Mensur. (3d)
1972—Thompson, Jane M., 19, Rugby Loc. Bd. governess—Dom. Econ. (3d)
2372—Thompson, Robert, 29, St. John's Inst., Woolwich, brass-finisher—Pract. Geom. (3d)
1033—Thompson, Walter, 17, Halifax W.M. Coll., warehouseman—Bkpg. (2d)
837—Thomson, Robert, 28, Pop. Evg. Classes, Anderson. Univ., Glasgow, music-seller—Theo. of Mus. (2d)
2241—Thomson, Spencer P., 16, Wednesbury (St. John's), machinist—Arith. (3d); Free-hd. Dwg. (3d)
344—Thornber, Thomas, 22, Burnley M.I., warehouseman—Anim. Phys. (2d)
1472—Thorne, Samuel, 21, City of Lond Coll., clerk—Bkpg. (2d)
583—Thornley, Joseph, 19, Dean Mills Inst., hand-mule cotton spinner—Arith. (3d)
1670*-Thornley, Richard, 19, New Mills M.I., book-keeper—Arith. (3d)
1550—Thornton, Robert P., 17, Stepney Deanery Loc. Bd., engineer—Arith. (2d)
387—Thornton, Thomas, 23, Bury Ath., joiner—Pract. Geom. (2d)
1077—Thorp, Edward, 22, Huddersfield M.I., foreman (woollen trade)—Chem. (2d); English Lit. (3d)
1611—Thorp, Henry, 17, Manchester M.I., draper's assistant—French (3d)
408—Thorpe, Alfred, 18, Carlisle M.I., clerk—Arith. (2d)
1334—Tiffany, John B., 25, Leeds Y.M. Christ. Assoc., tobacco manufacturer—Trigon. (1st)
1180—Tilson, Edward, 25, King's Lynn Ath., clerk—Arith. (3d)
79—Todd, Robert, 27, Alnwick M.I., gardener—Chem. (3d)
838—Todd, Robert, 22, Pop. Evg Classes, Anderson. Univ., Glasgow, law clerk—Anim. Phys. (3d)
1259—Todd, William, 22, Leeds M.I, woollen manufacturer—Botany (3d)
992—Tomes, William J., 22, Gloucester Sch. of Art, draper's assist.—French (3d)
2497—Tomlinson, John J., 24, Crewe M.I., engine fitter—Arith. (2d)
272—Tonge, James, 31, Bolton Ch. Inst., colliery surveyor—Arith. (1st)
362—Tonge, Harry, 16, Burrage-road Sci. Classes, joiner—Mech. Dwg. (3d)
389—Tox, John, 20, Bury Ath., engineer—Pract. Geom. (3d)
644—Treleaven, Joseph Thomas, 24, Devonport M.I., shipwright H.M. dockyard—Geog. (1st), with 2d prize of £3; Bkpg. (2d)
730—Tritton, John D., 20, Faversham Inst., mast and block maker—Mensur. (3d)
1812—Treacy, Thomas, 23, Parsonstown Y.M. Christ. Assoc., grocer's assist.—Bkpg. (3d)
2544—Treverton, George F., 30, Beauvoir Coll. Evg. Classes, fancy box manufacturer—Music Comp. (1st)
1858—Trounson, John W., 20, Penzance Inst., builder's clerk—Free-hd. Dwg. (3d)
2345—Tucker, Charles, 19, Woolwich Roy. Arsenal M.I., blacksmith—Arith (2d)
1676—Tuffnell, Thomas W., 18, New Swindon M.I., clerk—Arith. (3d)
917—Turnbull, John, jun., 27, Glasgow M.I., engineer—Prac. Mech. (3d); Mech. Dwg. (2)
1636—Turner, Charles H., 16, Manchester M.I., warehouseman—Bkpg. (1st)
1524—Turner, George, 27, St. Stephen's (Westm.) Evg. Sch., clerk—Bkpg. (3d)
1185—Turner, Samuel, 48, Lancaster M.I., certificated teacher—Chem. (2d); Anim. Phys. (2d)
2134—Turner, William H., 17, Southampton Ath., telegraph clerk—Chem. (2d)

2520—Turton, Fletcher T., 16, Liverpool Inst., surveyor —Arith. (1st); Chem. (1st)
1678—Turnbull, George, 19, New Swindon M.I., engine erector—Arith (2d)
541—Twohig, Thomas, 17, Cork Y.M. Soc., accountant —Eng. Hist. (2d)
1284—Tyson, William, 18, Leeds M.I., occupation not determined—Eng. Hist. (2d); Geog. (2d)

1848—Vaughan, James R., 17, Pembroke Dock M.I., shipwright (apprentice)—Geog. (2d)
2052—Vaughan, Thomas, 19, Salford W.M. Coll., clerk—Bkpg. (2d)
1289—Vaux, Walter, 17, Leeds M.I., engineer—Arith. (2d)
1853—Vingoe, Alexander L., 17, Penzance Local Board, pupil teacher—Theory of Mus. (1st)
2348—Vinicombe, Charles, 20, Woolwich Roy. Arsenal M.I., mechanic (science teacher)—Mech. Dwg. (2d); Pract. Geom. (3d)
979—Vinson, Samuel J., 17, Gloucester School of Art, clerk—French (3d)
1577—Vosper, Henry, 19, Manchester M.I., clerk—Eng. Hist. (2d); Anim. Phys. (1st) with 2nd prize of £3

1642—Wade, Charles H., 16, Manchester M.I., no occupation stated—Anim. Phys. (3d)
1163—Wade, Edwin E., 17, Ipswich W.M. Coll., solicitor's clerk—Bkpg. (2d)
1897—Wade, George A., 21, Preston Inst., certificated teacher—Pract. Geom. (3d)
1923—Waddington, Hiram, 21, Rawtenstall M.I., joiner —Mech. Dwg. (3d)
2350—Wagg, Frederick, 21, Woolwich Roy. Arsenal M.I., wheelwright—Arith. (3d)
645—Waghorn, John W. W., 20, Devonport M.I., engineer (student)—Conic Sect. (1st); Trigon. (2d); Mensur. (2d); Princ. Mech. (2d)
2433—Wain, John, 16, York Inst., monitor—Arith. (3d)
224—Wainwright, Thomas J., 19, Birm. and Midl. Inst., gold and silver engraver—Anim. Phys. (3d)
1279—Wainwright, Walter, 16, Leeds M.I., grease maker, &c. Arith. (3d)
225—Waite, Harriet S., 22, Birm. and Midl. Inst., no occupation stated—Metric Syst. (2d); Chem. (2d)
646—Wakeham, William P., 16, Devonport M.I., engineer (student)—Navig., &c. (2d)
226—Waldron, Joseph T., 23, Birm. and Midl. Inst., mechanical draughtsman—Pract. Mech. (3d)
647—Walke, Andrew J., 17, Devonport M.I., engineer (student)—Mensur. (1st) with 2d prize of £3; Geom. (3d)
1474—Walker, Daniel, 36, City of Lond. Coll., shopman—Arith. (2d); Alg. (3d)
412—Walker, James, jun., 17, Carlisle M.I., architect—Arith. (2d)
1527—Walker, John, 17, Stepney Deanery Loc. Bd., pupil teacher—Arith. (3d)
1969—Walker, Kate, 16, Rugby Loc. Bd., no occupation stated—German (2d); French (3d)
519—Walker, Robert, 20, Compstall M.I., mechanic—Pract. Geom. (3d); Mec. Dwg. (3d)
2219—Walker, Robert, 21, Wakefield M.I., mat maker —Arith. (3d)
2082—Walker, William, 19, Sheerness Dockyard Inst., engineer (student)—Eng. Hist. (2d); Mensur. (3d)
17—Walker, William P. S., 27, Aberdeen M.I., clerk —Logic, &c. (2d)
1680—Wall, George H., 29, New Swindon M.I., brass finisher—Bkpg. (2d)
861—Wallace, James, 17, Glasgow Ath., no occupation stated—Bkpg. (1st)
406—Wallace, John, 18, Carlisle M.I., clerk—Arith. (2d); Bkpg. (2d)
1365—Wallington, Emma S. S., 28, Birkbeck Inst., no occupation stated—Polit. Econ. (3d)
357—Walmsley, Thomas, 21, Burnley Ch. Lit. Inst., joiner—Anim. Phys. (2d)
50—Walton, Thomas, 28, Aldershot and Farnham Loc. Bd., private R.H.A.—Geog. (3d)
2415—Walton, William, 20, Rectory-place Sch., Woolwich, engineer—Arith. (1st); Chem. (2d); Alg. (3d).
1567—Walwyn, Frederick A., 17, Macclesfield Useful Know. Soc., clerk—Arith. (2d)
1351—Want, George W., 22, Beauvoir Coll., cabinet-maker—Theo. of Mus. (2d); Mus. Comp. (3d)
348—Ward, Henry T., 20, Burnley M.I., ironmonger —Chem. (3d)
1791—Ward, Samuel, 18, Oldham Lyceum, clerk—Civ. Gov. (2d); French (3d)
300—Ward, Thomas L., 17, Bradford M.I., mercantile clerk—Arith. (1st)
1220—Wardle, Frederick, 20, Leeds Ch. Inst., clerk—German (3d)
1610—Wardle, John, 17, Manchester M.I., clerk—French (3d)
1510—Warner, Alfred E., 25, Roy. Polyt. Inst., seal-engraver—Eng. Hist. (2d); Mensur. (2d); Latin, &c. (2d)
728—Warr, Thomas, 29, Faversham Inst., bookseller and printer—Mus. Comp. (2d); Theory of Mus. (3d)
1859—Warren, James, 17, Penzance Loc. Bd., carpenter (apprentice)—Free-hd. Dwg. (2d)
1549—Waterson, Francis J., 17, Stepney Deanery Loc. Bd., pilot (apprentice)—Arith. (1st)
1807—Waterston, Marion, 18, Paisley Artiz. Inst., mill-worker—Theo. of Mus. (2d)
1808—Waterston, Margaret, 20, Paisley Artiz. Inst., mill-worker—Theo. of Mus. (3d)
1877—Watts, Luther, 20, Portsmouth Loc. Bd., engineer (student)—Con. Sec. (2d); Alg. (2d); Trigon. (3d)
228—Watson, Charles J., 21, Birm. and Midl. Inst., grocer—Chem. (1st)
1544—Watson, David G., 21, Stepney Deanery Loc. Bd., engineer—Arith. (1st); Mensur. (2d)
1794—Watson, Joseph, 26, Oldham Lyceum, grinder (card-room)—Arith. (3d); Bkpg. (3d)
491—Way, George A., 17, Whitworth Sch. of Sci., Cheltenham, pupil-teacher—Geog. (3d)
2227—Webb, William H., 22, Walsall Ch. Inst., teacher —Polit. Econ. (3d); Anim. Phys. (3d)
103—Welsh, Charles, 18, S.E. Rail. M.I., railway accountant's clerk—Arith. (1st)
928—Weir, Joseph, 19, Glasgow M.I., clerk—Bkpg. (2d)
1878—West, James S., 17, Portsmouth Loc. Bd., engineer (student)—Arith. (1st); Navig. &c. (1st) with 1st prize of £5
1475—West, John B., 20, City of Lond. Coll., clerk—Eng. Hist. (2d); Metric Syst. (2d)
1725—West, Stephen, 17, Northampton Museum, pupil teacher—Mag. and Elect. (3d); Free-hd. Dwg. (3d)
2269—Weston, Edward, 19, Wolverhampton (St. Peter's), dispenser—Anim. Phys. (3d)
2326—Wentzell, Henry T., 34, Woolwich Roy. Arsenal M.I., book-keeper—Chem. (3d)
2092—Whalebone, George J., 19, Sheerness Dockyard Inst., engineer (student)—Arith. (1st)
1754—Whatmough, William, 17, Oldham Analytic Lit. Inst., grocer's assistant—Arith. (3d)
1476—Wheeler, John, 20, City of Lond. Coll., assistant surveyor—Arith. (3d); Eng. Hist. (3d); Mens. (3d); Geog. (3d)
2457—Whiddington, William, 19, Lambeth Evg. Clases, architect's clerk—Mech. Dwg. (3d)
2062—Whipp, George, 18, Scarborough M.I., joiner—Arith. (3d)

143—Whitaker, John, 17, Bacup M.I., clerk—Arith. (1st); Bkpg. (2d); Mensur. (2d)
2107—Whittaker, Harry, 16, Slough M.I., architect's pupil—Free-hd. Dwg. (3d)
130—Whittles, Henry, 20, Bacup M.I., teacher—Arith. (2d); Eng. Hist. (2d); Geog. (2d)
921—White, Alfred, 18, Glasgow M.I., engineer (apprentice—Arith. (3d)
1971—White, Forence, 19, Rugby Loc. Bd., of no occupation—Latin, &c. (3d)
2273—White, Henry E., 17, Wolverhampton (St. Peter's) Inst., clerk—Anim. Phys. (3d)
2531—White, Henry T., 27, Liverpool Inst., clerk—Theory of Music (2d)
1851—White, Joseph 18, Penzance Loc. Bd., clerk—Arith. (3d); Bkpg. (3d)
404—Whitehead, Thomas, 20, Carlisle M.I., marine engineer (apprentice) — Pract. Mech. (2d); Mech. Dwg. (2d); Pract. Geom. (3d)
841—Whyte, Matthew, 18, Pop. Evg. Classes, Anderson. Univ., Glasgow, no occupation—Arith. (2d)
1253—Wicksteed, John H., 18, Leeds M.I., draughtsman—Chem. (2d)
1083—Wigglesworth, Thomas, 23, Huddersfield M.I., lithog. printer—Freehand Dwg. (3d)
972—Wild, William, 17, Glodwick Inst., piecer—Arith. (3d)
383—Wilde, Thomas, 19, Bury Ath., pattern maker—Mech. Dwg. (3d)
842—Wilkie, William, 25, Pop. Evg. Classes, Anderson. Univ. Glasgow, teacher—Arith. (1st); Mensur. (2d)
153—Wilson, Alexander, 22, Belfast Lit. Inst., foundry apprentice—Arith. (2d); Mensur. (2d); Mech. Dwg. (3d)
1239—Wilson, Edward F., 29, Leeds M.I., clothier—Mus. Comp. (1st)
1034—Wilson, Joseph, 19, Halifax W.M. Coll., bookseller—Eng. Hist. (1st); Alg. (3d)
1240—Wilson, Samuel, 25, Leeds M.I., Loc. Bd., clothier—Mus. Comp. (1st)
1035—Wilson, Samuel R., 17, Halifax W.M. Coll., printer—Arith. (1st); Pract. Mech. (3d)
1251—Wilson, Thomas, 30, Leeds M.I., chemist's assist. Chem. (2d)
1508—Wilson, William J., 26, Roy. Polyt. Inst., engineer's clerk—Mag. and Elect. (1st), with 1st prize of £5; Civil Gov. (1st), with 1st prize of £5; Pol. Econ. (1st), with 2nd prize of £3; and Logic (1st), together with the Prince Consort's Prize of twenty-five guineas
1509—Wilkins, Robert W., 24, Roy. Polyt. Inst., clerk—Light and Heat (2d)
2231—Wilkinson, Arthur W., 19, Walsall Ch. Inst., factor (apprentice)—French (3d)
1056—Wilkinson, Joe B., 23, Huddersfield M.I., dyer—Chem. (3d)
2217—Wilkinson, John, 25, Wakefield M.I., mat maker—Arith. (3d)
1232—Wilkinson, John H., 17, Leeds Ch. Inst., insurance clerk—Arith. (3d); French (3d)
1722—Wilkinson, Samuel B., 18, Northampton Museum—Mag. & Elect. (2d); Free-hd. Dwg. (3d)
570—Wimpenny, John R., 20, Darlington Ch. Inst., accountant—Logic, &c. (3d)
1621—Winchester, James A., 19, Manchester M.I., invoice clerk—Spanish (3d)
1489—Winterbottom, Charles, 19, Roy. Polyt. Inst., dental mechanic—Arith. (2d)
476—Winters, Edwin S., 39, Cheltenham W.M. Club, teacher of drawing—Free-hd. Dwg. (2d)
1546—Wintle, Arthur G., 16, Stepney Deanery Loc. Bd., pupil teacher—Arith. (1st)
354—Wiseman, Robert, 16, Burnley M.I., book-keeper—Arith. (1st)
1836—Williams, Herbert, 17, Patricroft M.I., mechanic—Arith. (3d)
2286—Williams, Philip, 17, Wolverhampton (St. Peter's), assistant teacher—Eng. Hist. (1st); Arith. (3d)
376—Williams, Robert, 30, Burrage-road Sci. Classes, carpenter and joiner—Pract. Geom. (3d); Mech. Dwg. (3d)
2271—Williams, Thomas B., 16, Wolverhampton (St. Peter's), pupil teacher—Arith. (1st)
501—Witchell, Edward J., 21, Whitworth Sci. Sch., Cheltenham, engineer—Free-hd. Dwg. (1st); Chem. (2d); Mech. Dwg. (2d)
696—Wood, Alexander, 20, Edinburgh Watt Inst., clerk—Arith. (2d); Bkpg. (2d); French (3d)
2083—Wood, James M., 19, Sheerness Dockyard Inst., engineer (student)—Arith. (2d)
2171—Wood, John, 18, Stockport Sund. Sch. Imp. Soc., book-keeper—Arith. (2d)
1166—Wood, Thomas, 20, Ipswich W.M. Coll., clerk—Eng. Hist. (3d)
2225—Wood, Walter H., 18, Wakefield M.I., clerk—Arith. (1st)
229—Woodcroft, George F., 16, Birm. and Midl. Inst., clerk—Chem. (2d)
999—Woodhead, Rufus, 17, Halifax M.I., clerk—Bkpg. (3d)
1970—Woods, Mary A., 28, Rugby Loc. Bd., teacher—Latin, &c. (1st)
1879—Woodthorpe, William H., 18, Portsmouth Local Board, engineer (student)—Alg. (1st)
91—Woodworth, John T., 16, S.E. Rail. M.I., engine turner's apprentice—Arith. (3d)
99—Woodworth, William R., 18, S.E. Rail. M.I., railway accountant's clerk—Bkpg. (2d)
529—Woolley, George, 35, Compstall Ath., weaver—Arith. (3d)
1896—Woollman, John W. P., 19, Preston Inst., assistant dentist—Free-hd. Dwg. (3d)
302—Wolstencroft, William, 21, Bradford M.I., clerk—Bkpg. (3d)
2054—Wolstenholme, John B., 19, Salford W.M. Coll., porter—Arith. (1st)
2055—Wolstenholme, Richard H., 16, Salford W.M. Coll., pupil teacher—Arith. (1st)
1041—Womersley, Frederick W., 29, Hastings M.I., upholsterer—Alg. (2d)
1076—Worth, John Edward, 20, Huddersfield M.I., surveyor—Chem. (2d)
230—Wright, Herbert, 29, Birm. and Midl. Inst., manufacturer's clerk—Spanish (1st)
1631—Wright, John, 18, Manchester M.I., clerk—Bkpg. (2d)
2158—Wright, John M., 17, Stockport M.I., clerk—Chem. (3d)
1186—Wright, Samuel, 16, Lancaster M.I., architect—Anim. Phys. (2d)
66—Wright, William, 33, Alnwick M.I., wood carver Free-hd. Dwg. (3d)
1771—Wrigley, William, 23, Oldham Lyceum, warehouseman—Pract. Geom. (2d)

2393—Yearsley, Ormond B., 19, St. Paul's Sch. Deptford, pattern maker—Pract. Geom. (3d); Mech. Dwg. (3d)
843—Young, James, 20, Pop. Evg. Classes, Anderson. Univ., Glasgow, clerk—Mus. Comp. (1); Theo. of Mus. (1st) with 1st prize of £5
2069—Young, James W., 21, Sheerness Dockyard Inst., shipwright—Arith (3d); Mens. (3d)
950—Young, John, jun., 16, Glasgow M.I., assistant librarian—Arith. (2d)
876—Young, Sidney W., 23, Glasgow Ath., commercial clerk—Arith. (3d); Bkpg. (3d); Pol. Econ. (3d); Logic, &c. (1st) with 2nd prize of £3
955—Young, William, 21, Glasgow M.I., law clerk—Mus. Comp. (2d)
1404—Young, William E., 23, Birkbeck Inst., engineer—Mech. Dwg. (2d)

MEETINGS FOR THE ENSUING WEEK.

Mon.....British Architects, 8.
Asiatic, 3.
Victoria Inst., 8.
Tues ...R. Medical and Chirurgical, 8½.
Ethnological, 8. Dr. Richard King, "On the Cranium and its Deformities, in relation to Intellect and Beauty."
Wed .Geological, 8.
Social Science Assoc., 8. Mr. Thomas Briggs, "On the Relations of the British Colonies to the Mother-Country, considered from an Agricultural and Commercial point of view."
R. Society of Literature, 8½. Mr. Newton, "Notes on some new Greek Inscriptions;" and Mr. Vaux, "On Recent Additions to the British Museum."
Thur ...Zoological, 8½.
Royal Society Club, 6¼. Annual Meeting.
Fri .....R. United Service Inst., 3. Capt. H. M. Hozier, "The Abyssinian Campaign."

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb.

Delivered on 5th June, 1869.

126. Bill—Trade Marks Registration.
223. Criminals (Metropolis)—Return.
231. Sewage (Barking)—Memorial.
235. Steamship *Buccleugh*—Report.
Births, Deaths, and Marriages (England)—Thirtieth Annual Report.
Public Petitions—Twenty-second Report.

Delivered on 7th June, 1869.

147. Bill—Public Parks (Ireland)
64. (vi.) Committee of Selection—Seventh Report.
220. Sugar—Return.
228. Malt and Barley—Return.
234. East India (Bullion)—Return.
246. Royal Society (Meteorological Committee)—Letter.

Delivered on 8th June, 1869.

128. Bill—Poor Law Union Loans.
129. ,, Witnesses (House of Commons).
233. Municipal and Parliamentary Franchise (Ireland)—Returns.
236. Merchant Seamen's Fund—Account.
237. Seamen's Savings Banks and Money Orders—Account, &c.
241. County Courts—Return.

Session 1868.

433. (vi.) Endowed Charities (County of Essex)—General Digest.

Patents.

From Commissioners of Patents' Journal, June 11.

Grants of Provisional Protection.

Anchors—1705—F. R. A. Glover.
Asphaltos, obtaining anthracen out of—1642—J. Brönner and H. Gutzkow.
Beds, &c., supports and mattresses for—1676—R. Mathers.
Bicycles—1651—F. Brown.
Bicycles—1669—H. T. Braithwaite.
Billiard tables, converting dining tables into—1665—J. F. Nicholls.
Boiler tubes, brushes for cleaning—1646—W. R. Lake.
Boilers—1628—L., W., and J. Beesley.
Boilers and furnaces—1674—C. E. Brooman.
Boilers, low-water indicator for—1701—B. J. B. Mills.
Bottles, stoppers for—329—A. S. and A. R. Stocker.
Bottles, &c., novel device for locking corks or stoppers in—1678—W. E. Newton.
Brick moulds—1666—J. J. R. Humes.
Buildings, apparatus for giving light and ventilation to—1572—W. H. Dupré.
Carding engines—1616—W. Tatham.
Carding engines—1677—J. Dockray.
Carpets, &c.—1707—T. B. Worth.
Carriage axles and axle boxes—1667—J. Cockshoot, jun., and H. Weatherill.
Carriages—1639—B. T. Newnham.
Cigars, lighting—1579—N. Lawrence.
Circular saws, guards for—1672—B. Littler.
Clipping and shearing apparatus—1655—J. L. Hancock.
Coal, &c., getting—1660—J. Sturgeon.
Collar and tie combined, seamless—1496—J. S. Jarvis.
Doors, &c.—1690—J. Warhurst.
Drying closets, &c.—1636—T. Bradford.
Felted fabrics—1686—T. R. Clarke, W. Bywater, T. Lawson, and C. L Lister.
Furnaces—1658—W. H. Turner.
Furnaces—1670—J. Hanworth and H. Horsfall.
Handkerchief boxes, &c.—1681—S. Birch.
Hats, &c.—1696—R. B. Cooley.
Hay-making machines, &c.—1654—J. L. Hancock.
Iron keelsons—1659—J. Humphrey.
Knife cutlery—1502—H. G. Whitehead.
Knitting machines, &c.—1687—A. Rushworth.
Looms—1145—W. H. and T. Hacking and J. Chambers.
Looms—1673—J. Bullough and C. Catlow.
Lubricants, manufacturing—1700—G. V. Turnbull, C. Salvesen, and R. Irvine.
Lubricators—1688—C. H. Gardner.
Magnesium, &c.—1706—H. Larkin and W. White.
Meat, &c., apparatus for basting—1449—C. H. Merritt.
Microscope, applying polarised light in connection with the—1620—J. J. Field.
Mineral oils, purifying—1632—F. A. Barrow.
Moorings—1709—C. Francis.
Mortar—1689—O. Barrett and G. P. Wheeler.
Motive-power engines—1685—F. A. Calvert.
Mowing and reaping machines—1634—P. Whiteside.
Needle cases—1671—R. S. Bartleet.
Ores, treating—1523—W. Benson.
Pasteboard, &c., machine for cutting and scoring—1653—J. Fraser and L. and R. Simon.
Printing surfaces—1699—A. Watt and T. Knowles.
Puddling furnaces—1668—P. Kirk.
Pumps—1629—J. Snape.
Railway carriages, &c., axles for—1650—B. Garner.
Railway goods waggons—1708—C. Francis.
Railways—1662—A. A. Sax.
Railways, prevention of accidents upon—1695—M. Wrigley.
Railways, wooden—1640—J. Wilson.
Railways working the signals and switches on—1704—E. Bemelmans and A. V. Volxem.
Ratchet brace—1637—C. Plumb.
Sewing machines—1305—J. A. Haberkorn and B. Rudolph.
Sewing machines—1693—C. F. Waldo.
Sheep attacked by fly, treating—1710—A. L. Simpson.
Ships, coating the bottoms of—1652—A. T. Fairgrieve.
Ships, sheathing for—1648—G. F. Guy.
Shot or shell, hollow—1633—D. Foster.
Skins, treating—1371—A. and E. Fau.
Spinning machinery—1635—H. McE. Ward.
Spinning machinery—1664—J. Smith.
Spinning machinery—1537—E. H. and A. I. Solly, J. F. Hall, and R. B. Millman.
Slide valves—1656—A. Hemingway.
Steam engines, &c.—1692—J. S. Stubbs.
Stoves—1684—J. H. Johnson.
Tea and coffee urns—1451—E. T. Hughes.
Varnish or paint—1691—H. Browning.
Vegetable fibres, &c., bleaching—1617—C. E. Brooman.
Velocipedes—1643—S. and J. Prestwich.
Velocipedes—1663—E. Davis.
Velocipedes—1703—J. H. Smith.
Velocipedes, &c.—1649—T. Clarke.
Warp-dressing machinery—1644—J. Ingham and I. Butterfield.

Invention with Complete Specification Filed.

Lamps—1711—C. Ostlund.

Patents Sealed.

3778. C. Ellison & E. Parkinson.
3783. G. Preston and J. Prestige.
3791. W. Meakin.
3798. J. Thomas.
3805. H. Williamson.
3806. A. Baumann.
3815. P. Kotzó.
3820. W. Cotton and E. Attenborough.
3825. T. C. Fidler.
3837. G. Hadfield.
3845. F. H. Knevitt and H. H. Hazard.
3855. J. Hodgson, H. Bottomley, and E. Cockroft.
3869. M. S. Maynard and R. Grime.
3870. P. Spence.
3905. G. Tidcombe, jun.
3937. H. C. M. Turnbull.
3942. W. Ehrhardt.
1086. W. W. and J. D. Hooper.
1093. S. F. Van Choate.
1178. G. T. Bousfield.
1194. H. A. Bonneville.

From Commissioners of Patents' Journal, June 15.

Patents Sealed.

3833. G. Ritchie.
3847. R. Hallimond.
3849. J. Pouncy.
3850. C. Liebermann & C. Graebe.
3853. J. W. Brierley.
3856. E. S. Griffiths.
3857. T. B. Salter & J. Silvester.
3859. S. Remington.
3864. E. Pavy and J. Clark.
3873. J. Dickson.
3874. G. H. Asker.
3898. G. Ritchie.
3908. S. Smart.
3913. W. Clay.
3929. A. M. Clark.
3955. I. Pick.
3968. J. H. Johnson.
20. S. J. Peet.
34. D. Nicoll.
57. W. Tatham.
105. W. R. Lake.
163. J. H. Johnson.
762. H. J. B. Kendall.
957. W. F. Proctor.
1016. S. Sharrock.
1083. J. Dewar.
1245. W. R. Lake.

Patents on which the Stamp Duty of £50 has been paid.

1601. G. D. Kittoe.
1629. J. G. Marshall.
1679. P. Barlow.
1616. J. Carter.
1630. W. Robertson and J. G. Orchar.
1596. P. H. Limet.
1618. W. Bellhouse.
1707. H. Medlock and W. Bailey.
1594. T. J. Leigh.
1620. R. E. Hodges.

Patents on which the Stamp Duty of £100 has been Paid.

1738. W. Holland.
1825. A. Warner.
1832. H. and J. Davenport.

Journal of the Society of Arts.

FRIDAY, JUNE 25, 1869.

Announcements by the Council.

Annual General Meeting.

The One Hundred and Fifteenth Annual General Meeting, for the purpose of receiving the Council's report and the Treasurers' statement of receipts, payments, and expenditure during the past year, and also for the election of officers, will be held, in accordance with the Bye-laws, on Wednesday next, the 30th of June, at four o'clock, p.m.

At this meeting, in conformity with the provisions of the Act of Parliament, 3 William IV., c. 4, intituled "An Act for Settling and Preserving Sir *John Soane's* Museum, Library, and Works of Art in *Lincoln's Inn Fields*, in the County of *Middlesex*, for the Benefit of the Public and for Establishing a sufficient Endowment for the due maintenance of the same," an election will take place of the Society's Trustee of the Soane Museum, in the place of Mr. Samuel Redgrave, Vice-President of the Society, whose term of office under the Act has expired. Mr. Redgrave is eligible for re-election.

The Council hereby convene a Special General Meeting of the Members of the Society to ballot for members, such meeting to take place at the close of the Annual General Meeting.

By order,

P. Le Neve Foster, *Secretary.*

Society's House, Adelphi, June 21st, 1869.

India Committee.

This evening (Friday), June 25th, the discussion on "Cotton Cultivation and Supply," adjourned from Friday, the 18th instant, will be resumed by Thomas Bazley, Esq., M.P. The chair will be taken at 8 o'clock, by John Cheetham, Esq. Members of the Society interested in Indian questions are invited to attend.

Meeting.

On Monday afternoon, the 5th of July, a paper "On the Limits to be placed upon Posthumous Dispositions to Public Uses," will be read before the members of this Society, and the members of the Association for the Promotion of Social Science, by Arthur Hobhouse, Esq., Q.C., to be followed by a discussion. The chair will be taken at 4 o'clock p.m., by the Right Hon. W. N. Massey. Members and their friends are invited to be present.

Conversazione.

The Society's Annual Conversazione will take place at the South Kensington Museum, on Thursday evening, the 1st July.

Cards of invitation are now being issued.

Improved Cabs.

The Council of the Society of Arts offer the following medals for improved hackney carriages specially suited to the metropolis :—

The Society's Gold Medal for the best and most convenient open hackney carriage for two persons.
The Society's Silver Medal for the second-best ditto.
The Society's Gold Medal for the best and most convenient closed hackney carriage for two persons.
The Society's Silver Medal for the second-best ditto.
The Society's Gold Medal for the best and most convenient closed hackney carriage for four persons.
The Society's Silver Medal for the second-best ditto.

Lightness of construction, combined with adequate strength and durability, will be especially considered in making the awards.

The awards will be made after actual trials of the carriages extending over a certain period.

Communications describing the carriages must be sent to the Secretary of the Society of Arts before the 1st January, 1870, the carriages to be sent to a place hereafter to be appointed.

The Council also offer the Society's Silver Medal for the best instrument, to be affixed to a cab or other hackney carriage, for indicating the fare as between the passenger and the driver, whether by registering the distance travelled or otherwise, and which instrument shall also indicate, for the convenience of the cab-owner and of the driver, the total distance travelled during the day and the total amount earned. The instruments competing, with full descriptions of their construction, to be sent to the Society's House before the 1st January, 1870.

Competitors may, at their option, sign their communications, or may forward with them sealed letters containing the name and address of the writer.

The Council reserve to themselves the right of withholding all or any of the medals, in case none of the carriages or instruments possess, in their opinion, sufficient merit.

Present to the Society's Library.

Mr. John Pye has kindly presented two volumes of Catalogues of the Exhibitions, held between the years 1760 and 1790, by the Society of Artists of Great Britain, and one volume of Catalogues of the Exhibitions of the Free Society of Artists, held between 1761 and 1783, and also a Minute Book of Meetings held by the Free Society between 1775 and 1780.

These rare volumes, being, as the donor observes, "curiously instructive in matter with which the Society of Arts, Manufactures, and Commerce is continually in connection," have been accepted by the Council with thanks.

Financial Statement.

The following statement is published in this week's *Journal*, in accordance with Sec. 42 of the Society's Bye-laws, which provides that, at the Annual General Meeting, the Council shall render to the Society a full account of their proceedings, and of the receipts, payments, and expenditure during the past year; and a copy of such statement shall be published in the *Journal* of the Society on the Friday before such general meeting :—

TREASURERS' STATEMENT OF RECEIPTS, PAYMENTS, AND EXPENDITURE, FOR THE YEAR ENDING 30th MAY, 1869.

Dr.

	£ s. d.	£ s. d.
To Cash in hands of Coutts and Co., 30th May, 1868	617 3 9	
Do. do. the Secretary	22 19 0	
		640 2 9
To Subscriptions received during the year, from Members and Institutions in Union	5,308 9 0	
Life Contributions	186 18 0	
Donation by A. Davis, Esq. (4th)	21 0 0	
		5,516 7 0
To Dividends on Stock :—		
Consols, £4,746 19s. 5d. 138 17 0		
Do. North London Exhibition Trust, £167 7s. 3d. 4 17 10		
Reduced 3 per Cents. £434 8s. 6d. 12 14 0		
	156 8 10	
To New 3 per Cents. :—		
Dr. Fothergill's Trust, £388 1s. 4d. 11 7 2		
India 5 per Cent. Notes, 52,000 Rupees 250 11 4		
	261 18 6	
		418 7 4
To Examinations :—		
British Association	10 0 0	
College of Preceptors	3 3 0	
The Rev. Dr. Temple	5 5 0	
Charles Brooke, Esq., F.R.S.	1 1 0	
Fees from Local Board Candidates, &c.	22 1 0	
		41 10 0
To Whitworth Exhibitions		75 0 0
To Sale of Books, &c. :—		
Sale of Photographs	0 2 0	
Sale of Books	2 6 5	
Harvesting Prize	0 3 1	
Artisans' Reports	161 16 1	
Stationery and Printing	0 16 0	
		165 3 7
To The Prince Consort's Prize	26 5 0	
Artisans' Paris Visit Fund	5 0 0	
South Australian Institute	350 0 0	
Advance by Coutts and Co.	500 0 0	
Legacy by Dr. Aldred	90 0 0	
		971 5 0
		£7,827 15 8

Cr.

	£ s. d.	£ s. d.
By House and Premises :—		
Rent, Rates, and Taxes	266 12 6	
Insurance, Gas, Coals, and House Charges	172 8 5	
Repairs and Alterations	204 3 11	
		643 4 10
By Office :—		
Salaries, Wages, and Commissions	1,649 9 10	
Stationery and Printing	197 18 9	
Advertising	95 11 11	
Postage Stamps and Parcels	146 9 5	
		2,089 9 11
By *Journal*, including Stamps and Distribution to Members	1,155 12 6	
Library, Bookbinding, &c.	99 2 10	
Conversazione	184 2 8	
		1,438 18 0
By Union of Institutions, including Examination Prizes, Postage, Stationery, Printing, &c.	883 3 8	
Art-Workmanship Prizes	113 19 10	
Society's Albert Memorial Medal	3 0 2	
Harvesting Prize	72 15 6	
Netherland International Exhibition	25 0 0	
Swiney Prize	201 13 6	
		1,299 12 8
By Whitworth Exhibition awards		75 5 6
By Committees :—		
General Charges	73 16 2	
India Committee	33 11 5	
Musical Committee	1 0 6	
Food Committee	14 7 0	
Artistic Copyright Committee	31 18 0	
Technical Education Committee	33 7 0	
		188 0 1
By South Australian Institute	270 0 2	
Prince Consort's Prize	26 5 0	
North London Exhibition Prize	4 17 10	
Artisans' American Visit	142 0 0	
Artisans' Reports	326 0 11	
Donation to the East London Museum Fund	105 0 0	
		874 3 11
By Cantor Lectures	130 15 5	
Repayment to Messrs. Coutts and Co.	500 0 0	
Interest on Advance	12 10 8	
		643 6 1
By Balance of Cash in hands of Messrs. Coutts and Co., 30th May, 1869	569 12 11	
Ditto in hands of Secretary, Petty Cash	6 1 9	
		575 14 8
		£7,827 15 8

Liabilities and Assets.

Dr.

	£ s. d.	£ s. d.
To Sundry Creditors :—		
Sir W. C. Trevelyan (for Prize)	70 0 0	
Prince Consort's Prize	26 5 0	
North London Exhibition Trust	2 8 11	
Dr. Aldred's Bequest	90 0 0	
Examination Prizes (Society's)	266 10 0	
Metric Prizes by the Metric Committee of the British Association	8 0 0	
Balance of Cash received for do.	2 0 0	
Tonic Sol-fa Association	8 0 0	
Royal Horticultural Society's Prizes	24 0 0	
Royal Geographical Society's Prize	5 0 0	
Thomas Twining, Esq., Prizes	5 0 0	
Harry Chester, Esq. (the late), Prizes	5 0 0	
Examiners' Fees	307 13 0	
Tradesmen's Accounts	1,161 17 0	
South Australian Institute	68 4 5	
		2,049 18 4
* Excess of assets over liabilities		3,141 0 3
		£5,190 18 7

Cr.

	£ s. d.	£ s. d.
By Reduced 3 per Cent. Stock, £220 4s. 8d., at 92¼	203 3 1	
Consols, £146 19s. 5d., at 93½	137 8 4	
Invested in India 5 per Cent. Rupee Notes	353 11 6	
Subscriptions due and in course of collection, £2,191, valued at	1,752 16 0	
Barry's Pictures and other Property	2,000 0 0	
Prince Consort's Prize	26 5 0	
Royal Horticultural Society's Prizes	49 0 0	
Royal Geographical Society's Prize	5 0 0	
Tonic Sol-fa Association Prizes	8 0 0	
Thomas Twining, Esq., Prizes	5 0 0	
Harry Chester, Esq. (the late), Prizes	5 0 0	
		4,545 3 11
Cash in hands of Messrs. Coutts and Co.	569 12 11	
Do. London and Westminster Bank, on account of Sir W. C. Trevelyan's Prize	70 0 0	
Do. Secretary, Petty Cash	6 1 9	
		645 14 8
		£5,190 18 7

* The above is exclusive of the value of the Society's lease of premises.

Stock standing in the name of the Society at the Bank of England.

Consols	£4,914	6	8
New 3 per Cents.	388	1	4
Reduced 3 per Cents.	434	8	6
India 5 per Cent. Rupee Notes	Rs. 52,000		

Trust Funds included in the above.

Swiney Bequest	£4,500	0	0	Consols, chargeable with a sum of £200 once in five years.
John Stock's Trust	100	0	0	,, chargeable with the Award of a Medal.
North London Exhibition Trust	167	7	3	,, chargeable with the Award of the Interest as a Money Prize.
Fothergill's Trust	388	1	4	New 3 per Cents., chargeable with the Award of a Medal.
Cantor Bequest	5,049	9	7	Invested in India 5 per Cent. Rupee Notes, 52,000 rupees.

SAMUEL ANDREWS, HENRY VAUGHAN, } *Auditors.*
P. LE NEVE FOSTER, *Secretary.*

Society's House, Adelphi, 24th June, 1869.

Members Proposed.

The following additional candidates have been proposed for election as Members of the Society, and will be balloted for at a special meeting, to be held after the Annual General Meeting, on the 30th inst. :—

Bliss, William, Chipping Norton, Oxon.
Crowther, Joseph, 13, Upton-road North, De Beauvoir-town, N.W.
Davies, John, 9, Cambridge-terrace, Chelsea, S.W.
Fernandes, Albert Bernard, 24, Tavistock-terrace, Westbourne-park, W.
Grant, Thomas, 29, Gerrard-street, Soho, W.C.
Guelton, Richard, 138, Buckingham-palace-road, Pimlico, S.W.
Handford, George C., 224, King's-road, Chelsea, S.W.
Hind, George W., 5, Torrington-square, W.C.
Houchin, Richard, 13, Bridport-place, New North-road, N.
Inglefield, Rear-Admiral, E.C., C.B., F.R.S., 10, Grove-end-road, N.W.
Keating, Hon. Sir Henry S., 11, Prince's-gardens, W.
May, Thomas, 1, Elgin-villas, Notting-hill, W.
Quaritch, Bernard, 15, Piccadilly, W.
Watney, James, 32, Prince's-gardens, W.
Yardley, Samuel, 50, Charlwood-street, Pimlico, S.W.

Subscriptions.

The Midsummer subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Free Public Libraries and Museums Committee.

A meeting of this Committee was held on Monday afternoon, the 21st instant. Present—Lord Henry G. Lennox, M.P., in the chair; General Eardley Wilmot; Messrs. Wilbraham Egerton, M.P.; Samuel Redgrave, Seymour Teulon, George Godwin, F.R.S., Hyde Clarke, Captain Festing, R.E., Captain Donnelly, R.E., Messrs. James Hole, J. F. Iselin, and Edward Denison, M.P.

Mr. Hyde Clarke was called upon to introduce the motion of which he had given notice, to the effect—"That various old public libraries, as that of Archbishop Tenison, having been dispersed, it is expedient that legal provision should be made for the security, as public property, of all libraries and museums which are appropriated to public use." He did not think it necessary for him to say much in support of the motion. It was well known that a great many libraries had been formed in this country which had been designed for perpetual public use, but they had no public existence in the eye of the law, and in many instances, subscriptions having failed, or from some other cause, the institutions having charge of the property had been closed, and valuable books presented to them for public use had been sold, dispersed, or hypothecated. On the Continent and in the United States this evil was provided against. In the United States public libraries were under the protection and control of the State Legislature, and on the Continent they were either Imperial, provincial, departmental, or commercial, but in all cases under legal protection. As a consequence, books accumulated in those libraries, but here they were often dissipated, and valuable books of reference were lost to public use. It was necessary that public provision should be made for the mortmain character of the objects presented to public institutions; they should be, so to speak, marked with the broad arrow. He thought there should be a general administration for all the libraries in the country. He did not wish, however, to embarrass local managers, or abridge their powers.

Mr. Hole was strongly of opinion that a general central administration would not be regarded with favour throughout the country. He ventured to recommend that the town councils of corporate towns should be the trustees.

The resolution was adopted, with slight alterations embodied in the notice, as quoted above.

Mr. Teulon, in the absence of Mr. Cole, introduced the motion of which that gentleman had given notice:—"That free libraries and museums maintained under the 'Free Libraries Act' should be regarded as parts of a system of national education, and assisted by funds voted by Parliament, in addition to local rates."

Mr. Teulon said that the small number of free libraries that had been established throughout the country was evidence that the advantages of these institutions would not be realised as they ought to be, unless some assistance were given towards their establishment. It was also contemplated, and he thought quite properly, to put museums on the same footing as libraries.

Mr. Godwin thought that the aid contemplated was much wanted for the provision of buildings, and that it would be of great value in stimulating local effort.

Mr. Egerton said that there were many workmen's and Mechanics' Institution libraries throughout the country. He knew that there were many in his county that were practically free. He did not think it desirable that there should be complete exemption from payment.

Mr. Hole could not think that a working man would feel pauperised by using a free library, supported by local rates. He looked upon it as in part his own, and used it freely. In Sheffield the attempt to found a Mechanics' Institution library had failed, but the free library there had been very successful. In Manchester they had five free lending libraries, all alike successful.

The resolution was then passed.

Lord Henry G. Lennox (the Chairman) intimated that he purposed to put a question in the House of Commons, with a view to government sanction and asistance in the distribution of duplicate or unexhibited specimens of works of art and science in the national museums and galleries of the metropolis. He would be glad to be favoured with any suggestions from the Committee with a view to framing his question. He thought it very desirable that this matter should be stirred. He believed that there were a vast number of specimens that could well be spared from the large collections, such as the many Turner drawings, and other works, that were stowed away in the cellars of the National Gallery.

Mr. Redgrave urged that duplicate books should be included in his lordship's question. There were many books, as well as other objects, stowed away at the British Museum and other collections, that would be available for such a distribution.

Mr. Egerton strongly recommended that textile fabrics, including the delicate tissues of Indian manufacture and design, should be embraced in the desired distribution.

After further conversation the Committee separated.

Eighteenth Annual Conference.

The Eighteenth Annual Conference of the Representatives of the Institutions in Union, and the Local Educational Boards, with the Council of the Society, was held on Wednesday, the 23rd instant, at 12 o'clock noon. Seymour Teulon, Esq., Vice-Chairman of the Council, presided.

The following is a list of the Institutions and Local Educational Boards represented at the Conference, with the names of their respective representatives :—

Banbury Mechanics' Institution	Mr. B. Samuelson, M.P.
Cambridge, Philo-Union and Literary Society	Mr. H. Welford, (President). Mr. O. J. Jones (Treasurer). Mr. C. W. Palmer (Hon. Sec).
Canterbury, Church of England Young Men's Literary Association	Rev. Edgar H. Cross Hon. Sec.
Carlisle Mechanics' Institution	Mr. Edward Potter, M.P. Sir Wilfred Lawson, Bart., M.P.
Chelmsford, Literary and Mechanics' Institution	Mr. John Gibbs.
Compstall Athenæum	Mr. C. Andrew (President.
Devonport Mechanics' Institution	Mr. W. Mogg. Mr. J. W. Ryder.
Epsom and Ewell Literary Institution	Mr. W. O. Reader. Dr. Daniel.
Farnham Young Men's Association	Mr. George Dewdney.
Gilford (Co. Down) Young Men's Mutual Improvement Society	Mr. George Benson.
Glasgow Institution	Mr. Alexander Craig.
,, ,, Local Board	Mr. G. Anderson, M.P.
,, Mechanics' Institution	W. Montgomerie Neilson.
Lancashire and Cheshire Union of Institutions	Mr. Alderman Rumney, J.P. Dr. R. M. Pankhurst. Dr. J. Watts. Mr. W. H. J. Traice. Mr. Thomas Lawton.
London, Birkbeck Literary and Scientific Institution	Mr. J. H. Levy. Mr. J. Rigby Smith. Mr. G. M. Norris.
,, City of London College	Rev. R. Whittington, Principal. Rev. J. G. Wrench. Mr. James Knight. Mr. F. Reynolds. Mr. Thomas Beck (Secretary).
,, Greville-house, Paddington-green	Mr. R. Keith. Mr. W. Watts.
,, Lambeth Evening Classes, Hercules-buildings, S.E.	Mr. H. Turner. Mr. W. W. Jones. Mr. T. E. Heller, Hon. Sec.
,, South London College	Mr. W. Rossiter.
,, Walworth, Literary and Scientific Institution	Mr. Frederick Wood. Mr. Edwin Pears. Mr. W. E. Jones.
Middlesborough Mechanics' Institution	Mr. John Jones.
New Swindon Mechanics' Institution	Mr. J. Goudge.
Yorkshire Union of Institutions	Mr. James Hole, Hon. Sec. Mr. H. H. Sales.

The Secretary read the following—

Report.

To the Council of the Society for the Encouragement of Arts, Manufactures and Commerce.

Gentlemen,—It is my duty at the close of the Session to lay before you the proceedings of the Union of Institutions during the last year, and in doing so I would draw your attention to the business of the Union as it now stands as compared with what it was formerly. In the earlier days of its formation there were numerous points connected with the management and condition of the Institutions which required discussion and consideration, and the proceedings of the Union were thus necessarily of a varied character. From time to time, however, these points became settled, and the examinations have now become the main proceedings of the Union. These examinations were established in 1856, commencing with 52 candidates, and have gradually gone on increasing until the numbers taking advantage of the system have reached in the present year 2,165, being an increase of 323 over 1,842 who were examined last year. The number of Local Boards has only slightly increased, there being this year 139 as compared with 134 last year. While, however, there has been this large increase in the number of candidates examined, the number passing does not appear to have increased quite in the same proportion. Last year the number of those who obtained certificates was 1,308 out of 1,842 examined, or 71 per cent., whilst this year the successful candidates are 1,508 out of 2,165, or 69 per cent. This falling-off in the per-centage of passed candidates must be attributed to the Local Boards not being sufficiently careful in their preliminary sifting of the candidates,

and their too readily admitting them to the final examination. The following table shows the comparison of the examinations for the two years :—

	1869.	1868.
No. of Local Boards at which Final Examinations were held..	139 ..	135
„ Candidates examined	2,165 ..	1,842
„ „ passed	1,508 ..	1,308
„ Papers worked	3,193 ..	2,547
„ 1st class certificates	415 ..	318
„ 2nd class „	674 ..	608
„ 3rd class „	986 ..	801
„ unsuccessful papers	1,118 ..	820
„ Prizes awarded	84 ..	65

The Prince Consort's Prize has this year been awarded to No. 1,508, William John Wilson, aged 26, Royal Polytechnic Institution, engineer's clerk, who has obtained the following certificates :—

1867. Anim. Phys. (1st) with 1st prize; Dom. Econ. (1st) and 2nd prize.
1868. Arithmetic (1st); Bkpg. (1st); Geog. (1st) and the R.G.S. prize of £5.
1869. Civ. Gov. (1st) with 1st prize; Polit. Econ. (1st) with 2nd prize; Logic and Ment. Sci. (1st); Mag. and Elect. (1st) with 1st prize.

The extra prizes offered by the late Mr. Harry Chester in Political Economy, and by Mr. Twining in Domestic Economy, have been awarded, and the Royal Horticultural Society's prizes for gardeners, as well as the Royal Geographical Society's prize, have also been taken, but the prizes offered by the proprietors of the *Gardeners' Chronicle* have not been taken, no candidate having fulfilled the required conditions.

The Council Prize of ten guineas to the female candidate "who, obtaining a certificate of the First Class in the current year, shall have obtained in that year, and the two years immediately preceding, the greatest number of such certificates," has this year been awarded to No. 1,407, Elizabeth Backhouse, aged 21, Birkbeck Literary and Scientific Institute, who has obtained the following certificates :—

1868. Geog. (1st) with 2nd prize of £3, and Females' Prize of £2; Eng. Hist. (1st) with Females' Prize of £2.
1869. Dom. Econ. (1st) with Prize for Females of £2; Eng. Lit. (1st).

It was thought right last year to enlarge the number of subjects of examination in the programme, and the examination in the Metric system was added at the suggestion of the Metric Committee of the British Association, who give the prizes. The examination in Elementary Musical Composition was added at the special desire of the Tonic Sol-Fa Association, the prizes being offered by that association. Both these subjects were added after a wish expressed to that effect at the last Conference. Candidates in both these subjects have attended, and the prizes have been awarded. Another subject of examination, that of Political Economy, including Civil Government, in which one paper had hitherto been set, was, at the request of the Conference, divided into two separate subjects.

At the Conference last year a recommendation was made to the Council, requesting them "to enter into communication with the Government, with the Universities, and with such other bodies concerned in public education, as it may seem expedient, with a view to ascertain how far it is possible to combine the various examinations that are now in use, and to render them more generally useful in promoting the general and technical education of the people." The Council at once placed themselves in communication with the bodies named in the resolution; but, so far as the Universities are concerned, though both expressed themselves willing to discuss the subject, it appears that their Examinations are conducted on a system so totally different from that of the Society and of the Government, that anything like an amalgamation of them with those of the Society of Arts and of the Government seems out of the question. Besides this, they are intended for an entirely different class from that which avails itself of the Society's Examinations. With respect to the Science and Art Examinations of the Government, they embrace a considerable number of the subjects comprised in the Society's list; and here it would seem that something might be done in the way of modification.

The Council last year, looking at the fact that, in some subjects very few candidates had appeared, thought it right to insert a condition in the programme that unless a given number of candidates sent in their names by an early day, giving notice that they were preparing for examination in these subjects respectively, no paper would be set. The response, though small, was sufficient in each case to render it necessary to set papers. Still, however, the numbers in these subjects are so inconsiderable that it is a question whether it is worth while to maintain a large and expensive machinery for the benefit of so few candidates. This question, however, must be taken into consideration with the next, which is of much larger importance. When the Society's Examinations were first instituted no other Examinations existed which members of Institutions could take advantage of. With a view of stimulating the Institutions to render themselves more useful as a means of education, the Council established the Society's Examinations, and their value has been appreciated, as is abundantly shown by the increasing numbers attending them. The example thus set has been followed by the two Universities in their Middle Class Examinations, and by the Government in the Examinations held under the Science and Art Department. The former cannot, for various reasons, be taken advantage of by mem-

bers of Mechanics' Institutions generally, but the latter are open to the class for which the Society's Examinations were established, and the subjects embrace a very large number of those included in the Society's scheme. Seeing that the Government Examinations are working well, and are attended by very large numbers of candidates, numbers far beyond any that the means at the command of a voluntary society, like that of the Society of Arts, can ever succeed in obtaining, it is well worthy of consideration by the Council whether the time has not now arrived when it would be for the benefit of the Institutions on the one hand, and the Society on the other, that the Society should omit from its list of subjects all those which are embraced by the Science and Art Examinations. For the Society to continue doing on a small scale that which the Government is now doing on a much larger scale, and with equal efficiency, would seem to be a waste of its power and funds, and with no adequate advantage to the Institutions, besides giving the Local Boards the labour of superintending the work of examination twice over. The result of such a change would be the reduction of the list of subjects from 36 to 18, and it may even be worth consideration whether this number should not be further reduced to 16, by omitting two subjects in which the candidates attending have been so few as practically to render it not worth while to set any papers. It is believed that, by adopting this course, the best interests of the Institutions would be consulted, the Local Boards, which in nearly every case are connected with the conduct of the Science and Art Examinations, as well as those of the Society, would be relieved of their double labour, and the candidates themselves would lose little by the change.

As usual, I annex a tabular return of the results of the Elementary Examinations held by

ELEMENTARY EXAMINATIONS, 1869.

NAME OF UNION OR LOCAL BOARD.	Number of Centres	HIGHER GRADE.				LOWER GRADE.			
		Male Candidates.		Female Candidates.		Male Candidates.		Female Candidates.	
		Examined.	Passed.	Examined.	Passed.	Examined.	Passed.	Examined.	Passed.
Blandford	1	..	..	1	1	..	..	6	6
Farnham and Aldershot District	2	31	26	6	..	15	8	9	6
Hastings and St. Leonards	1	4	2	..	..	..	..	..	..
Hertford	12	19	13	1	1	42	32	8	6
Lancashire and Cheshire Union of Institutes	62	284	174	6	3	1,017	497	302	148
Lichfield	1	7	7	..	..	13	6	..	..
London:—									
South London Working Mens' College	1	..	..	..	..	9	4	1	1
Young Men's Catholic Association, 10, Red Lion-square, W.C.	1	10	10	..	..	..	..	..	..
Stepney Deanery Board	1	40	33	..	..	28	24	..	..
New Swindon	1	9	4	..	..	6	3	24	12
Rugby	2	2	2	7	3	5	3	6	3
Stourbridge Associated Institute	1	..	..	..	..	10	10	..	..
Weston-super-Mare	1	2	2	1	..	41	15	..	..
Yorkshire Board of Education	25	110	56	34	10	490	208	28	9
Totals	112	518	329	56	18	1,676	810	384	191

such of the District Unions and Local Educational Boards as have chosen to avail themselves of the elementary papers issued by the Society, the certificates being awarded by the local authorities themselves. The table shows that the number of candidates has not been so large as last year, but as it merely represents the results of an examination held with papers furnished simply for the convenience of the local authorities, many of whom, as I have reason to know, prefer setting their own papers, and having independent examinations, it does not fairly represent the amount of stimulus given, in the form of local examinations, to elementary instruction. When these returns are compared with those of last year, it appears that, in 1868, these examinations were held by twelve District Unions, or Boards, at 97 centres; this year they were held by fourteen District Unions, or Boards, at 112 centres. In 1868, the total number of candidates was 2,826, of whom 1,588 obtained certificates. This year the number of candidates was only 2,634, of whom 1,348 were successful. The proportion of higher grade candidates, however, is considerably larger than last year, the number being 574, with 347 successful, as compared with 485 in 1868, and 308 succesful. The number of lower grade candidates this year

was 2,060, with 1,001 successful, as against 2,341 last year, with 1,280 successful. These results show that the candidates did not generally come up to the examination so well prepared as last year.

Among the higher grade candidates there were 56 females, with only 18 successful, as against 51 last year, of whom no less than 32 obtained certificates; of the lower grade candidates 384 were females, with 191 successful, whilst in 1868 there were 537 females, with 341 successful. These returns do not give a favourable impression as to the state of female education in the districts where the elementary examinations were held.

I am, &c.,
P. Le Neve Foster,
Secretary.

Appendix.

Mr. Henry H. Sales, the Visiting Officer for the Yorkshire district, writes:—

In this district educational efforts have been concentrated upon the promotion of scientific instruction with remarkable success. Last year I reported the results of an investigation, instituted by the Yorkshire Union of Mechanics' Institutes, of the condition of the means for scientific instruction in the county. Action has succeeded investigation. In the autumn, a vigorous movement was made to arouse the attention of the industrial community to the importance of the subject, and to establish science classes. Another county association, the Yorkshire Board of Education, took action in a direction necessary to the success of the proselytizing campaign of the Union of Mechanics' Institutes, but beyond its sphere of operations. The council of the Yorkshire Board established special schoolmasters' science classes at Leeds, Wakefield, Huddersfield, and Sheffield, in order to create a supply of duly qualified science teachers from the ranks of professional schoolmasters. Up to the present time, the stock-taking of the work done by the combined action of these county associations shows that, as regards the supply of science teachers, at least fifty schoolmasters have passed the advanced examination of the Science and Art Department, and will be available for class-work in the ensuing session, while the position of class-work now, as contrasted with last year, will be seen at one glance of the following table:—

	1868.	1869.	Increase per cent.
Science schools in England and Wales	183	355	94
Science schools in Yorkshire	14	41	193
Science students in England and Wales	8,686	14,210	63
Science students in Yorkshire	426	1,035	143

It requires no stretch of the imagination to see that the machinery, now in good working trim, will increase considerably both the number of science classes and science students during the ensuing session. The organisation of these classes for schoolmasters and students being completed, the moving spirits are left comparatively free for other departments of science-work; for additional training classes for schoolmasters follow as a matter of course, and the multiplication of ordinary science classes becomes mere routine. The new work now requiring attention is the introduction of science-teaching into day-schools, and the establishment of trade-schools. In this report I need not enter into a description of the plans to be adopted for the accomplishment of this work, but will reserve until next year's report the record of their fulfilment. Then will follow the science college proper, unless the men of Bradford develop their proposed school of science and art more rapidly than we can venture to hope, in which case next year will witness a science college in Yorkshire, in working order.

Apart from scientific instruction, it seems to me that I could not do better than literally repeat my last annual report on Examinations. The Examinations in Elementary Knowledge are productive of incalculable good. We record this year a large increase in the number of classes and candidates. In Yorkshire we religiously confine these Examinations to the class for whose benefit they are intended, and admit no pupil of a day-school, or candidate under twelve years of age. Our number of candidates would be increased four-fold if we admitted school-boys, but for them other Examinations exist, and we are satisfied that their admission, which some years since was permitted, is foreign to the objects of the Examination and prejudicial to its usefulness.

The Final Examinations make little headway. Were I to enter into reasons, I could only repeat what I have now for years advanced, and it is gratifying to know that the opinions I urged when it appeared to be treacherous to the Society to do so, have, year by year, gained more support, and that the time does not seem to be far distant when the Council will take steps to remove the anomaly of a voluntary body and a State Department endeavouring each to cover the same area with like operations, thereby causing waste of labour, and diverting interests that could be effectually combined for the common good.

As the second half of the "Endowed Schools Bill" is not yet agreed upon, and may be postponed *sine die*, I again press upon the Council the great advantages that would arise from the extension of the system of the Final Examinations to middle-class schools. I cling to my belief in the Society as the educational "pioneer," and I most earnestly commend this subject to the consideration of the Council.

Mr. Thomas Lawton, Visiting Officer for the Lancashire and Cheshire district, reports as follows:—

Eighty per cent. of the Institutes in the Lancashire and Cheshire Union have elementary evening classes. Upwards of 2,000 of the pupils belonging to these classes applied for this year's elementary examination papers. 1,609 candidates were examined, and 822 succeeded in obtaining certificates, being an increase of 234 over last year.

The local examiners report a decided improvement, as compared with last year's papers, especially in the lower grade.

It is interesting to notice the steady increase of successful candidates at these examinations. The number of certificates awarded in 1864 was 72; 1865, 171; 1866, 373; 1867, 477; 1868, 588; 1869, 822.

Science Classes.

During last autumn, I visited most of the Institutes where no science classes existed, and urged upon committees the importance of establishing such classes. I succeeded in opening new classes in connexion with 26 Institutes; other new classes were also established, giving a total of 92 Institutes with science classes in operation during the winter, an increase of 33 over the previous year. In some cases the Institutes are grouped, and the pupils meet at convenient centres. In almost every instance the instruction given in the classes had reference to the trade requirements of the respective districts.

The classes, last winter, were taught by 49 certificated teachers; 18 of these were schoolmasters, 13 artisans, 11 clerks, draughtsmen, &c., and 7 make science-

teaching a profession. Eight of our science teachers were formerly pupils in the science classes of the Institutes where they are now engaged as teachers.

The number of certificates and "passes" awarded by the Science and Art Department, in 1868, to candidates connected with the Lancashire and Cheshire Union was 1,499, an increase of 480 over the preceding year. The results for 1869 are not yet published.

The Council of the Union have been directing their attention to the importance of science teaching in elementary day schools, and arranged in several cases last session for science teachers to take charge of the upper classes in the schools once each week, and put the pupils through a course of instruction in geometrical drawing, after the ordinary school work was over. The Council hope soon to be able greatly to extend this scheme. It is also proposed to establish central science and art classes for pupil teachers and assistant masters, to be held on Saturday mornings.

A conference of the Council with day-school managers and teachers connected with the Manchester district was held on the 12th of June, when the proposed scheme was heartily received and approved. It is believed that a large increase of candidates at the Society's Examinations will result from the establishment of these classes.

Society of Arts' Examinations.

These Examinations are becoming widely known and appreciated in this district. The number of certificates awarded in 1869 is 553, being an increase of 130 over the previous year, and 306 as compared with 1864.

The unfortunate proximity of the Society of Arts' Examinations to the Examinations of the Science Department has this year seriously interfered with the number of candidates from this district. The great majority of Lancashire and Cheshire candidates at the Science Examinations take the papers in drawing, chemistry, and animal physiology. The examinations in these subjects were fixed by the Department for the week immediately after the Society's Examinations, in the following order:—

Monday and Tuesday, from 7 to 11—Geometrical Drawing.
Wednesday and Thursday, from 7 to 10—Chemistry.
Friday, from 7 to 10—Animal Physiology.
Saturday, from 7 to 11—Machine Drawing.

Considering that a large number of the candidates went in for examination at least three nights out of the six; that from these candidates we obtain a large proportion of candidates for the Society's Examinations; that, in many cases, the Society's Local Boards form the examining committees on behalf of the Department; and that the science teachers' salaries depend upon the results of the Science Examinations, the effect upon the Society's Examinations is obvious.

It is hoped that the Department will appoint inspectors to take entire charge of the Science Examinations, and do away with examining committees. If this were done, and a greater distance placed between the two examinations, the principal difficulties and inconveniences in connection with that examination would be removed.

I should be very sorry if the peculiar feature of a Society of Arts' certificate were interfered with. In this district a high value is set upon this certificate, not only by candidates, but by many employers of labour; and I could give many instances that have come under my own notice, where a certificate from the Society of Arts has proved of considerable service to its possessor. Two must suffice:—A commission agent was in want of a young man for an important situation. One of our students applied. He was asked for testimonials. He stated that he had only brought the certificates which he had obtained at the Elementary and Society of Arts' Examinations. The gentleman added, "You could not have brought me testimonials with which I should have been more pleased," and the result of the interview was that the young man's services were secured.

The following incident was communicated to me by the gentleman himself:—Some years ago, a gentleman in China required an assistant. A young Englishman applied; references were asked for. The young man stated that he was a complete stranger, having just arrived. In course of conversation it transpired that, when in England, he was a member of the Manchester Mechanics' Institution, and succeeded in obtaining a Society of Arts' certificate. The gentleman, who was formerly a director of one of our Institutes, and was well acquainted with the Society's Examinations, replied that he was perfectly satisfied with the reference and testimonial, and at once engaged the young man.

The Council of the Union of the Lancashire and Cheshire Institutes have decided, this year, to give their special prizes for Free-hand Drawing and Political Economy on the results of the Society's Examinations in these subjects, and to extend the prize scheme in this direction, so as to keep down the number of examinations, and induce pupils to prepare for the Examinations of the Society of Arts.

Mr. W. G. Larkins, Visiting Officer of the Metropolitan District, writes:—

The closing of the labours of the Metropolitan Association for Promoting the Education of Adults has had a very marked effect upon the number of candidates who have this year come up for elementary examination.

The Metropolitan Association, for the last seven years, had done a great work in preparing candidates, by two grades of examinations, for the Final Examination of the Society of Arts, and this especially amongst that class of candidates which comes from evening schools. Taking the Lambeth Evening Classes as representative of this, it will be seen that this year there is a marked falling off from last year in the Final Examinations. In 1868 the number of candidates was 29; this year it is 14. The per-centage of those who passed is also much smaller, being 8 out of 14; this against 25 out of 29 last year. These evening classes were amongst the most successful of those connected with the association. This falling off, there is no doubt, is entirely attributable to the fact that no special encouragement has been given this year to elementary studies.

Taking the whole metropolis, last year, 937, or 178 higher and 759 lower-grade candidates were examined in elementary subjects at 18 centres; this year, 50 higher and 38 lower have been examined at 3 centres.

I should observe that the 162 (against 237 in 1868) candidates entered in the table of the Final Examination (Table 1), as having passed a previous examination, have not been examined in the elementary papers furnished by the Society, and a large proportion of those who passed the Final Examination had already taken both prizes and certificates from the Society.

The total want of systematic elementary examination, this year past, I have recorded, must have the effect in future of keeping out of the Final Examination a large number of metropolitan candidates from that class of students which the Society is most desirous of encouraging. On the authority of the Rev. Canon Conway, of Westminster, Mr. E. H. Currie, and other friends of the education of the poorer classes, I can say that its loss is severely felt, especially among the night schools.

I have visited nearly all the institutions in the metropolis, and, with few exceptions, they are healthily progressing. The Birkbeck Institution is particularly flourishing, and its educational classes are exceedingly well attended.

It is with pleasure that I report the resuscitation of the Evening Classes at Bow, through the exertions of Mr. E. H. Currie, in connection with the Stepney Deanery Local Board; also the progress made by the South London Working Men's Club, which has sent candidates for examination for the first time. The West London

Youths' Institute is again absent from the list, and it is to be feared that the reason no candidates from that institution have come up is to be found in the closing of the labours of the Metropolitan Association.

EXAMINERS' REMARKS.

The Examiner in *Arithmetic* says:—"The papers have this year been, as a whole, very fairly worked; some of them being marked by great acuteness and thought. The penmanship is in general very good, and the figures are distinctly made and easily read."

The Examiner in the *Metrical System* says:—"The examination has shown that the metrical system is thoroughly understood by a large number of candidates, and few have entered who have not creditably passed."

The Examiners in *Book-keeping* say:—"Some of the papers are extremely well worked, but the general average is hardly so good as that of last year."

The Examiner in *Algebra* says:—"I am glad to be able to remark some improvement in the papers of the candidates, in the algebra examination, over those of last year. The average character of the work is decidedly, in some degree, better; while there are several papers of great merit, showing both careful teaching and considerable natural ability. As far as I am able to judge, the examination appears to answer its purpose satisfactorily."

The Examiner in *Geometry* says:—"In general the papers of the first and second class are good. More candidates than usual have attempted the problems, showing that they have been led to grasp the geometrical method; but some have neglected to observe the directions which require at least six problems for a first-class and four for a second-class; and, therefore, though they may have done well in reproducing the geometry of their text-books, they have been placed in the third class, in strict accordance with the conditions."

The Examiner in *Mensuration* says:—"There is a considerable increase in the number of candidates this year, but the numbers who have fallen into the third class and below it are disproportionately large, there being only 28 per cent. in the first and second classes, while 44 have 'not passed.' It would be worth while to pay more attention to book-work than seems to be generally done, for the sake of the mental training, as well as for obtaining a knowledge of the ordinary rules, and acquiring the power of dealing with new questions."

The Examiner in *Trigonometry* says:—"The answers to the questions in trigonometry were well written out. The work was accurately done, and in many cases considerable ability was exhibited. The papers of the most successful candidates were highly satisfactory."

The Examiner in *Conic Sections* says:—"The papers given in by the candidates in conic sections are much better than heretofore. They are generally marked by an intelligent knowledge of the subject; they give indications that the work, especially the analytical part, has not been learned by rote, but has been understood and can be applied, and they exhibit a very considerable amount of intellectual culture in an abstract subject. The examiner is of opinion that this year's work justifies the hope he ventured to express two and three years since, that the Society would not erase the subject from the list of those in which it proposes to xamine."

The Examiner in *Navigation and Nautical Astronomy* says:—"Of the seven candidates the knowledge of three is of the most meagre kind. The others are better acquainted with the theory than with the applications; they have more or less broken down in the numerical solutions, where accuracy in taking elements, &c., out of the Nautical Almanac is required. There is one exception. I observe that almost all have attempted more than one question in some of the sections, omitting wholly those in other sections; hence there seems some doubt whether they have done themselves justice in this examination. I recommend that in future it be stated on the paper of questions that only one question may be attempted in each section."

The Examiner in the *Principles of Mechanics* "is much gratified in being able to report a very decided improvement in the papers submitted to him this year, as compared with those of the last year. He regrets that the number of those to whom he is compelled to refuse a "pass" is still painfully considerable, but the grounds of his rejection are somewhat different. Last year, the papers of some candidates were marked by complete ignorance of the subject in which they presented themselves for examination. Not so this year. The great majority of those who are not passed have written too little, though that little has been fairly done; they have produced a far less quantity of matter than a time of three hours would justify an examiner in expecting from them. One characteristic, however, applies to all the papers of this year, that the candidates have improved in the clearness and expression of their knowledge about the principles of mechanics."

The Examiner in *Practical Mechanics* writes:—"I am happy to find, in the papers submitted during the present year, an evidence of greater accuracy in the work, as well as an improved knowledge of principles. It seems to be better understood that some special preparation is necessary on the part of those who wish to distinguish themselves in the subject of applied mechanics, and the result has been that a fair proportion of the candidates have passed with considerable credit."

The Examiner in *Magnetism and Electricity* "is much gratified in finding that the more important practical applications of these forms of energy have this year met with more attention than heretofore. The answers of the prizemen, and especially of the first, are of a superior character. But the examiner earnestly recommends future candidates to avoid wasting their time in answering questions not asked; an answer which would have been entitled to full marks if asked for, is otherwise obviously worthless. He would also suggest that a smaller number of questions fully answered is generally worth more than a larger number superficially treated."

The Examiner in *Light and Heat* says:—"The advice given to candidates in former years I must repeat again, namely, that they ought to prepare themselves, before going into examinations, by writing answers in a condensed form to old examination papers. It is only by such exercises that they can expect to learn how to make the best use of the knowledge they have acquired, and economise time in writing their answers at their own examination."

The Examiner in *Chemistry* says:—"The papers exhibit a very decided improvement upon those which came before me some years ago, and afford encouraging evidence of the improvement which is taking place in the study of chemistry."

The Examiner in *Mining and Metallurgy* says:—"Two of the papers sent in this year show a considerable amount of practical acquaintance with iron-smelting and coal-mining."

The Examiner in *Botany* says:—"The result of this year's examination is very unsatisfactory, much behind last year. Eleven out of eighteen have failed to pass. I have but two in the second class; one of these is very fair, but too weak in physiology to deserve helping over into the next class."

The Examiner in *Floriculture* says:—"The papers show an evident improvement on those of last year, but there is still reason to complain, in many cases, of bad spelling, especially as regards the names of plants."

The Examiner in *Fruit and Vegetable Culture* says:—"Some of the candidates would have received a much higher number of marks if they had attended more carefully to the nature of the questions. In some cases they lose sight of one-half of the question, and, consequently, lose also in the number of marks; as for example, in the second question they are asked 'What varieties, and

TABLE I.

RESULTS OF THE FINAL EXAMINATION OF 1869.

NAME OF LOCAL BOARD.	No. of Candidates Examined at Previous Examination by Local Board.	No. of Candidates who Passed Previous Examination by Local Board.	No. of Candidates Examined at Final Examination.	No. of Candidates who Passed at Final Examination.	No. of Papers Worked at Final Examination.	No. of First-class Certificates awarded.	No. of Second-class Certificates awarded.	No. of Third-class Certificates awarded.	No. of Prizes awarded to Candidates.	No. of Unsuccessful Candidates.
Aberdeen	31	18	21	16	22	2	4	11	...	5
Accrington	20	16	16	14	26	6	8	8	...	2
Alderley Edge	...	...	4	3	9	...	2	5	...	1
Aldershot and Farnham	...	...	11	10	17	3	4	8	...	1
Alnwick	80	60	20	15	21	2	7	5	...	5
Ashford	18	17	17	14	17	4	5	5	...	3
Ashton-under-Lyne	10	10	13	7	20	...	4	4	...	6
Bacup	20	20	20	14	46	4	12	11	...	6
Belfast (Academy Science School) ...	2	2	4	3	9	4	4	...	...	1
„ (People's Literary Institute) ...	9	9	10	9	14	2	5	6	...	1
„ (Union-place Science School) ...	20	20	11	10	18	3	4	10	...	1
Bewdley	3	3	3	2	3	...	...	2	...	1
Birmingham and Midland Institute ...	43	34	45	36	55	9	19	15	2	9
Blackley (Science Class)	12	12	12	...	12	...	..	...	...	12
Blandford	...	...	2	2	2	...	1	1	...	...
Bollington	...	..	1	1	2	...	1	1	...	...
Bolton (Mechanics' Institution)	...	...	5	1	8	...	...	1	...	4
„ (Church Institute)	...	...	28	19	43	2	5	24	...	9
Bradford	17	15	19	17	24	3	6	12	...	2
Bristol (Young Men's Christian Association)...	22	22	18	8	19	1	2	6	...	10
Burnley	...	...	15	14	25	4	7	10	...	1
Burrage-road School (Plumstead)... ...	49	46	20	7	32	1	2	5	...	13
Bury (Lancashire)	30	30	18	9	33	...	3	8	...	9
Carlisle	7	7	12	12	19	3	9	6	1	...
Chapel Town	...	...	17	...	17	...	...	...	..	17
Chatham (St. Mary's Science School) ...	20	17	20	8	29	...	2	9	...	12
Chelmsford	5	5	8	8	8	2	4	2	1	...
Cheltenham (Whitworth School of Science) ...	30	30	23	14	45	2	8	12	...	9
„ (Working Men's Club) ...	7	7	5	4	12	...	2	4	...	1
Chorley	3	3	9	5	18	2	7	1	...	4
Compstall	25	23	20	6	30	...	2	7	...	14
Cork (Catholic Young Men's Society) ...	22	21	17	14	27	4	5	11	1	3
Crawshawbooth	...	...	4	3	5	1	1	2	...	1
Crewe	9	8	9	5	16	...	2	4	...	4
Darlington	20	20	14	10	14	1	6	3	1	4
Dean Mills	14	...	8	4	8	...	...	4	...	4
Deptford	4	4	3	3	9	5	2	1	3	...
Derby	1	1	1	1	3	1	1	1	...	...
Devonport	24	24	38	36	66	29	19	13	8	2
Droylsden	50	29	16	2	25	...	...	2	...	14
Dudley	10	7	8	7	10	2	3	4	...	1
Earlestown	20	14	15	5	27	...	...	7	...	10
Edinburgh (Watt Inst.)	16	15	20	14	32	1	9	15	...	6
Failsworth	20	17	16	2	20	...	1	1	...	14
Faversham	...	...	3	3	7	...	2	2	...	...
Freetown (Glossop)	...	...	3	2	4	1	...	2	...	1
Gilford (Ireland)	1	1	2	2	2	...	1	1	..	...
Glasgow (Athenæum)	41	35	28	25	33	10	12	8	3	3
„ (Institution)	1	1	1	1	1	1	...	...	...	...
„ (Mechanics' Institution)	72	58	67	53	80	10	23	29	2	14
„ (Popular Evening Classes, Anderson. University)	80	70	94	63	109	16	26	31	2	31
Glodwick (Oldham)	12	11	18	6	22	...	1	6	...	12
Gloucester	12	12	12	7	12	...	...	7	..	5
Greenwich, East (St. Mary's Nat. Sch.) ...	15	15	12	2	12	1	1	...	1	10
Halifax (Mech. Inst.)	14	9	13	10	21	1	5	8	...	3
„ (Working Men's Coll.)	18	15	27	23	38	5	7	20	...	4
Handsworth	5	5	2	2	2	...	1	1	...	...
Haslingden	...	...	3	2	4	...	2	1	...	1
Hastings and St. Leonards	3	3	4	3	4	...	1	2	...	1
Hatherlow	...	...	1	1	2	2	...	...	...	...
Haughton Dale	...	...	1	1	1	...	1	...	...	...
Hertford	4	4	5	4	5	1	1	2	...	1
Holbeck	1	1	3	3	6	1	2	2	...	...
Huddersfield	36	36	27	23	33	5	8	14	...	4
Hull	6	6	7	7	16	3	4	7	...	...
Hulme	...	...	21	15	32	2	6	12	...	6
Hurst	...	...	10	...	10	...	...	...	...	10
Hyde	50	30	13	5	16	...	...	5	...	8
Ipswich	8	8	8	8	9	3	3	2	...	...
Keswick	12	12	11	8	14	2	3	6	...	3
King's Lynn...	2	2	4	4	4	2	1	1	...	...
Kinver	...	...	2	2	5	1	1	2	...	...
Lancaster	70	70	24	19	29	1	7	14	...	5

TABLE I.—(Continued).

NAME OF LOCAL BOARD.	No. of Candidates Examined at Previous Examination by Local Board.	No. of Candidates who Passed Previous Examination by Local Board.	No. of Candidates Examined at Final Examination.	No. of Candidates who Passed at Final Examination.	No. of Papers Worked at Final Examination.	No. of First-class Certificates awarded.	No. of Second-class Certificates awarded.	No. of Third-class Certificates awarded.	No. of Prizes awarded to Candidates.	No. of Unsuccessful Candidates.
Leeds (Church Inst.)	7	7	13	13	18	2	6	10	...	...
,, (Mech. Inst.)	46	46	48	39	85	13	23	27	6	9
,, (Young Men's Christian Association) ...	54	44	36	27	48	5	8	22	...	9
Lichfield	...	...	3	2	4	...	1	2	...	1
Liverpool Inst.	27	27	29	26	48	6	10	21	...	3
London (Beauvoir Coll.)	6	6	23	23	29	15	11	3	1	...
,, (Birkbeck Literary and Scientific Institution)	41	39	52	46	82	24	25	21	9	6
,, (City of London College)... ...	30	29	56	56	95	34	35	19	7	...
,, (Lambeth Evening Classes) ...	25	23	14	8	19	...	3	8	...	6
,, (Royal Polyt. Inst.)	22	21	37	31	63	11	17	22	6	6
,, (St. Stephen's, Westminster) ...	4	4	6	6	7	...	3	4	...	...
,, (Stepney Deanery)	17	17	20	19	22	7	7	6	...	1
,, (South London Working Men's College	17	17	12	2	19	...	1	2	...	10
Macclesfield	23	...	6	1	7	...	1	...	...	5
Manchester (Mech. Inst.)	138	96	73	53	108	20	27	29	6	20
Middlesbro'	...	...	2	2	2	...	...	2	...	...
Mossley	5	4	6	6	6	1	...	5	...	...
New Brompton, Chatham (St. Mark's Science School)	9	9	10	5	17	...	1	5	...	5
New Mills	2	2	8	4	9	1	...	3	...	4
New Swindon	22	22	25	12	32	2	6	7	...	13
Newcastle-on-Tyne (Church of England Institute)	2	2	4	3	7	...	4	2	...	1
,, (Mech. Inst.)... ...	...	...	4	2	5	...	2	1	...	2
Newton Heath	9	9	8	6	15	1	5	4	...	2
Northampton	23	20	19	12	25	...	3	12	...	7
Oldham (Analytical Lit. Inst.)	10	8	18	6	33	1	...	6	...	12
,, (Lyceum)	...	...	41	25	78	2	12	23	...	16
Over Darwen	...	...	1	1	1	...	...	1	...	...
Paisley	10	9	10	10	12	3	5	4	1	...
Parsonstown (Ireland)	7	7	9	6	12	1	3	4	...	3
Patricroft	12	12	14	5	18	2	1	4	1	9
Pembroke Dock	11	11	10	10	17	4	7	5	...	...
Penzance	11	11	9	9	23	1	3	9	...	...
Portsmouth	13	13	18	18	36	19	14	3	7	...
Preston	...	...	20	11	27	1	4	7	...	9
Ramsgate	1	1	1	1	2	1	1	...	1	...
Rawtenstall (M.I.)	28	28	25	3	34	...	1	2	...	22
,, (Irwell Inst.)	6	6	3	2	3	...	1	1	...	1
Richmond	6	6	8	5	13	5	2	3	7	3
Rugby	22	21	29	22	50	1	9	20	...	7
Salford (Working Men's College)	...	53	70	63	101	17	31	33	3	7
Scarborough	...	...	4	3	5	...	...	3	...	1
Sheerness Dockyard	76	72	33	31	59	12	19	20	2	2
Slough	5	5	7	5	13	1	1	6	...	2
Southampton	38	38	31	27	60	10	15	20	1	4
Staleybridge	24	...	12	...	14	...	...	...	...	12
Stockport (M.I.)	30	12	16	8	21	3	3	3	...	8
,, (Sunday School—Night Class) ...	70	50	14	12	27	...	2	12	...	2
Stockton-on-Tees	...	...	3	3	6	2	...	3	...	...
Stourbridge (Associated Institute)... ...	...	...	2	...	2	...	...	...	...	2
Swinton	...	...	1	1	1	...	1	...	...	...
Tottington	3	2	4	4	6	1	1	4	...	...
Tyldesley	30	26	12	...	12	...	...	...	...	12
Wakefield	10	9	9	6	9	1	1	4	...	3
Walsall (Church Institute)	9	9	9	8	10	...	3	6	...	1
Wednesbury	12	12	10	10	20	1	2	14	...	...
Werneth (Oldham)	8	8	4	...	4	...	...	...	...	4
West Bromwich (Gold's Hill)	...	...	6	5	6	...	2	3	...	1
Weston-super-Mare	2	2	2	2	4	1	1	2	...	...
Whaleybridge	...	...	2	...	2	...	...	...	...	2
Wolverhampton	1	1	15	13	23	5	5	9	1	2
Woolwich (Royal Arsenal)	52	52	62	36	113	3	9	36	...	26
,, (St. Michael and All Angels) ...	5	5	5	3	8	1	1	2	...	2
,, (St. Thomas's School)	39	38	28	20	40	...	5	17	...	8
,, (Rectory-place Science Classes) ...	22	22	16	3	24	1	2	2	...	13
Worcester (Mutual Improvement Society) ...	...	...	1	1	3	2	...	1	...	...
York	6	6	10	4	14	...	1	4	...	6
Totals	2,264	1,988	2,160	1,504	3,193	415	674	986	84	656

Number of Local Boards, 139.

how many of each,' they would select to plant a quarter of an acre with. In more than one instance the reply to the latter part of the question is entirely omitted. I would therefore advise future candidates to make themselves thoroughly acquainted with the question before they begin to answer it. I am glad to remark that the three first-class papers of this year are highly respectable, but one of them would have obtained a much higher number of marks had it not been that the writer fell into the error I have indicated above."

The Examiner in *Animal Physiology* says:—"The papers sent in this year show a decided improvement over those of the two previous years. Their general merit is higher, and those of the first-class are in every way excellent. Still, I may repeat the caution of last year, that a mere display of technical terms is no proof of a knowledge of physiology, and that first-class papers often show a minimum, and third class papers a maximum of long Latin words."

The Examiner in *Domestic Economy* says:—"The average quality of the answers is nearly the same as last year. The third-class is twice as numerous as last year, but those who have not passed are only half as many. I find, as last year, great deficiencies of spelling in some of the papers, and many of the candidates seem little practised in composition, and, therefore, unable to express clearly what they know. These papers impress me strongly with the opinion of the necessity of good primary instruction as a preliminary to technical instruction."

The Examiner in *Political Economy* says:—"I have been greatly pleased with the general excellence of the papers. The questions set are many of them difficult. The candidates to whom I have given the highest number of marks have done remarkably well, and I hope all those who have obtained first-class certificates will be encouraged to pursue the study of political economy. I am confident they will be able to master its more difficult principles."

The Examiner in *Geography* says:—"The geography papers, on the whole, are hardly equal to those of some former years. There are, indeed, many among them which exhibit merit of a high order, but those of only third-class value are numerous, and there are a great many failures. Some of the latter are so completely failures as to lend strong confirmation to an opinion which I have expressed upon a former occasion, on the desirability of a fuller "preliminary examination" before allowing candidates to compete for the Society's certificates. The objects of the Society would be better served were intending candidates more fully cognisant of the nature of the task they would undertake, and were they especially more generally aware of the definiteness and precision of study which are essential to success."

The Examiner in *English History* says:—"I am happy to say I have no complaint to make of grammar or spelling; with a few exceptions the papers are free from inaccuracies in these respects. Some of the candidates in the first class have acquitted themselves entirely to my satisfaction, and have obtained marks over the average."

The Examiner in *English Literature* says:—"The number of papers on this subject is greater than it has generally been in past years, but rather a larger number of the candidates have failed to pass. I think the amount of really good work somewhat exceeds that of last year. Several of the papers are highly creditable, and exhibit attentive reading, correct habits of thought, and considerable power of expression."

The Examiner in *Logic and Mental Science* says:—"The present year's papers on logic and mental science are beyond comparison the best I have yet had. Not only is there a larger number of candidates, but the average merits of the papers are far higher than on any previous occasion since I have had the pleasure of examining them."

The Examiner in *Latin and Roman History* says:—"The translations were more correct than they have been on previous occasions, and some were not only correct but spirited. The grammatical questions were fairly answered, but not more than fairly except by one candidate. The history was generally very poor."

The Examiner in *French* says:—"I cannot speak highly of the French papers this year. The work of preparation has evidently been superficial, and there is scarcely any evidence of a thorough grasp of the subject. The grammar is especially weak, and the spelling very faulty. On the whole, the papers are below the average, particularly those that aim at the highest class of certificate."

The Examiner in *German* says:—"I have much pleasure in being able to state that the work of the candidates who have taken up German is, on the whole, fairly done. It is true that none of the papers bear evidence of particular excellence, but, on the other hand, only a very few candidates—chiefly aspirants to a third-class certificate—have shown themselves really ignorant of the subject in question. The principal defects I have to point out in general are these:—1. Insufficient practice in the conjugation of verbs, both regular and irregular. 2. Imperfect knowledge of the rules referring to the construction of sentences. 3. Want of a sufficient German vocabulary, which defect showed itself particularly in the translations from English into German. The deficiency just pointed out arises, in my opinion, from the circumstance that the candidates, though well prepared in the subjects which have been set, do not seem to have read much German besides."

The Examiner in *Italian* says:—"I notice a considerable improvement in the papers worked this year by candidates for first-class certificates; they are generally done with intelligence and care. I would inculcate, however, a more diligent application to Italian grammar, of too deficient a knowledge of which I have again met many instances; this remark applies more especially to the candidates for second-class certificates."

The Examiner in *Spanish* says:—"The number of students has been larger this year than on any preceding occasion. Those who have tried for the first-class certificate have manifested a good knowledge of the Spanish language, particularly the best, whose composition was almost faultless. The other candidates, with the exception of three, are not so well prepared, and require a better acquaintance with the rules of grammar."

The Examiner in *Free-hand Drawing* says:—"I have before had occasion to remark on the increase in the number of candidates in free-hand drawing, but this year the increase is far beyond that of any previous year. In 1867 there were 85 candidates; in 1868 there were 108; and this year there are 187. It is satisfactory to find that, while the number is so much greater, the average of merit is not less; the first, second, and third classes being in the same proportion to each other."

The Examiner in *Practical Geometry* says:—"Of 442 candidates, two have obtained a first-class, nine a second-class, and 54 a third-class. The papers bear strong evidence of being the result of memory only, and not of any sound knowledge of the subject. Any question that is not of an ordinary character is unattempted. The drawing, on the whole, is very creditable, and in many cases particularly good, very rarely careless. The examination is, on the whole, more satisfactory than the last, indicating an improvement in knowledge; much cannot be expected till the subject of theoretical geometry is more studied in England than it is, this country contrasting very unfavourably in this respect with other nations."

The Examiner in *Mechanical Drawing* says:—"At first sight the results of the present examination in mechanical drawing may appear not to be very satisfactory, as 152 out of the 243 candidates have failed to pass. When, however, it is taken into consideration that this is the first examination that has been held by the Society upon this subject, and, consequently, that many of the candidates are likely to have entered upon it with anything

but a clear idea of what would be required of them, and also that the standard of proficiency has been kept high, I think that the examination, which was professedly a tentative one, may be considered successful. With regard to the general quality of the work, I would remark that, in many cases, whilst the neatness of the drawings showed that the pupils were familiar with the use of their instruments, still there was much to be desired in the point of accurately working to the given dimensions; and also that, as many of the drawings sent in were only in pencil, I was unable in those cases completely to judge of the capacity of the pupil."

The Examiner in the *Theory of Music* writes:—"Inequality is the most remarkable feature in the work of this year in my subject. More very good papers have, I think, been sent in than on any former occasion; also more very bad."

The Examiner in *Elementary Musical Composition* says:—"I find, on the whole, evidence of much musical fluency, but of little real talent; a few candidates, however, indicate decided exceptions from this last remark. I find that the first exercise seems to have been more perplexing than the other two; in this the metre was prescribed, but no verses given, and certain modulations and cadences were required. Hence it is shown that there is greater difficulty in writing within defined limits, than when the invention is left free. I find that the compositions set to the prose verse from the Psalms make more pretension than those set to metrical verses, but are, for the most part, less meritorious as they are more ambitious. I think that the signs of musical aptitude which the examination affords are in a high degree satisfactory, and that they are still more promising of progress. I have counted as faults any errors in writing the notes, considering that all who practice music must begin by understanding either its usual or its exceptional characters. I have made a small deduction also for not writing the words under the notes, because this is a very unmusicianly method, to say nothing of the extra trouble it has given in judging the accentuation, which, indeed, has not always been possible."

The report of the discussion at the Conference will appear in a subsequent number of the *Journal*.

TABLE II.—Number of Papers Worked in each Subject in the Four last Years; with the Result for the Year 1869.

SUBJECTS.	1866.	1867.	1868.	1869. No. of Papers Worked.	1869. No. of First-class Certificates.	1869. No. of Second class Certificates.	1869. No. of Third class Certificates.	1869. No. of Papers in respect of which no Certificate was awarded.
Arithmetic	383	520	528	621	137	142	219	123
Metrical System	..	..	..	42	19	11	7	5
Book-keeping	209	235	255	253	41	78	112	22
Algebra	65	87	76	66	7	8	16	35
Geometry	30	41	36	48	4	12	23	9
Mensuration	40	55	78	98	6	22	28	42
Trigonometry	9	9	20	19	3	8	3	5
Conic Sections	7	8	5	12	4	4	2	2
Navigation, &c...	2	1	2	7	1	3	..	3
Principles of Mechanics ..	10	27	52	33	1	6	5	21
Practical Mechanics	18	38	53	55	2	7	24	22
Magnetism, Electricity, &c. ..	8	32	41	95	4	9	31	51
Light and Heat..	7	35	28	13	1	3	2	7
Chemistry	80	76	92	138	21	48	44	25
Mining and Metallurgy ..	3	1	1	4	2	1	1	..
Botany	19	16	16	18	..	2	5	11
Floriculture	6	9	16	12	5	3	4	..
Fruit and Vegetable Culture ..	8	9	13	9	3	4	2	..
Animal Physiology	48	45	121	135	11	38	63	23
Domestic Economy	6	34	32	31	8	4	13	6
Political Economy	6	8	7	19	9	4	5	1
Civil Government, &c... ..	..	..	..	8	2	3	1	2
Geography	86	98	114	99	8	35	28	28
English History	78	86	99	94	20	44	17	13
English Literature	39	29	33	37	5	4	18	10
Logic and Mental Science ..	8	4	9	24	6	11	3	4
Latin and Roman History ..	9	9	21	17	3	7	4	3
French	116	118	148	140	6	18	68	48
German	10	12	16	26	7	9	6	4
Italian	5	2	3	9	2	3	1	3
Spanish	6	6	6	13	5	2	4	2
Free-hand Drawing	55	85	108	187	12	38	91	46
*Practical Geometry	132	240	421	442	2	9	54	377
Mechanical Drawing	..	..	..	243	6	25	60	152
Theory of Music	39	71	97	69	22	26	10	11
Elementary Musical Composition (Tonic Sol-fa System)	..	..	..	57	20	23	12	2
Totals..	1,571	2,050	2,547	3,193	415	674	986	1,118

* In previous years, Geometrical Drawing.

THE LONDON CAB SYSTEM.

The following additional information and suggestions may be regarded as supplementary to the discussion which took place on the 8th inst.:—

Mr. Telford Macneill proposes a "Cab-fare Indicator," of his own invention, as follows:—The instrument is proposed to be so placed as to be easily seen by the person using the cab, but its control is in the hands of the driver; that is to say, he can set the instrument at zero each time his cab is engaged, by pulling a cord, one end of which is attached to the indicator, but further than this he has no control over it; and, once it is set to zero, it would be against his interest to interfere with it, as all he could do would be to shorten the apparent distance he had driven. The person using the cab would, at the end of the journey, have an exact and simple indication of the distance traversed, the dial being divided into miles and quarter miles; five miles being chosen as a useful unit for one revolution of the hand, but any distance beyond that, and up to one hundred miles, is shown by a second and smaller set of divisions on the face of the indicator. These latter figures are, however, principally for the use of the cab proprietor, who will thus know how far his horses have been driven. The hand used by the public for short distances is set, each time the cab is engaged, at zero, but the smaller divisions do not change, but carry on the total up to one hundred miles. The band which drives the indicator cannot be removed except by the cab proprietor, and as the reversing of the wheel will not affect the indicator, the proprietor will know, on the return home of his cab, whether his horses have been over-driven or have performed a fair day's work; and it is not impossible that he may use this indication of work done to form a scale of payment as between himself and his drivers. The inventor states that the working of an elastic band has been found to answer its purpose admirably, giving a smooth and noiseless action to the indicator, and has completely overcome the difficulty of communicating the motion from the wheels of a carriage to an indicator placed on the carriage body, the nearly uniform motion of the body, and the sharp rattling vibrations of the wheels, requiring a connection which would at once transmit the proper motion and soften the incessant jar between them, and also allow for the play of the springs when loaded or unloaded.

Mr. Peter Gaskell, of Birmingham, proposes a cab indicator, or tell-fare, invented and patented by him. Its objects are to enable the drivers of hackney coaches and cabs, and the passengers therein—first, to know the distance passed over; and second, the correct fare to be paid; and then, further, to enable cab-owners to ascertain—thirdly, the number of journeys the cab has made; fourthly, the distance of each journey; fifthly, the fare receivable for each journey; and, sixthly, the entire distance run by a cab from leaving the premises of the owner to its return. The machine is so geared that when the cab is moving forward the cab-wheel is made to measure and the machine to indicate the distance passed over. This is done by a worm-wheel taking into a pinion-wheel having a new coupling slot, which permits a shaft to pass freely through, whatever may be the vibration or oscillation of the vehicle. The rotary motion of the shaft drives a tooth-wheel inside the indicator, at the rate of one revolution in 20 miles (or any other number required). It works loose on its spindle, and is graduated with numbers up to 20, and with suitable pointers, shows the entire runnings of the cab. When a distance under 20 miles requires to be measured, as when a passenger wishes to be conveyed from one place to another, a lever marked "For hire" is brought down, and in doing so it secures the spindle which carries the dial-pointer firmly to the wheel by a clutch, and it is then carried round by it, and the pointer will show on the dial the progression made. When the cab arrives at its destination, the distance is seen, with the fare, on the indicator. On raising the lever "For hire," the clutch is removed from the wheel, and a spring carries it with the dial-pointer back to zero. The wheel again moves loose on the shaft, and has no action on the pointer until another passenger requires the cab, when the "For hire" lever is brought down, and the pointer again shows the distance and fare, and will do so as often as may be required. To obtain a record of the journeys and fares, the spindle is made hollow, and allows a slide to move freely within. This slide moves across an arm, and carries a needle which perforates a paper disc. The cam which works the clutch acts on the needle slide, and makes the needle perforate, and recede on bringing down the lever before it can bring the pointer to the wheel. The needle is carried round by the arm, and when a journey is ended, the cam again acts, when the "For hire" lever is raised, and causes the needle to stamp the disc again opposite the distance and fare, as shown on the dial. The needle is prevented marking the disc twice in the same place by a rack, giving the needle a different circuit every journey. The paper disc used will record 21 journeys, and if the journeys are 20 miles each, 420 miles would be registered. Mr. Unwin, manager of the Sheffield Carriage Company (Limited), reports favourably of the invention.

Mr. P. N. Hasluck, of Tottenham-court-road, also proposes his patent hackney-carriage mileage indicator. This instrument prints two waybills, one showing the exact distance traversed each journey, the other the distance traversed throughout the day, marking on paper the licensed number of the hackney carriage and the letters O. N. E. M. I. L. E., thus distinguishing the eighth of a mile or furlong. The exact distance is shown on the printed way-bill, and the gratuity, if any, in excess of legal charge may be determined without controversy. The exact distance is printed on the way-bill placed to the debit, and the exact cash paid placed to the credit, determining the most important point, as a matter of business, in the proprietor's balance of account, and the inventor thinks that an advantage to the driver is the offering a pledge of good faith which must increase demand for his services, and also tend to increase gratuities.

Mr. W. H. Simms proposes free trade in cabs. Each proprietor to fix his own price per mile, provided the same is clearly painted on the side of the cab. Price not to be altered without giving one month's notice to the police. Half-mile fares to be paid when over one mile, thus, one and a-half mile at 8d.=1s.; two miles, 1s. 4d., and so on. The circle to be seven miles round St. Paul's, which he thinks is the nearest true centre you can invent. Many hundreds of single cab stands could be found near to lamp-posts, where one cab might stand, to be indicated by a red ring round the post. All outside luggage to be paid for at twopence per package. No extra charge for extra passengers beyond the mileage rate, each cab being licensed to carry so many persons.

Mr. R. Dell.—Free trade in cabs. Price per mile to be painted on the cab. Some means of registering distance to be provided.

Dr. G. Wylde suggests that the fare be restored to the former 8d. a mile, but that all distances be calculated in direct lines between the points of "taking up" and the points of "laying down" passengers. In order to effect this, an authorised map of London, on a small scale, should be placed in every cab, together with a pair of compasses or a measuring scale. By this means the exact direct distance between any two points could be at once ascertained in all disputed cases.

Mr. P. H. Holland proposes that any cab-owner be allowed to charge at whatever rate he pleases, not exceeding say 1s. per mile, on condition that the rate of charge be distinctly marked, and that every cab for which more than 6d. a mile is charged be provided with an indicator, to show the distance travelled with approximate correctness. Good cabs cannot be main-

tained unless adequately paid for, and it is far better that such payment should be obtained by a publicly announced fixed rate of charge and just measure of distance. In cases of dispute, suggests that the plan successfully worked at Manchester should be adopted, allowing complaints against cab-drivers to be made in writing, the attendance of the complainant not being required unless the statement of facts be disputed, as is rarely the case. If there be no dispute as to facts, the Hackney-coach Committee of the Manchester Town Council inflict a penalty, generally a small one; and, though their decision cannot be legally enforced, it is always submitted to, as the Town Council can revoke a cabman's license for misconduct.

Mr. G. N. Hooper—There should be two classes of close four-wheel cabs, to carry four inside.—1st class, at 9d per mile, the drivers to wear a livery or uniform; 2nd class at 6d. per mile, for the convenience of persons of limited means and servants. Hansom cabs on two wheels should be of two classes, at similar fares to the four-wheel close cabs. Small omnibuses drawn by one horse, should be introduced for use at railway stations, to carry six persons inside, the fare to be 9d. per mile; the roofs should be adapted to carry luggage. Little open carriages on four wheels should also be introduced. The fares for these should be 9d. per mile, as they would probably only be in use half the year. A table of fares should be fixed outside as well as inside each carriage. Each driver should be compelled by law to give to the hirer, on engaging his carriage, a ticket. There should be more stands provided; the best quarters should not be entirely exempted, and other localities should not have a disproportionate number of standings allotted to them. Rigid discipline should be enforced among the drivers. Empty cabs should be compelled to display some mark or signal, to show they are plying for hire, and should be prevented by the police from interfering with the traffic. A simple and uniform method of construction should be adopted, to facilitate repairs. This system is already in operation at the works of the Paris General Omnibus Company, where the parts, being made alike, readily interchange, just as do the parts of a rifle made at the Government factory at Enfield.

Mr. George Powley.—Two classes of cabs, light and handsome ones, *not* to carry luggage; these might be lighter than the present cabs, For luggage the construction should be stronger, but these also should be handsomer and more roomy, with higher wheels. There should also be open carriages licensed by the month, so as to lie by in winter. To meet the difficulty of the change in style of cabs, proposes that government grant loans, which cab-owners could repay by instalments. The present inspection is inefficient. The cab-owners should have a printed form, which must be signed every month by the inspector, who shall be a practical coach-maker, not a policeman.

Mr. Sydney Robins—Two classes of cabs, with different rates of fares. That two models of cabs be obtained by the Commissioners of Police, and that all cabs be required to resemble one of these models. That cabmen be required to pass an examination as to their fitness to drive, their knowledge of London, and in reading and writing. That no cabman be licensed unless he has one certificate of good conduct. No cabman be licensed who is in any maimed or crippled. Cabmen to wear a uniform. That all cabmen be compelled to carry an official book of fares. That all cab proprietors be obliged to place in the hands of the Commissioners of Police the sum of £10 per cab, which sum shall be forfeited in case of strike. All cabs going on duty shall pass the nearest police-station, there to be inspected. That all horses worked by the cab trade be examined once a month by some person appointed by the Commissioners of Police. That any cabman found conveying any person suffering from any contagious disease be fined, dismissed, and the cab disinfected. No loitering cabs to be allowed.

Mr. G. Tonkin proposes that the steps of cabs should be placed lower. That lockers for luggage should be constructed. That the seats should be covered with leather, to lessen the fear of contagion.

Mr. James Townley, a cab proprietor and driver, proposes a light, roomy carriage, like a brougham, at 1s. a mile, or 3s. an hour, in addition to the present cabs. Thinks the Hackney Carriage Act bears harshly upon cab proprietors. The present inspectors do not understand their duties. Fares refusing to pay cannot be taken into custody, which is unfair. Property found in cabs should be the property of the cabman, if not claimed within a certain time.

Mr. J. Wakeling—Free competition as to kind of carriage to be provided. Inspection only as to safety and cleanliness. Fares to be fixed by a meeting of the trade. Cabs to be able to ply for hire wherever they set a fare down; and no privileges, as now, granted to special cabs by railway companies. Cab-owners to be made responsible for the characters of their drivers.

Mr. Thomas Fry, solicitor to many of the Cab Proprietors' Associations, refers to four articles written by him in the *St. James's Magazine*. He thinks that the Act proposed to be brought in by the Home Secretary should repeal all the present Hackney Carriage Acts, and then in one consolidated statute contain the whole law upon the subject. As to the inspection, he considers there should be a distinct office under a responsible chief, with power to appoint as inspectors men who have been brought up to the coach-building trade; the inspection should not take place, as it now does, once a year, at a stated time, when all the six thousand cabs have to be brought to the inspector, but districts should be appointed, and so many numbers taken daily. Then the position of the watermen ought also to be altered. At present they are of no use except to prey on the poor drivers. These men should be under the control of the proposed chief office. He considers the law of lost property unjust alike to the driver and useless to the public. The office for it ought to be under the same control, and if there were also an office where all complaints could be made and inquiries answered, a more direct control would be obtained over the proprietors and drivers. The liability of the proprietors for loss of luggage should be limited, as is the case with the railway companies. He thinks the rate of sixpence a mile is unreasonable, and as long as it is law we must not expect to have cabs that will do credit to our London streets. There ought to be better conveyances, especially open ones. The proprietor should be allowed, when he sends his conveyance to be inspected, to declare the charge he intends to make per mile; let this be painted upon the carriage, and no dispute can then arise, except as to the distance travelled.

Mr. W. Britton—Cabmen should be in uniform, to be supplied them, and paid for by instalments.

Mr. G. Best—The whole duty should be taken off cabs, but £5 to be paid on first taking out the license. The system of "yard money" is bad.

Dr. J. McGrigor Croft—Has a plan of a new cab, affording greater comfort; recommends special hospital cabs, painted in various colours to signify their purpose, as for fever, cholera, accidents, &c.

Mr. R. Taylor—Suggests that the ironwork on the top of cabs be painted white, and set upright so as to show when a fare is inside. Suggests an electro-silvered badge as a mark of good conduct.

Mr. W. Grant—Proposes to place on or in the ordinary lamps the numbers, fares, &c., in such a manner that they can be distinctly seen day or night—especially at night. From the proximity of the eye to the lamps, on entering or leaving the vehicle, the numbers, &c., can be most easily seen. Thinks a small addition should be made to the fares at night; suggests that there should be a signal for the driver to stop, consisting of an arm in front of him, raised by a string within the vehicle; that transparent numbers be inserted in the doors or fan-

lights of houses, so as to enable cabmen more easily to find the address given.

Mr. M. A. Lewis thinks that no driver under 20 years of age should be licensed. Character to be strictly inquired into.

Mr. E. G. Hulett—Cabs should be six inches wider; should have speaking-tube; the four-wheeled cabs should have breaks to work with a treadle. All cabs should be kept in ranks marked by conspicuous lamps, and covered with zinc supported by iron columns. Each cab to pay 1d. a day for standing-room; each rank should have a manure-box, which would be a source of profit. Cabs should have lamps inside, like railway-carriages. There should be inspectors to visit each rank, to see it kept in order and clean.

Mr. Henry Marston—Payment simply by time, 3d. for every five minutes; and if either side gets the worst of the bargain, the vanquished is only damaged to the extent of 3d., allowing for all variation in clocks.

Mr. Butterfield suggests that the general cab-stand accommodation should be increased as much as possible; but that, in addition to the general stands, special licenses should be granted to (say) three men, exclusively to stand their cabs in special localities, and that this system should be applied generally throughout the suburbs of London. By such a system he considers the cabmen would become greatly improved as a class, as they would become known to the residents of the locality in which their standing was situated.

Mr. Stapleton—Suggests formation of a Co-operative Carriage Society, the entrance fee of each member being at such a rate as to provide the whole plant, and his annual subscription sufficient to pay expenses of management, &c. Moderate fares, proportioned to different sorts of carriages, and calculated to be sufficient to pay the ordinary current expenses, *i.e.*, drivers' wages, horse-keep, stores, stabling, and provide a sinking fund for replacing plant. Each carriage to be provided with a clock and pedometer; both to be set by the ostler on leaving the mews. No carriage to be hired except from the mews. Time to run on when carriages are put up during the hiring. No charge for expenses if put up at a mews of the society; otherwise expenses to be paid by the members. Proposed charges:—Victoria, 6d. a mile; 1s. an hour. Miniature brougham, 9d. a mile; 1s. 6d. an hour. Double brougham, 1s. a mile; 2s. an hour. The society should have as many mews as possible, in different parts of the West-end.

Mr. J. C. Brandon sends the following information as to the Paris *voitures*:—1. The cost of the coupé for two places for winter, that is closed, is £60; the open one, four places, £50. 2. The cost of the harness, nothing extravagant of course, but useful, £5. 3. Earnings in the average of all cabs per day, 16s. 4. Number of cabs running in Paris is 5,400 in winter time; 7,000 in summer. 5. Wages per day to coachmen, 4 francs. 6. Probable amount of miles run per day, say 55 to 60 kilometres, equal to 40 to 45 English miles. 7. Cost of shoeing one horse is 15 to 20 centimes per day at most. 8. Cost of man's coat, hat, waistcoat, trousers, &c., £6. 9. For the license paid to the Ville de Paris, 1 fr., 25 centimes contribution and petty,=1 fr. 25 c. together. The prices of the horses are under and above £20; the average would be, say £22. The wearing out of the wheels, &c., of the cabs may be reckoned at about 2 fr. 50 c. daily per cab. The cabmen are paid daily their wages of 4 frs. per diem, this amount being daily deducted from their earnings. The "pourboire," which has entered thoroughly into our habits, &c., affords the cabmen an extra 5 frs., and sometimes as much as from 8 to 10 frs.; that accounts for the small wages.

Mr. J. L. Haddan, in addition to his "course system," described at the meeting, suggests that each cab should have a name, which would be more easy to remember than a number.

The following, on cab fares in Paris, is from the Paris correspondent of the *Journal*:—

After a long series of experiments with a number of milometers, and much consideration of the subject, a practical attempt has been made to inaugurate the system of mileage rates in Paris. The authorities have not adopted any special meter, but seem to have confined themselves to giving information on the subject of such apparatus, and fixing maximum rates of charges, which are as follows:—

Vehicles carrying Four Persons.

First kilometre, 90 cents. = about 1s. 2d. per mile.
Per do. afterwards, 30 cents. = nearly 5d. „

Vehicles carrying Two Persons.

First kilometre, 85 cents. = about 1s. 1½d. per mile.
Per do. afterwards, 25 cents. = about 4d. „

A considerable number of cabs have been fitted with the meters, and there seems some chance of the difficult problem of equitable charges, as regards all distances as well as time, being resolved. The cabmasters fixed their rates somewhat lower than those authorised by the municipal authorities, but it was found that, even at these reduced rates, while the new system presented a positive advantage as regarded short distances, the charge for the first hour would amount to 3 francs 50 cents., or a franc more than under the old system. This being pointed out, has caused a revision of the new rates to be made, and M. Cezard, a cab proprietor, and president of the syndical chambers of the trade, has issued a new list of charges, with a lucid statement of the working of the system. The meter employed by M. Cezard is the invention of M. L. Bruet, and allows of stoppages and different rates of speed, without those who use the vehicle having in any case to pay more than the rates for the actual distance passed over. There should, however, be some regulation with respect to stoppages, as otherwise a vehicle might be detained for an unreasonably long time within a very short distance, which would be clearly unfair to the proprietor of the cab. The rates last adopted by M. Cezard, are as follows:—

Vehicles to hold Four Persons.

	Cents.			d.
First kilometre	75	=	per mile	11½
Per kilo. afterwards	25	=	„ nearly	4

Vehicles for Two Persons.

	Cents.			d.
First kilometre	60	=	per mile	9½
Per kilo. afterwards	25	=	„ nearly	4

And these prices, it must be mentioned, apply not only to Paris proper and the Bois de Boulogne, but also to the Banlieue; whereas, according to the old system, the rates in the case of the suburbs were considerably higher than within the town, to which alone the charge by the course or journey applied.

Under the old system, vehicles, when taken by the hour, were required to be driven at a minimum speed of eight kilometres, or five miles, per hour, and an hour's rate had to be paid even though the cab were retained for a much shorter time. According to M. Cezard's new tariff, the charge for five miles, or one hour, will be; for a vehicle holding four persons, 2s.; and for a two-place cab, 2 fr. 35 cents., or about 1s. 10½d. for the first hour; after the first hour the rate will be equal in each case to 2 francs per hour only. But it is promised that the speed of cabs shall be greater than formerly by one or two kilometres per hour, in which case the charge per hour would be relatively higher, the only difference to the customer being a saving of time.

M. Cezard sums up the results of his present rates of charge in a few lines. He says, in effect:—"For a single kilometre I carry two persons at the same rate as the omnibus (3d. each), and four persons riding two kilometres pay 20 centimes less than they would by omnibus." Riding from the Bourse to the Northern,

Western, or Strasbourg railway stations, the Chamber of Deputies, or Palais de Justice, would all come within the two kilometres. The cab-rates of Paris are at present exorbitantly dear for small distances; the shortest course in a two-place vehicle being 1 fr. 50 cents., with a *pourboire* of two, three or more sous for the driver; whereas, for a long course, which may extend from one end of the city to the other, the charge is admitted to be too little. The new system is, therefore, far more equitable than the old one for all parties; it does away with nearly all possible causes of contention, and, therefore, is likely to be appreciated by the public, and to cause a greatly increased demand for cabs. The adoption of what may be called the metrical cab system by our neighbours may assist the solution of the question in London.

The General Public Carriage Company states, in its annual report lately published, that it has engaged an eminent mechanician to study the whole subject of mileage meters, and that he has produced an instrument which is now being constructed in large numbers for the company, and which, it is believed, will fulfil all the requirements of the case.

EXAMINATIONS IN SCIENCE BY THE SCIENCE AND ART DEPARTMENT.

The annual science examinations of the Science and Art Department were brought to a close on Saturday, the 29th May. This was the ninth general examination that has been held since the establishment of the system of aid to instruction in science, in 1859. The examinations are superintended by local committees. They were in this way held at 437 centres this year, whilst last year they were only held at 261. At that time there were about 15,000 students under instruction, this year there were 25,000, and the number of papers worked shows a similar increase, having risen from 13,112 to 23,997. The number of candidates in the various subjects was as follows:—

In geometrical drawing there were 2,547, last year there were 1,337; in machine drawing 2,997, last year 1,671; in building, construction, and naval architecture 1,993, last year 1,206; in elementary mathematics 2,302, last year 1,390; in higher mathematics 85, last year 33; in theoretical mechanics 631, last year 353; in applied mechanics 284, last year 167; in acoustics, light, and heat 1,350, last year 769; in magnetism and electricity 2,480, last year 1,038; in inorganic chemistry 2,166, last year 964; in organic chemistry 210, last year 123; in geology 609, last year 309; in mineralogy 67, last year 38; in animal physiology 2,227, last year 1,182; in zoology 303, last year 298; in vegetable anatomy and physiology 144, last year 112; in systematic and economic botany 90, last year 73; in mining 48, last year 41; in metallurgy 120, last year 81; in navigation 303, last year 219; in nautical astronomy 107, last year 86; in steam 148, last year 106; and in physical geography 2,786, last year 1,516.

This is the first examination at which the scholarships of £100 per annum, founded by Mr. Whitworth, have been competed for. There have been about 120 candidates for them, and as soon as the results of all the theoretical examinations have been made known the practical examination will be proceeded with in the manner detailed in the minute of the Lords of the Committee of Council on Education.

DISTRICT SCHOOLS FOR PAUPER CHILDREN.

By George C. T. Bartley, Esq.

III.—THE NORTH SURREY DISTRICT SCHOOL, NORWOOD.

The third great school of this class is situated about a mile south of the Crystal Palace, overlooking the parish of Penge. It was one of the first to be established, and accommodated, in 1867-8, an average of 810 children. It provides for the parish of Chelsea, and the unions of Croydon, Kingston, Lewisham, Richmond, Wandsworth, and Clapham.

In giving the various details of expenditure, it must be remarked that the annual accounts, as published, are sadly vague, and only after great trouble can anything like an abstract be drawn out. It would be well if the managers were to publish a statement similar to, and even fuller, than that issued by the Hanwell school. It is hardly possible to give too much information on the expenditure of such institutions as these:—

I.—Cost of Officers and Staff.

Description of officer.	Salary.	Estimated cost of rations.	Total.	Cost per head for each child at the school.
	£ s. d.	£ s. d.	£ s. d.	£
1.—*General Staff.*				
Superintendent	100 0 0	†		
Chaplain	250 0 0			
Clerk and solicitor	150 0 0			
Matron	50 0 0	†		
Porter	25 0 0	†		
Assistant do.	12 10 0	†		
Cook	18 0 0	†		
Scullery maid	12 0 0	†		
Hall maid	14 0 0	†		
Four other servants	44 0 0	†		
Superintendent's clerk	78 0 0			
Gas man	54 12 0			
	808 2 0	286 0 0	1,094 2 0	1·350
2.—*Nurses.*				
Receiving-ward nurse	12 10 0	†		
Head nurse	25 0 0	†		
Three assistants	45 0 0	†		
Four infant nurses	48 0 0	†		
	130 10 0	234 0 0	364 10 0	·450
3.—*Medical.*				
Medical officer	100 0 0			
	100 0 0		100 0 0	·120
4.—*Teachers.*				
Schoolmaster	100 0 0	†		
Assistant	50 0 0	†		
Three pupil teachers	7 16 0	†		
Schoolmistress	60 0 0	†		
Assistant	40 0 0	†		
Four pupil teachers	10 8 0	†		
Infant schoolmistress	44 0 0	†		
Assistant	15 0 0	†		
	327 4 0	338 0 0	665 4 0	·821
5.—*Industrial and other Teachers.*				
Bandmaster	50 0 0			
Drill master	27 10 0	†		
Industrial trainer	30 0 0	†		
Sewing mistress	25 0 0	†		
Assistant do.	15 0 0	†		
Laundress	20 0 0	†		
Five assistants	60 0 0	†		
Engineer	104 0 0			
Tailor	65 0 0			
Assistant	54 12 0			
Shoemaker	65 0 0			
Assistant	54 12 0			
Carpenter	78 0 0			
Plumber	65 0 0			
Baker	65 0 0			
	778 14 0	260 0 0	1,038 14 0	1·281
6.—*Farm Servants.*				
Labourer	54 12 0			
Gardener	52 0 0			
	106 12 0		106 12 0	·131
Grand total	2,251 2 0	1,118 0 0	3,369 2 0	4·159

† Those marked thus (†) are allowed rations in addition, which have been computed as worth 10s. a week additional.

II.—The Cost of Maintenance.

The report furnishes no details as to how the children are fed; the sum spent in provisions is given in the gross, divided only on the outlay on the bakehouse, at £1,497 18s. 10d. (including unpaid accounts), and the outlay on "provisions" at £5,689 9s. 9d., making altogether £7,187 8s. 8d., being at the rate of £8·873 per head per annum.

III.—The Cost of Clothing.

This item does not seem to vary very much in the different schools, and amounts, in the institution under consideration to £1,406 13s. 4d., or at the rate of £1·736 per head per annum.

IV.—Miscellaneous Expenses.

The item includes everything not contained in the other headings of cost, and amounts to £951 1s., being £1·174 per head per annum.

V.—Farm Expenses.

These amount to £545 4s. 9d., or £0·673 per head, which, considering the produce and the occupation to the boys, is not excessive, and, possibly, were a minute insight into the accounts obtainable, might prove to be fairly remunerative.

VI.—Rent and Re-payment of Cost of Building.

On the estate and buildings about £44,000 has been expended, and of this £27,217 is paid off, leaving a burden of £16,466 still to be liquidated. The payments amounted in the year to £2,121 8s. 5d., or at the rate of £2·619 per head. A recent addition to the accommodation has entailed a large increase to the item, viz., the erection of receiving wards and a new infirmary. The former are used as a receptacle for all new-comers till they are medically examined; by this means much risk of importation of infectious diseases is avoided, and the general health of the school improved.

In reviewing, then, the cost of the various details, it will be found that the expenditure is a medium between that of Hanwell, as a maximum, and Sutton, as a minimum, fortunately being nearer the latter than the former. It is as follows:—

1. Staff	£4·159
2. Maintenance	8·873
3. Clothing	1·736
4. Miscellaneous	1·174
5. Farm	0·673
6. Rent and redemption of buildings	2·619
Total	£19·234

or nearly £19 5s. per annum for each child.

NETHERLANDS INTERNATIONAL EXHIBITION.

A meeting of the London Committee was held at the Mansion House on Friday, the 11th inst., the Right Honourable the Lord Mayor, M.P., in the chair. There were also present Baron Donald Mackay, President of the Central Committee at the Hague; Rev. Wm. Rogers; Messrs. Somerset A. Beaumont, M.P., G. F. Coster, Robert Hudson, F.R.S., Seymour Teulon, Hyde Clarke, D. Everwyn, Chargé d'Affaires of the Netherlands, J. W. May, Consul-General for the Netherlands, Hodgson Pratt, P. Le Neve Foster, C. Critchett, Edmund Johnson, and P. L. Simmonds, Secretary. The subcommittee reported that, owing to the exertions of their secretary, in conjunction with Messrs. J. M. Johnson and Sons, the portion of the building allotted to the United Kingdom would be well filled by nearly 200 exhibitors, and would include the most important British industries, all the classes being more or less fully represented, and especially those of household necessaries, clothing, and food. Messrs. Gilbert Sanders, P. Le Neve Foster, Hodgson Pratt, Edmund Johnson, and P. L. Simmonds were nominated British Jurors, having expressed their willingness to serve, if approved by His Majesty the King of the Netherlands.

The Secretary was instructed to proceed, as soon as the preliminary details of allotment had been completed, to Amsterdam, to arrange the British section for the reception of the exhibits. In reply to inquiries from Mr. Beaumont and Mr. Pratt, who were desirous to encourage the sending over of working men, Baron Mackay stated that very complete arrangements had been made by a special reception committee for boarding and lodging 200 of the working classes during the exhibition on the most economical scale, and so as to add generally to their instruction, comfort, and pleasure; it would be necessary, however, in the case of large parties going over, to have the precise dates previously agreed upon.

The thanks and congratulations of the Central Committee to the Lord Mayor and the London Committee having been expressed by Baron Mackay, for the successful result of their co-operation, the meeting separated.

Fine Arts.

South Kensington Museum.—The public are now admitted to see the prize works of the Schools of Art of the United Kingdom submitted in national competition. These works will be found to contain many designs for manufactures, which producers may consider it useful to consult. The works are exhibited in the galleries overlooking the Horticultural Gardens, for want of space in the South Kensington Museum itself.

Award of Medals at the Paris Salon.—The *Salon* has been closed, according to custom, for five days, to allow the juries to make their awards, and to effect some changes in the hanging of the works. For the first time since the election of two-thirds of the jurors by the artists has been in force the awards have given considerable dissatisfaction. Amongst the works of the forty artists to whom medals have been awarded there is not one which can be called historical, both as regards subject and treatment; there are four religious, as many mythological, and two poetical works, seven which come under the class of *genre*, and one which can only be regarded as a study of the nude, life-size. The most remarkable fact is the number of landscapes for which medals have been given; of these there are no less than eleven, of which three include animals, and one a chateau as the main or very important elements; the remaining subjects are three representations of animals, two hunting scenes, one military subject, three portraits, one of which is a large equestrian work; one water-colour drawing, one miniature, and one representing objects of virtu. The two great annual prizes or medals of honour, have been awarded, one to M. Bonnat, for a large work representing the "Assumption of the Virgin Mary," and the other to M. Perraud, for a beautiful nude male figure, representing "Despair." The fifteen ordinary medals awarded for sculpture are given for works, of which one is religious, nine poetic or mythological, one martial, and two rustic, with busts. One prize is given for medal-engraving, and one for engraving on precious stones. The number of landscapes and animal subjects which have won prizes is much remarked, and the increasing attention of French artists to landscape especially is certainly a mark of the times; railways and a consequent increasing familiarity with nature must be counted amongst the causes of this tendency; at the same time it must not be forgotten that many artists who give their attention to subjects generally considered as of a higher class, although exhibiting, are *hors concours*, as having already received three medals. The decision respecting the award of the Great Imperial Prize, of the value of four thousand pounds, is looked for with much interest; no painter, it appears, has yet been proposed for this exceptional honour, the list being at present con-

fined to one sculptor and two architects, one of whom, being an independent man, has declined to stand in the way of his less fortunate fellow-artists.

Commerce.

The Cotton Supply.—On Wednesday evening, the 16th inst., a public meeting, convened at the request of 2,000 of the inhabitants, was held at Bolton, for the purpose of considering the position of the cotton trade. The Mayor presided. It was resolved to memorialise in favour of a repeal of the Indian import duty, and to pray the Government to encourage the development of the resources of British India as a cotton-producing country. A deputation, composed jointly of employers and operatives, was appointed to wait on the Secretary of State for India.

Proposed System of Ship Lights.—M. Tronsens has made a communication to the Paris Academy of Sciences, in which he suggests a new arrangement of ships' lights to prevent collisions at sea. He proposes the use of three lights, arranged in the form of a right-angled triangle, one side of which is to be vertical and another parallel with the medial line of the vessel, and towards the head, and placed in the highest possible position. The light at the summit to be of a different colour from the other two, and the distance between the lights to be about eighteen feet. Observation of the two lights in a vertical line will, says the author, furnish an approximative notion of the distance from the ship, and by comparing the apparent distance of the two lights on the horizontal side with that of the two on the vertical side, an idea of the ship's route may be obtained; at any rate the relative distances will show whether that course is to the right or left of the line of observation, which is the main fact to be ascertained, and that without the aid of any instrument being required.

Notes.

Competitive Examination for the Civil Service in France.—The Minister of the Interior has decided that, in future, no appointment in his ministry shall be made without a competitive examination of the candidates. There were vacancies for seven unpaid *attachés* last month in this office, when thirty candidates offered themselves, and though all of them had obtained the degree of licentiate in law, only five were received. A competition for appointment as *redacteurs* is fixed for this month; the programme for their examination is very severe, and is nearly the same as that for the superior appointment of auditor of the *Conseil d'Etat*.

Roman Glass.—Mr. Franks, in his report on the Slade Collection in the British Museum, says the collection includes a great variety of Roman glass, as might be expected from the skill shown in glass-making during the Imperial times of Rome. Large vases were not especially sought after by Mr. Slade, but two fine cinerary urns may be noticed, remarkable not only for their form, but for the beautiful irridescent colours with which time has clothed them. There is also a very fine amber-coloured ewer, with blue filaments round the neck, which was found in the Greek Archipelago; an elegant jug or bottle with diagonal flutings found at Barnwell, near Cambridge; and a brown bottle, splashed with opaque white, from Germany. Of cut glass, an art which it was formerly denied that the Romans possessed, there are good examples; such, for instance, is a boat-shaped vase of deep emerald hue, and of the same make apparently as the Sacro Catino of Genoa; a bowl cut into facets, found near Merseburg, in Germany; and a cup, similarly decorated, found near Cambridge. The two last specimens are of a brilliant clear white, imitating rock crystal, a variety of glass much esteemed by the Romans. Several vessels found in Germany are remarkable for having patterns in coloured glass trailed as it were over the surface. There are two very fine bowls of millefiori glass, one of them with patches of gold, and very numerous polished fragments illustrating the great variety and taste shown by the ancients in such vessels. Two vases exhibit designs in intaglio; one of them a subject with figures; the other, a bowl, found near Meresburg, exhibits the story of "Diana and Actæon." The goddess is kneeling at a pool of water in a grotto; Actæon is looking on, and a reflection of his head with sprouting horns may be distinguished in the water at the goddess's feet. To prevent any mistake, the names of the personages, in Greek, are added. This bowl may be of a late date, probably early Byzantine. Of vases decorated in cameo, fragments alone are to be found in the collection, but as only four entire vases are known, this is not surprising. One of the fragments seems to be part of a large panel which has represented buildings, &c., and has on it remains of a Greek inscription. There are several glass cameos and intaglios, the representatives of original gems that have long since been lost; one of the cameos is a head of Augustus; another represents an Egyptian princess; whilst among the intaglios are several of great excellence; of these should particularly be noticed a blue paste representing Achilles wounded in the heel, and crouching down behind his rich shield, a gem worthy of the best period of Greek art. One of the rarest specimens in the collection is a circular medallion of glass, on which is painted a gryphon; the colours appear to be burnt in, and it is, therefore, a genuine specimen of ancient painting on glass, of which but three other instances are known. In the fourth and fifth century it was the habit to ornament the bottoms of bowls and cups with designs in gold, either fixed to the surface or enclosed between two layers of glass. These specimens have generally been found in the catacombs of Rome; but two or three have been found at Cologne, one of which is in the collection. It is the remains of a disc of considerable size, with a central design, now destroyed; around are eight compartments, with subjects from the Old and New Testaments—"Moses Striking the Rock," the "History of Jonah," "Daniel in the Lions' Den," the "Fiery Furnace," the "Sacrifice of Isaac," the "Nativity," and the "Paralytic Man;" of these the "Nativity" is a very rare representation.

MEETINGS FOR THE ENSUING WEEK.

Mon.....R. United Service Inst., 8½. Major Fosbery, "The Future Position of the Mitrailleur, or Machine Gun, in War."
Wed ...Society of Arts, 4. Annual General Meeting.
Thur ...Society of Arts' Conversazione, at the South Kensington Museum, 8½.
Fri .....Geologists' Assoc., 8.
Archæological Inst., 4.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb.

Delivered on 9th June, 1869.

145. Bill—Court of Session Act (1868) Amendment.
201. Land Writs Registration (Scotland) Act (1868)—Return.
242. Patent Office—Return.
243. India Office—Order in Council.
247. Contagious Diseases (Animals)—Return.
248. County Treasurers—Abstract of Accounts.

Session 1868.

344. (D.) Poor Rates and Pauperism—Return (D.)

Delivered on 10th June, 1869.

142. Bill—Judicial Statistics (Scotland).
144. „ Titles to Land Consolidation (Scotland) Act (1868) Amendment.
146. „ Sea Fisheries Act (1868) Supplemental.
148. „ Inclosure of Lands (No. 2).
149. „ Assessed Rates (amended).
152. „ Exchequer Bonds (£2,300,000).
153. „ Public Offices Concentration.

239. Copper, &c.—Return.
252. East India (Officers)—Letter.
Projectiles—Declaration.

Delivered on 11th June, 1869.

150. Bill—Government of India Act Amendment.
151. ,, Drainage and Improvement of Lands (Ireland) Supplemental (No. 2).
155. ,, Local Government Supplemental (as amended by the Select Committee).
188. (I.) Life Assurance Companies—Return.
244. Broadmoor Criminal Lunatic Asylum—Report.
245. Vagrancy—Memorial.
Manufactures, Commerce, &c.—Reports by Her Majesty's Secretaries of Embassy and Legation (No. 3, 1869).

Delivered on 12th June, 1869.

143. Bill—Prisons (Scotland) Administration Act (1860) Amendment.
157. ,, Pier and Harbour Orders Confirmation (as amended by the Select Committee).
158. ,, Pier and Harbour Orders Confirmation (No. 2) (as amended by the Select Committee).
160. ,, High Constable's Office Abolition, &c.
249. Hops—Return.
256. Endowed Schools (No. 2) Bill—Report and Special Report.
259. Poor Relief—Returns.

Delivered on 14th June, 1869.

203. East India (Finance and Revenue Accounts)—Parts 1 and 2.
206. East India (Home Accounts).
240. West India Colonies, &c.—Return.
260. Factory Acts Extension Act (1867)—Memorandum.
Public Petitions—Twenty-third Report.

Delivered on 15th June, 1869.

161. Bill—Pier and Harbour Orders Confirmation (as amended by the Select Committee, and on Re-commitment).
162. ,, Special Bails.

Delivered on 16th June, 1869.

163. Bill—Endowed Schools (as amended by the Select Committee, and on Re-commitment).
81. (IV.) Railway and Canal Bills—Fifth Report.
250. Electric Light, &c.—Further Report.
255. Mercantile Marine Fund—Account.
261. Inclosure of Lands—Returns.
North America (No. 2, 1869)—Despatch.

Session 1868.

433. (7) Endowed Charities (County of Hertford)—General Digest.

Patents.

From Commissioners of Patents' Journal, June 18.

Grants of Provisional Protection.

Anchors—1768—D. Cole.
Artificial fuel—1713—J. Hopkinson.
Artificial fuel—1785—W. L. Wise.
Boilers, &c.—1747—H. Kinsey.
Boilers, &c.—1750—W. B. Leachman.
Bottles—1734—F. Lewis.
Brewing casks, attemperator for—1694—J. A. Bindley.
Buildings, &c., heating and ventilating—849—J. D. Morrison.
Candles—1698—J. Urbain.
Carriages for conveying meat, &c., refrigerating and ventilating—1786—W. Chambers.
Copper, extracting from water containing the same in solution—1742—T. W. Arkle.
Crucibles, &c.—1719—W. V. Morgan.
Cucumbers, &c., apparatus for slicing—1737—T. Wilkins & W. Fisk.
Curtain poles for beds, &c.—1743—A. Wiglesworth.
Dentistry, mechanical and artificial—1775—R. Roberts.
Drawing boards—1771—W. Cubley.
Electoral boxes—1753—G. A. Frebault.
Electro-magnetic machines—1744—F. H. Holmes.
Embroidering machinery—1779—W. Madders and J. Wood.
Fans for ventilating—1715—J. Lloyd.
Fire-arms, breech-loading—1232—J. H. A. Blackman.
Fire-arms, breech-loading—1767—H. Carter and G. H. Edwards.
Flower and garden pots, cleaning—1528—W. Green.
Furnaces—1754—C. Gall.
Gas stoves for cooking purposes—1765—A. Williams.
Grain, cleaning, &c.—1738—A. B. Childs.
Grain, &c., cleaning, &c.—1741—K. Cook and G. Hauxwell.
Horse shoes—1739—H. Downie and I. B. Harris.
Horses' bits—1760—G. Fenner.
Invalid bedsteads—1583—R. Orley.
Iron—1721—J. H. Johnson.
Leather, treating—1774—W. E. Gedge.
Leather, &c., cutting and skiving—1702—N., G., and E. Smith.
Letters, &c., weighing—1784—N. R. Hall.
Life-boats, &c.—1723—C. W. Petersen.
Lithographic compositions or printing surfaces, obtaining—1766—B. J. B. Mills.
Looms—1787—G. Johnson.
Match boxes, &c.—1773—V. J. Four.
Motive-power machinery—1748—A. M. Clark.
Oleine, &c., treating—1782—A. St. C. Radisson.
Ornamental articles in wood in imitation of carving—1730—G. W. Ley.
Paper, folding printed sheets of—1762—W. E. Newton.
Paper pulp—980—J. B. Gridley.
Photographic apparatus—1796—W. Cook.
Picture frames, &c., mouldings for—1746—A. C. Engert.
Plaster and cement—1731—J. Duke.
Pneumatic apparatus—1798—W. A. Gilbee.
Powder—1800—G. W. Oliver.
Railway breaks—1740—E. G. Brewer.
Railway sleepers, &c.—1732—E. M. Syer, jun.
Reaping and mowing machines—1727—J. Farmer.
Reaping and mowing machines—1757—H. Smith.
Reins for controlling saddle horses—1752—W. R. Lake.
Roller blind furniture—1778—A. J. Billing.
Safety-bags for conveying despatches, &c., by sea—1712—B. F. Weatherdon.
Sawing machinery—1758—F. Heckner.
Seed-sowing machines—1298—J. H. Sams.
Sewing machines—1736—J. Blomfield.
Sewing machines—1759—W. Sellers.
Sewing machines—1777—J. Mabson.
Sewing machines, &c.—1733—R. B. Plum and R. George.
Shears—1783—E. Bishop.
Signal lamps—1675—G. Preston and J. Prestige.
Slates, &c., dressing—1788—R. Harrison.
Steam engines, &c.—1724—J. Edge.
Steam generators, &c.—1714—W. R. Lake.
Stiles for parks, &c.—1756—J. G. McKirdy.
Stone, &c., tools for cutting—1573—A. Munro and W. B. Adamson.
Swivel-couplings for nautical purposes, &c.—1755—B. F. Weatherdon.
Throstle spinning and doubling frames, &c.—1745—R. Law.
Vegetable matter, extracting colour from—1717—F. Rave.
Velocipedes—1494—F. E. Saxby and I. M. McGeorge.
Velocipedes—1725—E. S. Jones.
Velocipedes—1728—T. Best.
Velocipedes—1780—J. T. Twigge.
Vessels, machinery for propelling—1772—A. M. Clark.
Wadding, manufacturing—1792—J. Blair.
Washing apparatus, &c.—1531—E. Taylor.
Wire cloth used in manufacturing paper, &c.—1794—T. Hodgson.
Wood, &c., cutting—1569—J. G. Tongue.
Wood-boring instruments and auger bits—1726—E. T. Hughes.
Wool, &c., combing—1763—E. Tavernier.
Wool, &c., machines for compressing—1776—D. J. Field and I. W. Lister.
Wrought-iron—1641—J. Wilson.
Yarns, &c., steaming—1591—L. J. Crossley and R. Hanson.

Inventions with Complete Specifications Filed.

Floors, &c., covering for—1797—W. R. Lake.
Furnaces, prevention of smoke in—1795—J. Foster and J. Hollinrake.
Iron, producing a polished or enamelled surface upon sheet—1849—W. R. Lake.
Submarine cannon or mortar—1824—D. Fitzgerald.

Patents Sealed.

3876. W. R. Lake.
3878. W. F. Stanley.
3884. J. S. Walker.
3885. L. A. W. Lund and E. Axmann.
3887. R. Whitaker.
3889. J. Wilkinson, jun.
3893. W. E. Gedge.
3894. P. G. Jarre.
3895. W. E. Gedge.
3904. J. Palmer.
3910. J. Snape.
3914. J. G. Jennings.
3916. W. E. Gedge.
3922. G. Lowry.
3925. W. E. Gedge.
3926. F. P. Warren.
3933. W. R. Lake.
3936. R. Boby.
3977. C. de Bergue.
576. G. Rees.
600. J. Townsend.
749. J. Bathgate.
905. J. J. Bodmer.
1310. H. A. Bonneville.

From Commissioners of Patents' Journal, June 22.

Patents Sealed.

3920. W. G. Reeve.
3921. G. Hookham.
3930. W. H. Walenn.
3931. T. Warren.
3935. H. Robinson and J. Smith.
3938. H. Clifford.
3959. G. T. Bousfield.
3974. E. T. Noualhier.
3980. W. R. Lake.
3988. R. Griffiths.
25. S. Bateman.
61. A. B. Brown.
90. B. Hunt.
359. W. Adams & W. G. Beattie.
484. E. Round.
487. A. Ransome.
594. T. Moore.
791. J. G. Jennings.
873. J. E. Emerson.
875. A. Clark.
920. A. C. Kirk.
1211. H. Lee.

Patents on which the Stamp Duty of £50 has been paid.

1628. B. F. Stevens.
1674. A. V. Newton.
1722. W. E. Gedge.
1657. J. Möller.
1670. T. Whitby.
1672. W. and W. T. Eades.
1738. R. Hornsby.
1902. J. Saunders and J. Piper.
1646. F. J. Bolton.
1666. J. Parker.
1644. F. B. Lucas.

Patents on which the Stamp Duty of £100 has been Paid.

1790. J. and T. A. Nield.
1820. D. Adamson and L. Leigh.
1799. J. Warren.
1812. J. B. Wood.
1828. F. E. Schneider and J. Snider, jun.

Journal of the Society of Arts.

FRIDAY, JULY 2, 1869.

Announcements by the Council.

Meeting.

On Monday afternoon, the 5th of July, a paper "On the Limits to be placed upon Posthumous Dispositions to Public Uses," will be read before the members of this Society, and the members of the Association for the Promotion of Social Science, by Arthur Hobhouse, Esq., Q.C., to be followed by a discussion. The chair will be taken at 4 o'clock p.m. The Right Hon. Lord Stanley, M.P., will preside. Members and their friends are invited to be present.

National Elementary Training and Education.

The Council and the Members of the Drill Committee, with other Members of the Society interested in education, will, on Saturday, July 3rd, at 11 o'clock, visit the North Surrey District School, at Anerley (by permission), to witness the military drill of the pupils, and also an examination as to their attainments in subjects of elementary instruction, in elementary drawing and music, imparted on the half-time system of mixed physical, industrial, and mental training.

Subscriptions.

The Midsummer subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Eighteenth Annual Conference.

The Eighteenth Annual Conference of the Representatives of the Institutions in Union, and the Local Educational Boards, with the Council of the Society, was held on Wednesday, the 23rd instant, at 12 o'clock noon. Seymour Teulon, Esq., Vice-Chairman of the Council, presided.

The Secretary having read his report, which appeared in last week's *Journal*, read the following list of subjects proposed for discussion :—

1. What arrangements can Mechanics' Institutions make for promoting the systematic Technical Instruction of the people in their several localities.
2. It being in contemplation to call meetings of the members of the Society of Arts and others in corporate towns, for the furtherance of Technical Instruction, how far can the Institutions in Union with the Society aid in promoting the success of such meetings?
3. Does the Endowed Schools Bill, now before Parliament, afford any facilities which can be taken advantage of by Mechanics' Institutions for such purposes, and if not, can any steps be taken for obtaining the insertion of clauses with that object in view?
4. In what way can the advantages of union with the Society of Arts, apart from the Examinations, be made available in the provinces?
5. How can the Society of Arts assist in obtaining the extension of State aid to Night Classes in the Institutions in Union?
6. Is it necessary that the Examinations in the same subjects of Science and Art should be carried on both by the Department of Science and Art and by the Society of Arts?
7. Would the extension of the Final Examinations to Commercial and lower Middle-class Schools produce beneficial results?
8. Is it not desirable that scholars in attendance at Day Schools should be excluded from the Elementary Examinations?

The Chairman, in calling the attention of the meeting to the above list of subjects, observed that it contained one of great importance (No. 6), which had not only come under their notice on the previous occasion, but was also brought before them in the report which had just been read, viz., whether those subjects in which the Science and Art Department held examinations as well as the Society of Arts, should be retained in the programme, or whether it would not tend to economy in every direction if only one examination in such subjects were held. This being the principal topic alluded to in the report, although it stood sixth on the list of subjects, he proposed that it should be disposed of first.

Mr. Edwin Chadwick, C.B. (member of the Council), said it was found on all hands that the multitude of examinations was getting very perplexing, and the varieties which existed amongst them really produced no practical benefit of any kind. On that ground alone it would be very good educational policy to obtain, if possible, a uniformity of standards and of examinations.

The Chairman said he had prepared, for his own information, a comparative table of the numbers of candidates at the Society's and at the Science and Art Department's examinations in the previous year. He would not read it, however, as it was well known to all present that the numbers of candidates examined by the Science and Art Department of the government was very much larger than those examined by the Society of Arts. Moreover, many of the candidates in the science subjects went in for both examinations, and took the Society's prizes as well as those of the Science and Art Department.

Mr. Chadwick said these facts must convince any impartial person that only one course ought to be pursued. It was no doubt pleasant for the successful candidates to receive two or three prizes from different sources, but the Society could employ its funds in promoting education in other ways much more wisely than in competing in this way unnecessarily with the government. An immense deal of effort was required in the promotion of elementary and technical education, for which large resources would be required; and, in his opinion, the Society could not do better than employ in such efforts what might be saved by the abolition of these surplus examinations.

Mr. J. H. Levy (Birkbeck Institution) said where the Science and Art Department examinations were precisely of the same character as those of the Society, there could not be two opinions as to the proper course to be adopted, but where they were not identical very different considerations came in. For instance, he believed it would be a great mistake for the Society to give up its mathematical examinations so long as the South Kensington Department grouped all these subjects

together, as was done at present, which really put very great obstacles in the way of persons who had only the gleanings of their time to give to such studies. Then, again, there was an important consideration—what should be done with reference to the Prince Consort's prize. If they discontinued examining in physics and mathematics, these subjects would be shut out from the prize, unless they accepted the certificates of the Department as equivalent to those given by their own examiners. With regard to the general policy of cutting down the number of examinations, everybody who had had any experience in preparing pupils for them must agree that it was very desirable.

Dr. Watts (Lancashire and Cheshire Union) agreed with Mr. Chadwick that the simpler they could make all their arrangements the better, and he should be glad if they could have one examination which would cover all the subjects; but there were many other matters to be taken into account. The Society of Arts examination presupposed and required a preliminary examination in certain elementary subjects, and this important feature was entirely wanting in the South Kensington scheme, in which each subject was treated as a speciality, so that a candidate might pass in mechanical drawing who could not describe his own work in plain English. It appeared to him that if they wanted really to promote education, they should endeavour to do so systematically, so as to ensure general progress. This difficulty could of course be removed, if the Government required a certain standard of elementary knowledge before awarding a certificate for any speciality. But then there was another difficulty; in Lancashire they had striven hard, and not unsuccessfully, to set up science classes, and to induce men who had passed at South Kensington to take out certificates and become science teachers; the remuneration of these men depended on the number of "passes" they obtained from their classes, and if a sudden change were introduced, requiring a certain amount of elementary knowledge, the pecuniary results to these teachers would be in some cases serious. The difficulty might perhaps be removed if notice were given that after a certain date, say one or two years, a certain standard of elementary knowledge would be required from every candidate, and then the Society of Arts might very properly discontinue their examinations in subjects which were covered by the Government. The only difficulty then left would be that of the Prince Consort's prize, which could no doubt be got over.

Mr. Norris (Birkbeck Institution) said it must be remembered that if the Society discontinued their examinations in science subjects, the attendances of the local committees would not be lessened to any important extent. He also begged leave to throw out a suggestion, which he hoped would be favourably received by Mr. Cole, that the Science and Art Department would allow an examination in more than one subject on each evening. The consequence of the present system was, that the examinations extended to such a length that they had great difficulty in getting gentlemen to attend. He thought also it was rather unnecessary to require three gentlemen to be in a room from seven o'clock to eleven, while four candidates were being examined. The Society of Arts were satisfied if there were two committee-men present with twenty candidates, and only required three if there was a larger number.

Mr. Gibbs (Chelmsford) thought that whatever might be the final result, the time had not yet come for any great and sweeping change such as had been proposed. Several serious inconveniences had been pointed out as likely to arise from such a proposal, and he did not think it would be wise on the part of the Society to discontinue their examinations, until they had some guarantee that the alterations suggested in those of the Science and Art Department would be carried into effect. It was necessary in the case of any change of an important character, that its consequences should be looked at in detail, which had not yet been thoroughly done in the present instance. They had heard something of the comparative number of persons examined by the Society and by the Science and Art Department, but it would be also desirable to know the comparative number examined from year to year by the Society, in order to see whether these numbers were increasing or diminishing. If the latter were the case, he admitted it would be a good ground for making the change, but if it appeared that the Society of Arts examined more candidates every year, he thought an opposite conclusion must be come to. Not long ago, in that very room, the operations of the Science and Art Department were characterised as being "tentative in their operation, ever variable in their regulations, frivolous and vexatious in the manipulation of details; it is no matter of surprise that managers care not for an alliance. The returns of the last examination for the whole country, tabulated and issued by the West Riding Educational Board, will show, judging by those already issued, how impossible it is to maintain that the present science aid can in any but the very smallest degree affect the great and momentous question of industrial education. To the Society of Arts, established to promote manufactures equally with arts and science, standing aside from all political parties, and departmental influence, and commercial rivalry, managers of Institutions in this Union look to take action, in directing national attention to the consideration of industrial education as an important component of national education." It was difficult for him to believe that in the short space of two years the relative position of these two systems had so far changed as to entirely reverse the judgment then pronounced. They must remember that there were scattered throughout the country many eccentric individuals, who, though quite unconnected with any powerful association, studied with an enthusiasm not often found in large manufacturing towns, and it would be very undesirable to ignore this element, to sacrifice the eccentric energy of enthusiasm to the symmetry of centralisation, and convenience to lifeless uniformity, which he much feared would be the case if the proposed change were carried out.

Mr. H. H. Sales (West Riding Educational Board) was exceedingly glad to find that at length the views which he had for many years expressed on this subject had been formally brought under the notice of the conference in the Secretary's report. Dr. Watts had raised the question of the preliminary examinations required by the Society being a reason why the final examinations should be retained; and he was fully aware of the importance of requiring a knowledge of elementary subjects, before the pupil proceeded either to the final examination of the Society or of the Department of Science and Art, but, unfortunately for Dr. Watts, whilst his theory was right, the facts were against him. The Secretary's report contained this passage:—"The falling-off in the per-centage of passed candidates must be attributed to the Local Boards not being sufficiently careful in their preliminary sifting of the candidates, and to their too readily admitting them to the final examination." Whatever might be the case in Lancashire, it was evident that throughout the country generally great stress was not laid upon these preliminary examinations, or the report would not contain such a sentence. Again, Mr. Larkins wrote as follows:—"I should observe that the 162 (against 237 in 1868) candidates entered in the table of the Final Examination (Table 1), as having passed a previous examination, have not been examined in the elementary papers furnished by the Society, and a large proportion of those who passed the Final Examination had already taken both prizes and certificates from the Society." These two passages showed that, however desirable it was to insist upon elementary knowledge before proceeding to scientific instruction, this was not always done, even with regard to the Society's examinations. The object was to give a curriculum of study, to test that study, to reward diligence in the pupils, and to encourage a laudable spirit of emulation by awarding

prizes. That had been done in the first instance by the Society of Arts, and, as he had expressed over and over again, he felt that the Society was doing most good when it was acting as the pioneer in educational work; and as soon as that educational work was put on a sound and healthy footing, withdrawing itself and employing its energies in other fields of labour. It had done an immense deal of good in the way he had pointed out, and then the Science and Art Department stepped in. During the first year or two, there were many discussions whether it was right for the government to undertake this work at all. His own feeling was, that government ought to do much more for education than it was doing; but at any rate those discussions had now nearly ceased, and they had the fact that there were two bodies, the Society of Arts and the government, doing identically the same work, and for the same people; for the same persons who took off the Departmental prizes came in and took off the prizes of the Society of Arts. It was not proposed to discontinue the Society's examinations in those subjects which were not taken cognizance of by the Science and Art Department. Many of the subjects were common to both, and the Society's prize-list this year contained several names of candidates who had also taken prizes from the Science and Art Department. It thus happened that the prizes offered by the Society were taken by men who did not require such a stimulus, because they had already followed a course of study, been tested in it, rewarded for their success, and had earned payment for their teachers; and then they came in and took away the prizes from men who had not been prepared by a similar course of study in connection with the Science and Art Department. They were, therefore, rewarding those who had already been rewarded. If the Society of Arts liked to spend its money in that way, well and good; but his own feeling was, that they would do much better by devoting the funds to some cognate purpose not yet taken up by the government. If it appeared that there were any institutions which preferred the Society's examinations to those of the Department, it might be a question whether or not the Council might think it well to continue them; but those who were practically acquainted with the matter knew that, year by year, the most obstinate opponents of the Department were coming in to its examinations, and the number of those who did not attend was constantly growing less. It was really a matter of great difficulty to obtain properly-qualified men for the local committees, and it was not well that their labours should be increased unnecessarily by the multiplicity of examinations.

Mr. Lawton (Lancashire and Cheshire Union) said Mr. Chadwick had spoken of a decrease in the number of certificates, but in Lancashire and Cheshire there had been in recent years a very considerable increase. Again, the Society's examinations were not of the same character as those of the Science and Art Department, and a certificate of the Society was much more valuable, inasmuch as it carried with it the assurance that the possessor had passed a certain examination in reading, writing, and arithmetic, and, in consequence, it was thought much more of, at any rate in the district with which he was connected. Again, it must be remembered that the Department only paid the teachers upon the artisans who passed; and the inspectors had been so very strict in examining the registers, and striking off all who were even the least degree above the artisan class, that teachers were not encouraged to assist those upon whom they got no payment. As to the difficulty about the Local Boards, he thought the Department might easily relieve them from it by abolishing the examining committees. They generally sent down inspectors, who spent a considerable time in the examination rooms, and he thought they might as well be there the whole time and relieve the committee. With regard to the Society of Arts prizemen having previously passed the Departmental Examinations, it must be remembered that the government prizes were often of small value, and did not imply a high certificate. Some of the Institutions in Union actually based the constitution of their classes on the Society's examinations, as for instance, the Salford Working Men's College, which had this year carried off a larger number of certificates even than the Manchester Mechanics' Institution. He should be very sorry, in the present state of things, for the Society's examinations to be discontinued.

Mr. Rumney (Manchester) was in favour of continuing the examinations in the subjects referred to. He did not see that the Council were to initiate a change because some candidates had been in both examinations—that was to be expected. The secretary of the Manchester Mechanics' Institution wrote to him as follows:—"As to whether the Society's examinations are unnecessary where the government examinations take the same ground, I think certainly not; many go in for one who are precluded from the other, not having attended a science class, and it seems to me that the preparation required for both has a tendency to lengthen the term of special study. Moreover, one examination acts as a kind of rehearsal for the other, and that cannot but be beneficial. I have heard this latter reason given by our own students." His own experience was, that the Society's certificates were regarded as of much higher value than those of the Department, and this being so, he could not but think that it would be very injurious to the progress of education if the Society were to discontinue its examinations. Surely the difficulty that had been referred to, as to the time and mode of holding the examinations, could be remedied, and if that were done, he thought it would be much preferable to discontinuing the examinations altogether.

Mr. Heller (Lambeth) said he attended at the request of his Local Board, expressly to speak upon the question now before the meeting; but, since coming into the room, he must confess that he felt the position which he had been induced to take up somewhat shaken. The argument advanced by Mr. Sales, that in many of these examinations they were expending useless effort, only covering ground which was occupied by other agencies, seemed incontrovertible, but he was not quite sure whether the time was fully come for the Society to withdraw its examinations in all the Departmental subjects. He did not think the government examinations were put upon such a satisfactory footing that the Society could withdraw, and leave the examinations in the hands of the government. There was at present a very sincere intention on the part of the Department to put science teaching on a satisfactory basis, but there was as yet something very tentative about its action, and it could hardly be said to have obtained the confidence of the committees, or of the teachers themselves, as to its permanency. The clause at the beginning of the directory, which stated that the grants for science-teaching were liable to be diminished, and ultimately withdrawn, acted as a damper upon the whole scheme, and, therefore, before the Council of the Society of Arts decided upon withdrawing their examinations in certain subjects, he thought they ought to be satisfied that science teaching would be made permanent by the Department, and in such a way as to meet the requirements of the country. The argument about the prizemen he considered a little beside the mark, as it probably did not apply to a hundredth part of the whole number of candidates; and it must be expected that such things would occur where two organisations covered the same ground. After what he had heard, he could hardly vote for asking the Council to continue the examinations in question, but he did hope that, before relinquishing them, they would satisfy themselves that no injury would be done. In his own experience, it was found very easy to get managers for the Society of Arts examinations, but very difficult to get a sufficient number for those of the Science and Art Department, the reason for which was, he believed, that in the former case the office was purely honorary, while

in the latter it was looked upon as a sort of favour to the science teacher.

Mr. Henry Cole, who prefaced his remarks by saying that he spoke simply as a member of the Council of the Society of Arts, and not as Secretary to the Department of Science and Art, said his opinions now were the same as those he had frequently expressed to his lamented friend Mr. Harry Chester, who, he was bound to say, did not at all agree with them. He would remind gentlemen present that the Society expended between £800 and £1,000 a year in conducting these examinations, and looking at it simply in a pecuniary point of view, they obtained as a set-off only the subscriptions from the Institutes in Union, which did not amount to one-half the amount. It would naturally occur to everyone that the Society ought to do its work as economically as possible; and, as Mr. Chadwick had remarked, there were many subjects upon which, if they had funds at their disposal, they might usefully employ them. The question, therefore, came before them in this shape—Was it most profitable to be going over exactly the same ground which was occupied by another organisation, or to take up some other ground, which was lying altogether fallow and untrodden? It seemed to him that the latter was unmistakeably the proper course. No one would deny that there were many ways connected with education, particularly elementary and technical instruction, museums and free libraries, in which money might very usefully be spent, and to some of these he hoped the funds now expended in these duplicate examinations would be applied. They could hardly do better than endeavour to promote a better elementary education, as, for instance, by offering prizes for good handwriting. According to his own experience handwriting had much deteriorated within the last two centuries; he had seen specimens of writing 200 years ago far above the present average. It seemed to him that the function of the Society of Arts was to deal with that part of education which the State did not touch at all. Now, the State spent a great deal of money in teaching reading, writing, and arithmetic to children up to a certain age, but nothing for carrying that on in evening classes for the benefit of adults. This, therefore, was one direction in which, as he conceived, the Society's funds might be properly and usefully applied. They could not, however, throw too much strength into elementary subjects. As far as he could see, there were nearly twenty subjects which there was no chance of the government including in their programme, but a knowledge of which was very desirable; for instance, Roman history, Italian, French, and, above all, the English language, the last a most important matter, for not one person in a hundred could write decent English, and still fewer could speak it; but there was nothing in which the English people were more interested than in perpetuating the language spoken by Milton, Shakespeare, and their forefathers. Something was said in one of the reports about teaching geometry after school hours; he never knew anything learnt well after school hours except play, and there was no surer way of disgusting a boy than to put him to one of these dry subjects when he ought to be enjoying himself. With reference to the suggestion that, instead of seeking the co-operation of the different localities, the government should send round inspectors to attend all the examinations, he would only remark that there was some difficulty at present in obtaining, for payments for results in science and art, £15,000 a-year from Parliament, which would have to be doubled if such a plan were adopted. It was simply a question whether gentlemen would come forward in the different localities and take this duty upon themselves, or whether they would pay to have it done. He did not see how more than one subject could be examined in at the same time, unless there was an increase in the number of committee-men, because the examinations, to be fair to each candidate, must be simultaneous, and where £200 or £300 to one school depended upon the result, it was absolutely necessary that the rules should be strictly adhered to; indeed, there seemed no alternative between an absolute Draconian system and none at all. Notwithstanding all these precautions, he was sorry to say he feared there were sometimes irregularities. In some cases, it was true, there might be three judges to four candidates, and it might look absurd to see in a blue-book that only 3s. 6d. was earned in one examination, but in other cases there was as much as £100, £200, and in one instance, which had caught his eye, £293. He did not quite follow the train of reasoning which sought to continue the Society's examinations because the Department paid for artisans only, because the Society did not pay for anyone. The principle of the government was, that those who were not able to pay for themselves should be assisted, and he thought that principle was the right one.

Mr. Levy said he believed the point really was, that the help given by the Science and Art Department seemed rather of an eleemosynary kind, and there was a feeling amongst some persons that they were humiliated by going up to these examinations.

Mr. Heller said the argument, although not his own, appeared to be that, by taking away the Society of Arts' examinations because they were held by the Science Department, which paid for the instruction of artisans, the middle-class would be deprived of the benefit of these examinations.

Mr. Sales desired to protest most strongly against the sentiment expressed by Mr. Levy, that there was anything humiliating in accepting aid from government.

Mr. Lawton said he had used the argument referred to, and it was founded on his own experience in Lancashire, which was to the effect that science teachers, when applied to by middle-class pupils to prepare them for the examinations, replied in effect that they did get no payment on their account from the government, and therefore they must require a fee from them to repay them for their trouble.

Mr. Cole said his experience had been quite the contrary; middle-class pupils could come to the day classes, and in the case of evening classes they found that a gradation of fees worked very well indeed. At South Kensington they had pupils who paid fees varying from 20s. to ten guineas a-year, all in the same room, using the same models, and taught by the same masters, and there was no difficulty whatever about it. He would conclude by saying that the Science and Art Department, like all human institutions, was far from perfect, and was therefore, to a certain extent, tentative in its proceedings; but notwithstanding all their failures the results were not discouraging. In the present year they had had examinations at 437 centres, as against 261 last year, and they already had notice of a further increase, while the number of papers worked had risen from 13,000 to close upon 24,000; and he might add that, in order to meet the demand of localities for payments on account of science and art teaching, they had been obliged to curtail their building grants at South Kensington.

Mr. Traice (Lancashire and Cheshire) desired to offer a remark on the statement of Mr. Cole, that the government paid for the instruction of the working classes in science because they were supposed to be unable to pay for it themselves. He must demur to that proposition entirely. He held that the Department had no business to exercise charity at all; that the sole reason for creating the Department was to aid, if possible, in promoting technical education throughout the country, and if for that purpose it appeared desirable to educate a millionaire, it would be the business of the Department to do so. Speaking broadly, that was the only basis upon which the existence of the Department could be defended. Therefore, so far from drawing a line between the middle and working classes, they ought, as far as possible, to utilise the intellect of those who had had a somewhat better education, in promoting the main end in view. He had before suggested that a great deal of difficulty

might be got over by a system of handicapping under which a higher standard should be required from middle-class pupils, in order to entitle the teacher to payment. He had long entertained the opinion that it was very undesirable to have such a number of examinations as now existed, and he would not stop with discontinuing examinations in those subjects which were also taken up by the Science and Art Department, but would like to see the whole question discussed, with the view of initiating some general scheme, which should deal, first, upon a broad principle with primary education; next, with working-class-education up to a certain point; next, with so much of university education as might be said to be practical and technical; and, lastly, to have it clearly defined what part should be taken by the government in each of these departments, so as to do away with the present muddling system, which seemed to work more for examinations than for education. He hoped the Society of Arts would keep a vigilant eye on the working of these Science and Art examinations, to see how they could be brought more thoroughly *en rapport* with the wants of the time with regard to technical education. The question of the preliminary examination was an important one; but he believed that, two years ago, Professor Huxley had stated that where he found bad spelling and writing, he should deduct so many marks, and in the same way he thought the Department might considerably advance the cause of primary education by making it known that the special examinations were open to all, yet those who had not taken the trouble to acquire a certain amount of skill in writing and spelling would be under heavy disadvantages in the competition. It might be said that this would be a hardship on the teacher, but he did not conceive that it would be so if sufficient notice were given beforehand.

Mr. Cole thought the same end would be answered by giving additional marks and rewards for good spelling and writing.

Mr. Traice said he should like to see that, but it would not have the same effect as the plan he proposed, in making it to the interest of science teachers to promote primary education.

The Chairman, in summing up the discussion, said that, coming to the question as he did, quite unbiassed to one side or the other, he could not avoid the conclusion that most of those present were pretty much agreed that it was undesirable that either the Society of Arts or the Department should waste their energies in a duplicate system of examinations. The next point upon which they were tolerably unanimous was that the Science and Art Department were constantly changing, and this he conceived to be a very favourable feature, as it evinced an anxiety to bring their operations as near perfection as possible. He was sure the suggestions made for the improvement of the examinations would be carefully weighed and considered by the Department, and, on the other hand, the Council would make no change in their programme without very careful deliberation.

Dr. Watts hoped that whatever determination was come to by the Council about striking out any of the present subjects, the number of nights for examination would not be reduced, and that they would endeavour to come to some understanding with the Department of Science and Art, so that least a fortnight's interval might occur between the two examinations.

Mr. Norris, who desired to express to the Council the thanks of the Institution which he represented, for having so kindly received the suggestions made last year, said he had one more to offer, namely, that General History should form part of the programme (divided possibly into modern history, the history of the middle ages, and ancient history), and that at the same time the historical and literature questions should be removed from the papers in modern languages. He had met with many objections to these questions, which only served to take up the time of the pupil and distract his attention from the study of the language itself, and resulted at best in a cram.

Mr. Levy suggested that the examinations should take place later than at present, say the last week in May; he thought it would suit the convenience of all parties much better at that time.

Several gentlemen having intimated a different opinion, a show of hands was taken, which was strongly in favour of making no considerable alteration in the time of holding the examinations.

Mr. Gibbs begged to call attention to the fact that the prizes in botany, offered by the Royal Horticultural Society, had been taken by gardeners employed at the Royal Gardens at Kew, who really enjoyed the advantage of instruction from the Professor of Botany in the London University. He did not think such persons should be allowed to compete.

The discussion on the first and second subjects, namely:—"What arrangements can Mechanics' Institutions make for promoting the systematic Technical Instruction of the people in their several localities?" and "It being in contemplation to call meetings of the members of the Society of Arts and others in corporate towns, for the furtherance of Technical Education, how far can the Institutions in Union with the Society aid in promoting the success of such meetings?"—was then opened by—

Mr. Edwin Chadwick, who said—If we take the statistics of the numbers of members of Mechanics' Institutions in London, in Manchester, or in Leeds, or any of the most active seats of industry, and compare them with the numbers of the manufacturing population, it is perceived that the support they obtain is deplorably inconsiderable. One main cause of this is, after all, the restricted amount and the defective quality of the primary education given there. It may be taken now as generally admitted that any extension of technical or superior education, of any sort, must be based on an extended and improved system of primary elementary education. All the reports go to this. The extension of a sound primary education will be a means of the extension of the support of all such institutions as those in question, as well as of technical education. Now, it has to be considered that the present normal state of primary education is such as to exclude the lower middle-classes, as well as the great bulk of the wage-classes. Those who are connected with some of the well-organised large schools of the towns, and who only know those instances, know only the exceptions. The average number taught in the general average schools throughout the country is only fifty. Now, in schools of that size, even under trained masters, each with the aid of a pupil teacher, it is impossible to get through the "three R's" well in less than from six to seven years, or, by the thirteenth to the fourteenth year. In this condition the children must go away, as they do generally go away, only half-taught the "three R's," for they must go away about their tenth or their eleventh year. From one end of the country to the other, it is the complaint of the teachers of small parish schools that their children of the wage-classes are taken away too soon, and there is a cry for compulsory measures to detain them. But they will not and cannot be detained for the time required on the present scholastic system. Then, the lower middle-classes must leave by their thirteenth or their fourteenth year, and they leave only with the "three R's," and not taught in the best manner after all the time that has been occupied with them. They have generally no time to learn any more from the day school. Hence it is that it is only accidentally or exceptionally that science or art is studied for elementary education in after-life, and in night or adult schools, which ought to some extent to be studied in the primary schools. Nearly one hundred thousand communicants with the Science and Art Department is a vast number in comparison with what the Society now does or can do,

but it is inconsiderable as compared with what ought to be done, for the maintenance of the industrial position of the country. There ought to be, and there might be, upwards of a million under technical instruction in the secondary, and under preparation in the primary schools. It is to be regretted that the principle of the remedy has been so much overlooked, and that it has remained to me to assert it—namely, the principle of the administrative combination of educational means, or of the aggregation of numbers in school unions, so as to obtain division of educational labour and simultaneous teaching in large classes. Other occasions must be taken for the due development of this principle. It must suffice to state that, by its proper application, the "three R's" are taught well in half the time in which they are now taught indifferently. The work may be completed, and that at less cost, before the end of the eleventh year, instead of by the end of the thirteenth year. Three years of time may be gained for technical instruction in anything that may be selected, or in any art or science that can be taught within the three years. The special interests of the Institutions in Union are involved in this needed reform of our primary education, and in the general gain of time for technical instruction, in whatsoever can be given in the day-schools—for a national system of education will leave much to be supplemented, after the school stages, as languages not generally taught, Italian or Spanish, or arts not generally taught, which may be taught in these institutions. Moreover, a reform in primary education, by the division of educational labour, will provide gradations of rank for professional teachers, and will add to the number of the supporters of these institutions, for the sake of the ornamental arts or for refined amusements. On all grounds, the active support of the associations is needed to a movement for the extension of a reformed system.

Mr. Sales cordially agreed with Mr. Chadwick, that the subject of primary education was of the utmost importance, but that was hardly the topic before them, although connected with it. From the various reports which had been issued, he was aware that, in Lancashire and Yorkshire, the science classes in connection with the Department of Science and Art were year by year increasing, and he did not think that they were too sanguine in hoping that, through the organisation now in existence, they would shortly be able to establish similar classes throughout the whole of those northern counties; but they must by no means rest content with their labours in that direction. The conditions of success must be taken into consideration, and one condition was, that the pupil should come to these evening classes in some degree prepared for the more advanced knowledge which he was there to receive. To some extent he feared the present system was one of cramming, and from the nature of things it must be so. One great necessity, then, was the introduction of some branches of science into primary schools. Mr. Chadwick had referred to the difficulty of teaching the "three R's." He was more and more convinced that the Revised Code was doing an immense deal of harm to the cause of education by its rigid adherence to the "three R" system. He believed the teaching of these elements would be much facilitated and time saved if the intelligence of the children were developed by the introduction of some branch of natural science, he cared not what, into their studies, and they would certainly be better prepared for entering science classes in Mechanics' Institutes. But that was not the only requisite. The operations of most of these institutions were carried on in the evening, the class-rooms being unoccupied during the day, and it seemed to him that the answer to the question, "What arrangements can Mechanics' Institutions make for promoting the systematic technical instruction of the people in their several localities?" would be, that wherever circumstances were favourable, the managers should turn their attention, as had been done at Manchester and Leeds, to the establishment of a day-school, in which, in addition to the usual branches of education given in lower middle-class schools, they should teach natural science. To his mind no work could be taken up by the managers of Mechanics' Institutions with more advantage, even to Institutions themselves, because these day-schools would train up pupils for the more advanced evening classes, and, in fact, the Institution would become the *alma mater* of the district. He knew that, in many districts of Yorkshire, these Institutions were valued very greatly on account of the social intercourse which they promoted between different classes, and this would certainly not be weakened when the educational advantages were so much improved. He would, therefore, move:—

"That in the opinion of this meeting it is desirable, wherever possible, to establish day schools, to include teaching in science, in Mechanics' Institutions."

Mr. Lawton, in seconding the resolution, said in his opinion it was also quite as advisable to establish science classes in day schools and elementary schools not held in Mechanics' Institutions. But, further than that, systematic instruction in special work was required. They were getting a large number of first and second class certificated men in Lancashire, who had gone through the evening classes, and where were they to go? Owens College was not at present prepared to receive them, and they were not qualified to go into the Universities. Something was wanted to meet their case, and he thought Mechanics' Institutions might do a great deal by holding meetings, forwarding circulars, and so on, to bring about the establishment of science colleges.

Dr. Watts said Mr. Chadwick had introduced a very important subject, but it was one for the future rather than the present, and one which could only be fully worked out when they had a national system of education. While education was denominational, it would be impossible to carry out the plan proposed, however desirable. With regard to the question introduced by Mr. Sales, they must not forget that they were tending towards a national system of education, and that that national system ought in the first instance to include every child in an elementary school; for only in such a way could compulsory education be justified. Then, going beyond elementary schools, they ought to have in connection with existing endowed schools and others of the same class, certificated teaching, and these secondary schools would run parallel with the science classes now at work under the government department. And then, again, to meet the wants of the class referred to by Mr. Lawton, it seemed to him that there ought to be eight or ten central science colleges, into which to draft boys from endowed and secondary schools, who had devoted themselves to physical science, and also the holders of first-class certificates in science classes. They might also admit the sons of persons in the higher middle-class who were willing to pay for the higher education there given. Mechanics Institutions might operate by pressing upon the government the necessity for such science colleges, and they could also operate in the extension of the science classes under the Department. If Mr. Forster's Endowed Schools Bill did not sufficiently provide for it, they could bring their weight to bear upon the government, in order to ensure a provision by which science teaching might be introduced into all endowed schools. They might also do good service in the way pointed out by Mr. Sales's resolution. With regard to the second question, as to what local Institutions could do to aid the Society in promoting technical instruction by holding local meetings, they could no doubt form organisations which would bring the matter prominently before the public in their own neighbourhood, and enlist a great deal of local influence which would have weight in promoting the end in view, but he did not see his way at all to any adequate amount of technical instruction being diffused amongst the working classes without the establishment of science colleges.

Mr. Rumney said that Mr. Samuelson's Committee, which sat during last session, clearly proved that there was not so much deficiency in technical as in primary education. The establishment of day-schools in which science teaching would be conspicuous would be met by this difficulty, that they could not be certificated. It seemed very absurd, but so it was, that a school might be set up next door by any religious denomination, which, by reading a chapter from the Bible once a day, would be held to include religious instruction, and would be certificated, whilst that held in the Mechanics' Institute would be excluded. This absurdity ought to be got rid of as soon as possible, and until it was he did not see how the system Mr. Chadwick proposed could be adopted. He did not see how these proposed day-schools could exist in competition with those receiving aid from the State. They must alter the current of public opinion on this head before they could hope to do much in this direction.

Mr. Heller said the whole matter was really bound up in a proper arrangement of the teaching power of the country, so that it might be utilised exactly to the desired point, and in localities where it would be of the most value. He hoped that, before any action was taken, either by the Society of Arts or any other body, with regard to science-teaching or night-school teaching of any kind, a conference would be held on the question of reorganising the entire arrangements of the educational staff throughout the country; and, before doing so, it would not be wise to increase the difficulties in the way, by erecting new institutions which would have to be modified at a future time. Much might be done, he believed, to advance the interest of science classes by holding meetings, into which the weight of the Society's influence would be thrown. He was sorry to say that the bright example set by the northern counties in this matter seemed utterly lost upon the metropolis, where it was often difficult even to get managers to come and conduct the examinations. He thought, therefore, it would be very advisable if the Society of Arts could arrange to hold meetings in London under their own auspices, by which the interest of employers, and especially of working men, might be stirred up.

Mr. Chadwick proposed a rider to the resolution as follows:—"And to promote such schools as will have the proper arrangements to ensure such division of educational labour as may be requisite to ensure efficient and economical teaching in time and money." He said that, on what had been remarked as to religious teaching, he had to say that he was not for excluding religious instruction from the school, but for having it given in the school in a much better manner than it now was by the pupil teachers, namely, by having it given as it was given in our army schools and in Holland, directly and more impressively, by the pastors of the religious denominations, for whom stated times for its teaching should be arranged.

Mr. Norris asked if the Society had determined upon holding meetings at different centres; he thought such a plan would be very advisable.

The Chairman said the matter had been carefully considered by the Council, and they had determined on holding at least one meeting in the north. They were aware of the difficulties which must attend a Society located in London taking up the matter in distant centres, and their future proceedings must depend upon the amount of support they received.

Mr. Norris said it would be well, in such a case, for the Society to hold meetings in the various Institutions where they were large enough, and the Institutions could no doubt render aid by sending round invitations in the neighbourhood. He feared much would not be done in London, because the working men of the metropolis did not seem to respond to the advantages offered them. He was acquainted with one institution in London, however, where a class for technical instruction had been in operation for many years, and had been very successful. In order to be so, the subjects taught must be suitable to the requirements of the district.

Mr. W. E. Jones said it was a matter of regret to him that the working men of London did not take so much interest in scientific classes and lectures as seemed to be the case in the north, but such was unmistakeably the fact; and if, therefore, the Society of Arts could do anything to awaken this interest, they would be doing a great public service.

Mr. Neilson (President of the Glasgow Mechanics' Institution) said he attended at the request of his committee, and had been listening anxiously for any information which might aid them in the endeavours they were just now making to carry out a system of technical instruction. A great deal had been said about primary and scientific education, but as to technical education, which was a more difficult subject than either, he had not heard anything, although, in his opinion, it was one of the most important questions of the day. The Society of Arts had done much to produce the Great Exhibitions which had been held of late years, and these, owing to the superior technical education enjoyed by foreign workmen, had enabled them to compete successfully with ourselves in many branches of the arts and manufactures. He looked, therefore, to the Society of Arts to aid them in setting on foot and maintaining such a system of technical instruction as would place them in a fair position to compete with their continental rivals. They were hoping to establish in Glasgow, before long, something on a larger scale than had hitherto been attempted, but, before launching out into a great expense, they were anxious to obtain all the information and assistance they could.

The Chairman observed that, if Mr. Neilson stated what was proposed to be done, he might get some valuable suggestions.

Mr. Neilson feared there was not then time to enter at any length into the detail of their plans. What he understood by technical education was not scientific nor yet primary instruction, but the application of both to the useful arts and manufactures of the country. One gentleman had spoken of the difficulty of securing the attendance of working men to abstract subjects in the lecture-room, and that fact was patent to all; but what was wanted was to show the application of these abstract sciences to the useful arts, and for that purpose they must have lecturers who knew something about the arts and manufactures; and, even then, the lecturer, in order to make his subject intelligible and interesting to his audience, must have not only books and a black board, but some good models and coloured drawings, to illustrate his remarks. A few minutes' explanation with such aid would convey more information than an hour's reading from a book.

The resolution, with the rider, was then put and carried unanimously.

Dr. Watts then moved:—

"That in the opinion of this meeting all Mechanics' Institutions should be pressed to establish science classes under the Government, also to assist in any public movement for the establishment of science colleges in the various industrial centres, after the manner recommended by the Parliamentary Committee on Scientific Instruction, 1868."

Mr. Norris seconded the resolution.

Mr. Traice hoped that several meetings would be held in different centres, and that one of the results would be to raise the question whether the old organisation of Mechanics' Institutions had not done its work, and whether the time had not arrived for their complete reorganisation. They talked about what such Institutions could do, and seemed to forget that they were merely voluntary associations, depending entirely on the number of subscribers, and, moreover, that just in proportion as they were promoting the legitimate work of these societies, viz., the teaching in evening classes, were they comparatively superseding the organisation upon which they had been originally

founded. In the first instance they were started with a sort of congeries of objects, including a library, reading-room, and lectures, which were taken advantage of by adults, from whom the managers were selected. Now, in many instances there was little left but the classes of young men, and there was a difficulty in finding managing directors. Another matter of importance was the providing assistance for those who had made a certain amount of progress in their studies; a pupil might have attained a good position in his class, but the institution had no library which was of any use to him, and nothing was done to provide one at the public expense. There were other considerations of a similar character, which he would embody at a future time in a communication to the *Journal*, which led to the conclusion that the present system of Mechanics' Institutions had done their work. Referring for a moment to the previous resolution, he might say that, as far as his experience went, wherever there was a day-school in connection with the Institution, a superior class of teaching was secured for the evening classes. There could be no doubt that the establishment of Science Colleges would be an immense advantage in every way, not only in their direct effect, but as setting up a high standard of efficiency in scientific teaching.

The resolution was put, and carried unanimously.

On the suggestion of the Chairman, the discussion of question No. 3 in the agenda paper was omitted under the circumstances alluded to in the report.

In connection with No. 4, Mr. Mogg (Devonport) said he was requested to ask whether the Society could help country Institutions out of the difficulty which they constantly met with, of getting good science lecturers.

The Chairman said he would make a note of the matter, and it would receive the attention of the Council.

Dr. Watts, in reference to the question, "How can the Society of Arts assist in obtaining the extension of State aid to night-classes in the Institutions in Union?" said the government already gave aid to night-schools held in the same rooms as elementary day-schools, and taught by the same teachers, and the consequence was, that these classes competed on very favourable terms with the Institutions, and took away their pupils. It was only fair that if State aid were given to night-schools at all it should be given to all parties. He would therefore move—

"That the Council of the Society of Arts be requested to urge such of its members as are in Parliament to advocate the extension of similar aid to the night-classes in connection with Mechanics' Institutes as is now given to night-classes held in elementary day-schools."

Mr. Hole seconded the resolution.

Mr. Norris said he believed this subject had already been brought before the government, when it was promised that it should receive consideration, in connection with the great scheme of education which would be brought in probably next session. However, there could be no harm in again bringing the matter forward.

Mr. Heller remarked that in all probability the Committee of Council would insist upon the teachers being certificated.

Dr. Watts said he should not object to that condition. He did not ask favours, but simply justice.

The resolution was put, and carried unanimously.

Mr. Sales opened the discussion on the next subject —"Would the extension of the Final Examinations to Commercial and lower Middle-class Schools produce beneficial results?" He said that in Yorkshire every effort had been used to promote the success of the University local examinations, but, nevertheless, it was found that a very small per-centage of the children attending middle-class schools took advantage of them, and on inquiry it appeared that this did not arise from the want of preparation amongst the pupils, but from the indifference of the parents. It must not be forgotten in all these discussions that the apathy or indifference of the working-classes on the subject of education was no greater than that of the class above them, and the expense was one obstacle. The Oxford fee was 35s. for the senior, and 25s. for the junior examination, and the Cambridge fee in each case was 25s., in addition to which, in the majority of cases, there was the expense of the pupils' board and lodging for a week. It, therefore, appeared to him that, by a slight modification of the arrangements of the final examinations, the Society of Arts might do a great deal of good to middle-class education, at any rate tentatively, because he hoped Mr. Forster's Endowed School Bill (No. 2) would sweep away the middle-class examinations of the Universities, and establish a thorough system of inspection. As it was doubtful, however, when this bill would be passed, he should advocate the Society doing something in the meanwhile. His proposal was that, on payment of a fee of two guineas, any middle-class school should be admitted to the same privileges with regard to the examinations as an Institution in Union, with the provision that pupils should be at least 14 years of age, instead of 16, and that they should not be eligible for prizes.

Mr. Norris said if the Council acted on this suggestion, it would be departing from the principle they had hitherto gone upon, of aiding education in evening classes only, and not interfering with ordinary day-school education. How far this was desirable of course the Council would decide. It might lead to a very heavy additional expense, which he should think unnecessary, because there was no doubt that, before long, a government measure would be introduced which in all probability would meet the case.

Dr. Watts thought this subject was one entirely for the consideration of the Council of the Society; no doubt if the scheme succeeded, it would entail an immense amount of labour and expense; but it was a question solely for the Council whether they saw their way to being reimbursed. He saw no objection to it, with the limitations Mr. Sales had proposed.

Mr. Sales thought the principle of separating the artisan class from those immediately above them was very prejudicial, and he might also observe that the Birkbeck Institution, the City of London College, and such institutions, received pupils of exactly the same class as attended middle-class schools. He would move the following resolution:—

"That the extension of the Final Examinations to day-schools in union with the Society of Arts, whose pupils are over the age of fourteen years—such pupils being ineligible for prizes—would produce beneficial results."

Dr. Watts seconded the resolution.

Mr. Gibbs did not see that the proposal of Mr. Sales would at all interfere with the general scope of the Society of Arts' operations, and saw no reason why a person should be excluded from the examinations, if the Council thought right to admit him, because he received his education in the day-time.

The resolution was then put to the meeting, and carried.

Mr. Sales proposed that the eighth question, "Whether pupils of day-schools should be excluded from the preliminary examinations?" should not be entered upon at so late an hour, and in place thereof moved a vote of thanks to the Chairman for his kindness and ability in presiding over the conference.

Mr. Norris seconded the motion, which was carried unanimously.

The Chairman briefly acknowledged the compliment, and the proceedings terminated.

Free Public Libraries and Museums Committee.

At a meeting of this Committee, on Monday, the 28th June, Henry Cole, Esq., C.B., in the chair, the following resolution was passed:—

"That the Right Hon. W. E. Gladstone be requested

to receive a deputation from the Free Libraries and Museums Committee of the Society of Arts, appointed to promote the circulation to Local Museums, Libraries, and Institutions of the United Kingdom of the superfluous or unexhibited specimens of Works of Art, Science, and Literature in the National Museums and Galleries in the metropolis."

ANNUAL GENERAL MEETING.

The Annual General Meeting, for receiving the Report from the Council, and the Treasurers' Statement of Receipts, Payments, and Expenditure during the past year, and also for the Election of Officers, was held, in accordance with the bye-laws, on Wednesday, the 30th of June, at 4 p.m., Lord Henry Gordon Lennox, M.P., Chairman of the Council, in the chair.

The Secretary having read the notice convening the meeting, the minutes of the last Annual General Meeting, and of the subsequent Special General Meeting, were read and signed.

The Chairman then nominated Mr. Botly and Mr. Dawbarn as scrutineers, and declared the ballot open.

The Secretary then read the following—

Report.

At the Annual General Meeting, the Council lay before the members of the Society the report of their proceedings during the year.

The Albert Medal.

This medal, which was founded, as the members will recollect, for rewarding "distinguished merit in promoting Arts, Manufactures, or Commerce," has this year been awarded to Baron Justus von Liebig, Associate of the Institute of France, Foreign Member of the Royal Society, Chevalier of the Legion of Honour, "for his numerous valuable researches and writings, which have contributed most importantly to the development of Food Economy and Agriculture, to the advancement of Chemical Science, and to the benefits derived from that science by Arts, Manufactures, and Commerce." In making this award, the Council were much assisted by the members of the Society and others, who were good enough to communicate to the Secretary suggestions which were of much value in enabling the Council to arrive at their decision; and the Council feel assured that the award they have made will carry with it, not only the approval of the members of their Society, but that of the scientific world in general.

The Swiney Prize.

From the interest of £4,500 bequeathed to the Society, the will of Dr. Swiney directs that, on every fifth anniversary of his death, the Society shall present "to the author of the best published work on 'Jurisprudence' a silver goblet, value one hundred pounds, with gold coin in it to the same amount;" and in the award of it he associated the College of Physicians with the Society. This year the quinquennial period came round, and the award was made in favour of William Augustus Guy, M.D., author of a work entitled "Principles of Forensic Medicine." The work was selected by a joint committee of the Society and the College of Physicians, presided over by the Lord Chancellor; and the selection of the Committee was unanimously confirmed at a meeting of the judges appointed by the will.

Art Workmanship.

The programme of prizes offered last year was considerably altered from its previous form, and more liberty was given in the choice and treatment of the subjects, as had been frequently urged upon the Council by the competitors. The result of the competition was not such as to encourage the Council to continue the programme in that form. Articles were sent in competition, but prizes to the extent of £95 only, as compared with £198 10s. in the previous year, were awarded. The Council this year, on the recommendation of the Judges, have issued a programme which, whilst it retains much of the altered programme of last year, has combined with it nearly all the features of the previous programme.

Improved Railway Meat Vans and Milk Vans, and Milk Cans.

At the suggestion of the Food Committee, as having a material bearing on the supply of food to the people, the Council last year offered prizes for the most improved railway vans adapted for the conveyance of meat, the conveyance of milk, and for the cans, or churns as they are termed, in which milk is brought to London. A considerable number of models have been sent in for competition, and the Council have sought the assistance of well-qualified judges to decide on their merits. The judges on the meat vans were—Mr. Rudkin, the Chairman of the City Markets Committee; Mr. Tyrrell, Superintendent of Traffic on the Great Western Railway; Mr. M'Lagan, M.P., nominated by the Royal Agricultural Society of England and the Highland Society of Scotland. The judges of the milk vans and cans were Dr. Voelcker, nominated by the Royal Agricultural Society of England, Mr. Tyrrell, and Mr. J. C. Morton. As regards the railway meat vans, the judges are of opinion that although there is considerable ingenuity displayed in some of the models sent in, and a careful consideration shown of principles which it is desirable should be borne in mind in the construction of meat carriages, yet that there is no one which they can recommend as deserving of the Society's prize.

As regards the vans for conveying milk, the judges are of opinion that no model sent in is

deserving of the prize. As regards the cans for the conveyance of milk, the judges are of opinion that the can No. 4, sent in by the Aylesbury Dairy Company, is the best, and they recommend that the Society's Silver Medal and £10, as offered, be awarded to it.

Cantor Lectures.

There have been three courses of Cantor lectures this year. The first course was delivered by Mr. W. H. Perkin, F.R.S., who treated in four lectures the important subject of the Aniline Dyes, materials which have had an important bearing on the arts and manufactures of this country, creating, in fact, a complete revolution in the art of dyeing and calico printing. The second course was given by Mr. Solomon Hart, R.A., and consisted of four lectures on "Painting;" and the third course, which consisted of four lectures, was delivered by Mr. John Anderson, Superintendent of Machinery to the War Department. His subject was "Applied Mechanics," which was treated of under several heads in relation to "Art and Science," in relation to "Natural Properties of Materials," in relation to "Natural Laws in processes," and in relation to "Natural Power." All these courses were well attended.

Food Committee.

This Committee has made the following report:—

During the past session, your Committee have carefully considered the various proposals for preserving meat and other food which have been brought under their notice. They have further examined specimens which had been submitted to Professor Gamgee's process, which has been before described; and they await further specimens for fuller investigation. They have also tested the value of the plan invented by Dr. Estor, which contemplates subjecting meat to the vapours emitted by burning pastiles, by which sulphurous acid, and subsequently chlorine, are liberated. This agency certainly exercises considerable influence in retarding decomposition. Mr. Davison has suggested the desiccation of meat by hot air; and Mr. Bridges Adams has strongly urged the value of dried meat, or *charqui*. More recently the Committee have witnessed the experiments of M. Fabrice, who, by the use of a vegetable solution containing some preparation of tannic or gallic acid, hopes to preserve organic substances for an indefinite period. Mr. Morris and Mr. Shand have both supplied the Committee with many interesting details of plans for either freezing food, or keeping meat in refrigerated air. The cooling is effected, in Mr. Morris's plan, by a machine constructed by Mr. Reece, which alternately condenses and aërifies a solution of ammoniacal gas; in M. Tellier's process, as explained by Mr. Shand, methylated ether is vaporised, and again liquified.

The Committee have looked with the greatest interest to these proposals, and hope that the machines in use may be so perfected as to afford an opportunity of fairly testing the practicability and value of these processes.

The plan for importing live cattle from the River Plate, as suggested by Mr. Atkin last year, has again been discussed in a letter from Captain Hight, and in the evidence of Mr. Bailey. So far as information has as yet been received, this scheme does not seem to afford any great prospect of ultimate success.

On the whole, the Committee beg leave to report that, though they have had before them the above schemes (all of which are of considerable ingenuity and merit), they are not able to state that the problem of importing meat in a fresh state from distant countries has yet been completely solved.

The supply of milk, the best modes of carriage both of this essential article of food and of meat in railway vans, has been fully considered, and many plans and models have been sent in to the Society in competition for the prize it has offered.

The great desirability of increasing the present supply of fish, and securing the best means for its distribution when brought to market, have continued to receive the earnest attention of the Committee, but they are not prepared to say that any suggestion promising to attain these objects has been supported by adequate evidence.

In conclusion, your Committee beg leave to say that they are desirous further to prosecute inquiries, which they believe have been the means of diffusing much useful information, and which have beneficially directed public attention to this most important subject.

Benj. Shaw, *Vice-Chairman.*

June 21st, 1869.

National Musical Education.

The Committee for promoting National Musical Education, have, through the Right Hon. Sir John Pakington, renewed their communications with the Royal Academy of Music, in the hope, which they have always entertained, that the Academy may become the basis for an enlarged system of national musical education. Owing to the retirement of the Earl of Wilton from the direction of the Academy, and the death of Sir George Clerk, Bart., both of whom were much interested in the subject, the correspondence with the Academy had been suspended.

The Society has petitioned Parliament to take National Musical Education into consideration, with the view of affording sufficient aid in its promotion.

The Musical Committee has obtained, through the Foreign Office, very valuable information on the present state of the musical pitch in different capitals of Europe, which will be duly published in the *Journal.*

India Committee.

It having been suggested to the Council that it would be advisable to hold meetings at which Indian subjects could be taken into consideration, it was thereupon resolved that a Committee be formed to organise meetings for the discussion of subjects connected with the Arts, Manufactures, and Commerce of our Indian Empire, under the auspices of this Committee.

There has been held a series of Conferences on several important subjects. These embrace "The Cultivation of Tea," "The Cultivation and Supply of Silk," "Hill Settlements and Sanitaria for European Settlers," "Indian Fibres," "Waste Lands," "Trade with Central Asia," and "The Culture of Cotton in India." The discussions have been attended by leading men interested in India, and have

had the effect not only of awakening greater attention as to our empire there in the journals here, but have put the Indian press in possession of public opinion at home. The chief benefit, however, has been in showing what are our commercial wants with regard to India, and in bringing them for consideration before the practical administrators of India, many eminent members of the civil and military service of which have taken part in the proceedings. The great staples of tea, cotton, and silk, have, under these circumstances, been practically treated, with very great advantage to all concerned in their promotion, and in a manner very creditable to our Society. Full reports of these meetings have appeared in the *Journal.*

The Thames Embankment.

A Committee was appointed to report on the best way of dealing with the Thames Embankment, so that the opportunity might not be lost of making this noble site conducive to the improvement and embellishment of the metropolis. Its proceedings have been reported at length in the *Journal.* The Committee were of opinion that it should form part of the duty of a responsible minister, to exercise a controlling power, within necessary limits, over all operations bearing upon any public works in which the convenience and embellishment of the metropolis of the country are concerned; and the Council have petitioned both Houses of Parliament, praying for the appointment of such responsible control, and for the occupation of the Embankment with public buildings of such a character as the Natural History Museum and the Law Courts.

Minister of the Fine Arts.

The Council have appointed a Committee to consider whether it would be advantageous that matters referring to the promotion and interests of the Fine Arts in this country should be placed in charge of a Minister of the Crown, and, if it be so considered, that steps be taken to place the subject before the Government. This Committee, not having completed its investigations, will seek renewal from the new Council.

Piscicultural Committee.

At the suggestion of the Food Committee, the Council has established a Piscicultural Committee to discuss subjects connected with the preservation and breeding of fish, as bearing materially on the supply of food to the people. A very large number of persons throughout the United Kingdom interested in the subject, and especially the conservators of fisheries, have joined the Committee. Two meetings have been held, and a deputation from the Committee waited upon the Home Secretary to confer with him in reference to the Bill now before Parliament for amending the Salmon Fishery Laws.

Postal Reform.

A Committee has been appointed by the Council for the purpose of "Promoting the adoption of reduced rates of postage, particularly in reference to printed matter and parcels," and the Committee is now engaged in the consideration of the question, with a view to secure newspapers, printed matter, and parcels, being carried at rates not higher than those which are found practicable in France, Belgium, and the United States of America.

Free Libraries and Museums.

The Council have appointed a Committee to take charge of this subject, and to endeavour, by collecting and diffusing information, to promote the multiplication of such libraries and museums throughout the United Kingdom, believing that they will prove a material aid in the promotion of that technical education among our artisans which the Society has taken so deep an interest in promoting.

Designs for Channel Steamers.

The very defective state of the accommodation afforded by the Channel steamers, plying between this country and the Continent, having been brought under the notice of the Council, they have determined to offer the Gold Medal of the Society, and the large Silver Medal of the Society, for the best and the second-best block model of a steamer, which shall afford the most convenient shelter and accommodation to passengers on the deck of the vessel crossing the Channel between France and England. The steamer is not to exceed in tonnage and draught the best vessels now in use between Folkestone and Boulogne, and the model must be on a scale of a quarter of an inch to a foot. The models, marked in cypher, are to be sent in to the Society of Arts' House, John-street, Adelphi, on or before the 1st November, 1869, with a sealed envelope, giving the name and address of the designer.

The Council reserve the right of withholding either or both medals, in case, in their opinion, the models sent in do not possess sufficient merit.

The following particulars of the South-Eastern Channel steamers, *Victoria, Albert Edward,* and *Alexandra,* are given for the convenience of competitors, but it is not intended to confine the designs to them, except as to tonnage and draught:—

Length between perpendiculars, 200 ft.
Breadth of beam, 24 ft.
Depth underside of deck amidships, 12 ft. 6 in.
Draught of water, 7 ft.
Bow, clipper.
Stern, elliptic.
Rig, polacca with two masts, lug foresail, gaff mainsail, staysail, and flying jib.
Engines, oscillating.

Paddle wheels, 17 ft. 6 in. diameter.
Tonnage, 568 tons.
Speed, 17 miles an hour.

The London Cab System.

The improvement of the cab system of the metropolis was, two years ago, brought before the Society by Mr. Cole, and early in the year a deputation from the Council, headed by the Chairman, Lord Henry Lennox, waited upon the Home Secretary, pointing out the evils of the present system, and expressing a hope that the Government would take some steps in the way of legislation, to place the cab arrangements in London on an improved footing. On a subsequent day the Council summoned a conference on the subject, to which were invited the principal cab proprietors in the metropolis, many drivers, and others taking an interest in the question. The proceedings of this conference have been fully reported in the *Journal*, and it is believed that the information elicited at that meeting will be found of value in assisting the Government to arrive at a plan which will place the system on a more satisfactory basis than at present. In order to promote the establishment of a better class of vehicles—which it is hoped the new system may call into existence—the Council have determined to offer the following prizes :—

The Society's Gold Medal for the best and most convenient open hackney carriage for two persons.
The Society's Silver Medal for the second-best ditto.
The Society's Gold Medal for the best and most convenient closed hackney carriage for two persons.
The Society's Silver Medal for the second-best ditto.
The Society's Gold Medal for the best and most convenient hackney carriage for four persons, either open or closed, or both.
The Society's Silver Medal for the second-best ditto.

Lightness of construction, combined with adequate strength and durability, will be especially considered in making the awards.

The awards will be made after actual trials of the carriages extending over a certain period.

Communications describing the carriages must be sent to the Secretary of the Society of Arts before the 1st January, 1870, the carriages to be sent to a place hereafter to be appointed.

The Council also offer the Society's Silver Medal for the best instrument, to be affixed to a cab or other hackney carriage, for indicating the fare as between the passenger and the driver, whether by registering the distance travelled or otherwise, and which instrument shall also indicate, for the convenience of the cab-owner and of the driver, the total distance travelled during the day and the total amount earned. The instruments competing, with full descriptions of their construction, to be sent to the Society's House before the 1st January, 1870.

Competitors may, at their option, sign their communications, or may forward with them sealed letters containing the name and address of the writer.

The Council reserve to themselves the right of withholding all or any of the medals, in case none of the carriages or instruments possess, in their opinion, sufficient merit.

Technical Education.

The Council, having received from Owens College, Manchester, a communication in reference to some steps which might be taken for the promotion of technical education, and the establishment of technical colleges, after some correspondence, have resolved to convene meetings in various centres of industry, for the purpose of calling attention to the importance of promoting the establishment of technical colleges and science schools, under a system which shall combine local action and State aid; and the Council have instructed the Secretary to place himself in communication with the mayors and other authorities, with a view to the holding of such meetings, and they hope to have the assistance of the members of the Society residing in the several localities.

Union of Institutions.

The Union remains as to numbers about the same as last year, and, judging from the reports of the visiting officers, and by the results of the Examinations, the Institutions are doing good work in the way of systematic teaching. For the details connected with the Examinations the Council refer to the Secretary's report, communicated to the Annual Conference, which was held on the 23rd instant. By the report of the proceedings of the Conference, it will be seen that a grave question for their consideration has arisen—how far it is right that the Society should continue to include in its list those subjects in which the Science and Art Department holds Examinations.

Meetings at the Society's Rooms.

The Council have had much pleasure in placing the rooms of the Society at the disposal of various societies and other public bodies, for the discussion of subjects allied to Arts, Manufactures, and Commerce, and the Council look forward to increasing the use of the Society's premises in a similar direction in future.

Meetings have been held by the Institute of Naval Architects (continuing for three days), the new Iron and Steel Institute, the Acclimatization Society, the Aeronautical Society, the Co-operative Congress (extending over four days), the Association for the Suppression of Pauperism and Crime, the Working Men's Technical Education Conference, the National Choral Society, the Social Science Association, the Labourers' Cottage Congress, the Yorkshire Union Deputation, the Royal College of Pre-

ceptors, the London Association of Church Schoolmasters, and by other bodies.

Finance.

Appended to the report are statements of accounts, published in the last *Journal*, as required by the Bye-laws. Although it appears that the liabilities are somewhat larger than last year, it must be borne in mind that this year several items of expenditure have come into account which will not recur in next year, such as the Donation to the East London Museum, the Swiney Prize, and the cost of printing the Artisans' Reports.

Admiral Ommanney moved the adoption of the report.

Mr. Botly seconded the motion, and, as a constant attendant at the Society's rooms, expressed himself as much gratified at the success of the various meetings and conferences that had been held. He also thought the Cantor Lectures were remarkably interesting. He approved of the policy of the Council in lending the Society's room to other societies, for the discussion of subjects allied to those which this Society specially took under its cognizance.

The Chairman having expressed the pleasure he felt at the manner in which the report had been received,

The motion was put and carried.

The Chairman proposed that Mr. Samuel Redgrave, one of their Vice-Presidents, be re-elected the Society's Trustee of the Soane Museum.

Mr. Teulon, Vice-Chairman of the Council, seconded the motion, which was carried.

Mr. Fitzgerald proposed that a cordial vote of thanks be given to Lord Henry Lennox, the Chairman, and to the Council, for the admirable manner in which they had conducted the business of the Society during the past year. He might specially refer to the conferences on Indian subjects, in which he was himself specially interested, as amongst the most important and useful objects which had been undertaken during the preceding session.

Mr. Pagliardini seconded the motion.

The Chairman, in acknowledging the compliment, desired to express, on behalf of his colleagues and himself, the gratification they felt at the manner in which the services which they had endeavoured to render to the Society had been appreciated by the members; he might say that those who had just been re-elected would use every effort in their power to promote the welfare and usefulness of the Society in the future. The proposer of this motion had referred to the conferences held in this room on Indian subjects as amongst the most useful of the Society's proceedings during the past session, a view in which he (the Chairman) cordially concurred. With reference to the Society's *conversazione* to-morrow evening, members were aware that it had been intended to present on this occasion an address from the Society to his Highness the Viceroy of Egypt, in acknowledgment of the enlightened encouragement given by his Highness to the promotion of Commerce, Agriculture, and the Arts in his own country, and especially for the kind aid that he had on all occasions shown himself ready to afford to the merchants, as well as to the government of this country. He (the Chairman) had seen the Viceroy on the previous evening, and his Highness personally expressed to him his high appreciation of the kind terms in which the invitation of the Council had been conveyed to him, and his great regret at being unable to be present at the Society's *conversazione*, owing to his being compelled to leave England to-morrow morning. He (the Chairman) had reason to know that his Highness was highly gratified at the warm reception which the people of England had given him, as well as the highest personages in the realm. The Prince and Princess of Wales especially had, to his (the Chairman's) knowledge, done their very utmost to evince their cordial appreciation of the splendid hospitality shown them by his Highness on their recent visit to Egypt. He would conclude by again thanking the members present for the compliment paid to himself and his colleagues.

Mr. Dawbarn thought the meeting ought not to separate without expressing the thanks of the Society to the officers, to whom the members were so much indebted for their valuable services.

Mr. Teulon seconded the motion, and desired, as a member of the Council, to express his warm concurrence in the proposed motion.

The motion was then put, and carried unanimously.

Mr. Le Neve Foster, on the part of himself and his colleagues, acknowledged the compliment.

The ballot having remained open one hour, and the scrutineers having reported, the Chairman declared that the following members had been elected to fill the several offices. The names in *Italics* are those of members who have not, during the past year, filled the offices to which they have been elected:—

COUNCIL.

PRESIDENT.

H.R.H. the Prince of Wales, K.G.

VICE-PRESIDENTS.

Sir W. H. Bodkin (Assistant Judge)
Right Hon. H. A. Bruce, M.P.
The Lord Chancellor, F.R.S.
Henry Cole, C.B.
Sir Daniel Cooper, Bart.
Duke of Devonshire, K.G.
Lord de l'Isle and Dudley
Sir J. W. Gordon, K.C.B.
The Earl Granville, K.G., F.R.S.
William Hawes
C. Wren Hoskyns, M.P.
Lord Henry G. Lennox, M.P.
Sir John Lubbock, Bart.
Lord Lyttelton
Right Hon. Sir John S. Pakington, Bart., M.P.
Samuel Redgrave
Seymour Teulon
Thomas Twining
Joseph Whitworth, LL.D., F.R.S.
The Archbishop of York

ORDINARY MEMBERS OF COUNCIL.

F. A. Abel, F.R.S.
Samuel Andrews
John Bell
Edwin Chadwick, C.B.
Sir Charles W. Dilke, Bart., M.P.
Major-General Sir Vincent Eyre, C.B.
Rev. W. Rogers
Benjamin Shaw
Sir Charles Trevelyan, K.C.B.
E. Carleton Tufnell
James Ware
Major-General F. Eardley Wilmot, R.A., F.R.S.

TREASURERS.

Hyde Clarke, D.C.L.
John Murray

AUDITORS.

G. C. T. Bartley
Henry Vaughan

SECRETARY.

Peter Le Neve Foster, M.A.

FINANCIAL OFFICER.

Samuel Thomas Davonport.

The Chairman proposed a vote of thanks to the scrutineers, Mr. Botly and Mr. Dawbarn, for their services, which was carried.

At the conclusion of the General Meeting a Special Meeting was held, when the following candidates were balloted for and duly elected members of the Society:—

Adams, John, 3, College-gardens, Dulwich, S.E.
Black, John Thomas, 9, Adelaide-road, N.W.
Bliss, William, Chipping Norton, Oxon.
Brett, William, 3, Elgin-terrace, Kensington-park, W.
Broadwood, Walter Stewart, 3, Queen's-gate-gardens, South Kensington, W.
Churchill, James D., 531, Oxford-street, W.
Couch, Enos, 172, High-street, Wapping, E.
Crookenden, J. A., Phœnix Gas Company, Bankside, S.E.
Crowther, Joseph, 13, Upton-road North, De Beauvoir-town, N.W.
Dale, John, Cornbrook, Manchester.
Davies, George V., 9, Cambridge-terrace, Chelsea, S.W.
Davison, James W., 36, Tavistock-place, W.C.
De Bathe, Major-General Henry Percival, 3, Morpeth-terrace, S.W.
Dennison, William, 46, West-square, Southwark, S.E.
De Vahl, Arthur D. S., 1, Hyde-park-square, W.
Douglas-Hamilton, A., 34, St. George's-road, S.W.
Earle, Thomas, 1, Vincent-street, Ovington-square, S.W.
Eaton, Richard, Inns of Court Hotel, Holborn, E.C.
Edwards, W. J., 21, Elmore-street, Islington, N.
Fairbrother, Rev. William, Hornsey-lane, N.
Farrow, Morley, 23, Clifton-gardens, W.
Fell, William H., 73, Wenlock-street, New North-road, N.
Fernandes, Albert Bernard, 24, Tavistock-terrace, Westbourne-park, W.
Galloway, Rev. William Brown, M.A., 1, Fitzroy-road, Primrose-hill, N.W.
Gannell, Henry, 34, Sydney-street, Brompton, S.W.
Gardner, Edward Vincent, Berners-college, 44, Berners-street, W.
Gardner, John Dunn, 19, Park-street, Park-lane, W.
Grant, Thomas, 29, Gerrard-street, Soho, W.C.
Guelton, Richard, 138, Buckingham-palace-road, Pimlico, S.W.
Haines, Frederick, 413, Edgware-road, W.
Hall, G., 3, Westminster-chambers, Victoria-street, S.W.
Hallé, Charles, 11, Mansfield-street, W.
Haly, Col., 12, St. Stephen's-road, Shepherd's-bush, W.
Haly, J. Standish, 15, Cockspur-street, S.W.
Hammond, Edward W., 29, Charlwood-street, South Belgravia, S.W.
Handford, George C., 224, King's-road, Chelsea, S.W.
Hankey, William Barnard, Fetcham-park, Leatherhead.
Harrison, Charles Fisher, 1, Malden-crescent, Haverstock-hill, N.W.
Harrison, Octavius B. C., 4, Paper-buildings, Temple, E.C.
Harrison, William, Addingham-house, Quadrant-road south, Highbury New-park, N.
Hart, Arthur Marmaduke, 15, Campbell-road, Bow-road, E.
Hart, G. W., Hayling Island, Hants.
Harvey, John, 33, Harewood-square, N.W.
Hay, Frederick Rudolph, 35, Mornington-road, Regent's-park, N.W.
Henderson, James, 10, Whitehall, S.W.
Henry, Mitchell, Stratheden-house, Hyde-park, S.W.
Hind, George W., 5, Torrington-square, W.C.
Houchin, Richard, 13, Bridport-place, New North-road, N.
Inglefield, Rear-Admiral, E.C., C.B., F.R.S., 10, Grove-end-road, N.W.
Irons, Rev. W. J., D.D., Michael's-grove, Brompton, S.W.
Jackson, Charles W., 9, The Grove, South Lambeth, S.W.
Jago, George J., 19, Cheyne-walk, Chelsea, S.W.
Jago, Arthur, 38, Tregunter-road, Brompton, S.W.
James, Hugh, 68, Church-street, Chelsea, S.W.
Jervis, Rev. W. Henley, M.A., 28, Holland-park, Kensington, W.
Kalisch, Marcus, Ph.D., 3, Clifton-road, St. John's-wood, N.W.
Keating, Hon. Sir Henry S., 11, Prince's-gardens, W.
Kell, Thomas, 8, Castle-street, Holborn, E.C.
Lacey, John, 4, Wellington-street, London-bridge, S.E.
Laing, George E., 1, Raymond-buildings, W.C.
Lamb, Robert, 56, Richmond-road, Barnsbury, N.
Lamplough, H. T., 22, Myra-villas, King Henry's-road, Hampstead, N.W.
Lane, George Henry, 16, Redcliffe-gardens, The Boltons, S.W.
Lange, Daniel A., 21, Regent-street, S.W.
Langley, J. Baxter, 50, Lincoln's-inn-fields, W.C.
Lansdowne, George, 2 and 3, Warwick-street, Charing-cross, S.W.
Lara, D. Laurent de, 3, Torrington-square, W.C.
Lawlor, John, 233, Stanhope-st., Hampstead-road, N.W.
Lawrence, Sir Trevor, Bart., 18, Whitehall-place, S.W.
Lawson, George Anderson, 139, Gloucester-road, Regent's-park, N.W.
Macgeorge, W., 1, Castle-court, Birchin-lane, E.C.
Macpherson, Charles H., 23, Kingsdown-road, Upper Holloway, N.
Maguire, Henry Carlton, 2, Hargrave-park-road, Upper Holloway, N.
Maguire, John Thomas, The Vale, Chelsea, S.W.
Malgarini, Frederick Lewis, 30, Bedford-row, W.C.
Manning, John, 6, Lothbury, E.C.
Marshall, Rev. Charles, M.A., 9, South-street, Finsbury-square, E.C.
Martin, Sir James Ranald, C.B., F.R.S., 37, Upper Brook-street, W.
Marx, Karl, Ph.D., 1, Modena-villas, Haverstock-hill, N.W.
Mason, Matthew, 21, Doughty-street, W.C.
Mason, Samuel, Mecklenburgh-square, W.C.
Maudslay, Thomas Henry, Knight's-hill, Norwood, S.E.
May, Thomas, 1, Elgin-villas, Notting-hill, W.
Mc Kerrell, Robert, 45, Inverness-terrace, W.
Morton, William Scott, 65, Great Russell-street, W.C.
Murray, A. J., 181, Albany-road, Camberwell, S.E.
Napier, John, 1A, Fitzroy-square, W.
Napier, John, 1A, Fitzroy-square, W., and Glasgow.
Nash, Joseph, jun., York-chambers, York-buildings, Adelphi, W.C.
Nelson, Thomas A., M.D., 10, Nottingham-terrace, York-gate, Regent's-park, N.W.
Nettlefold, Frederick, 20, York-terrace, Regent's-park, N.W.
Nevett, William Charles, 17, Huntingdon-street, Barnsbury, N.
Palmer, Frederic W., Ormond-house, 363, Old Kent-road, S.E.
Pamphilon, Frederick W., 5, John-street, Adelphi, W.C.
Parry, John Humffreys, 20, Upper Gloucester-place, Dorset-square, N.W.
Phillips, Octavius, 34, Princes-square, W., and 91, Great Tower-street, E.C.
Quaritch, Bernard, 15, Piccadilly, W.
Quilter, William, 3, Moorgate-street, E.C.
Radford, Edward, 6, Abingdon-villas west, Kensington, W.
Radford, James, 16, Sheffield-terrace, Campden-hill, Kensington, W.
Rahn, Charles, 80, Brook-street, W.
Ramsay, Frederick William, M.D., 15, Somerset-street, Portman-square, W.
Ramsden, J. C., Little Horton-lane, Bradford, Yorkshire.
Ravenscroft, H., Powis-lodge, Haverstock-hill, N.W.
Rawlings, James, 184, Belsize-road, St. John's-wood, N.W.
Rawlins, Henry J. E., 99, Southampton-row, W.C.
Rawlinson, Major-General Sir Henry Creswick, K.C.B., F.R.S., 2, Hill-street, Berkeley-square, W.
Rayment, Samuel J., 79, Leighton-road, Kentish-town, N.W.
Robinson, Edwin, 76, Worship-street, E.C.
Samuel, John, 32, Park-lane, W.
Sanderson, Richard Manners, 65, Wimpole-street, W.
Sang, Frederick, 24, Sackville-street, Piccadilly, W.
Sassoon, R. D., 15, Leadenhall-street, E.C.

Simpson, Richard, 9, Fenchurch-street, E.C.
Tapernoux, Paul E., 58, Park-walk, Chelsea, S.W.
Tayler, Stephen S., Prospect-villa, Peckham-rye-common, S.E.
Underwood, W. Elphinstone, 3, St. Stephen's-crescent, Westbourne-park, W.
Valentine, John S., 11, Park-street, Westminster, S.W.
Warburg, Frederic E., 53, Prince's-square, Bayswater, W.
Ward, Edward Matthew, R.A., Kent-villa, Lansdowne-road, Kensington-park, W.
Ward, John Edward, Elm-cottage, Grosvenor-road, S.W.
Ware, Thomas, Manor-house, 182, Mare-street, Hackney, N.E.
Warren, Reginald A., 99, Great Russell-street, W.C., and Preston-place, near Arundel.
Waterlow, Alfred James, 25, Park-crescent, Regent's-park, N.W.
Watkins, Wynne W., 67, Claverton-street, South Belgravia, S.W.
Watney, James, 32, Prince's-gardens, W.
Watts, Thomas, British Museum, W.C.
Worley, Joshua, 6, Brabant-court, Philpot-lane, E.C.
Yapp, George, 172, Oakley-street, Chelsea, S.W.
Yardley, Samuel, 50, Charlwood-street, Pimlico, S.W.
Young, Frederick, 10, Russell-road, Kensington, W.
Young, John, 35, King-street, Cheapside, E.C.
Young, William, 47, Hemingford-road, Barnsbury, N.

And as Honorary Corresponding Member.

Aymar-Bression, M., Directeur-Général de l'Academie Nationale, 41, Rue du Cardinal Fesch, Paris.

FINAL EXAMINATIONS, 1869.

The following Table shows the ages of the 2,525 Candidates from whom return papers were received. Of these, 2,160 underwent the Final Examination:—

Age.	No. of Candidates.	Age.	No. of Candidates.
16	274	33	16
17	324	34	14
18	351	35	14
19	277	36	9
20	253	37	9
21	182	38	6
22	146	39	3
23	136	40	3
24	88	41	2
25	78	42	3
26	80	43	2
27	73	44	3
28	49	45	2
29	47	47	2
30	35	48	1
31	27		
32	16	Total	2,525

Occupations, Present or Proposed, of the 2,525 Candidates from whom Return Papers were received:—

Accountants (and Clerks)	21
Agents	7
Architects (and Pupils)	14
„ Clerks	4
Artist	1
Assistants—Broker's	1
„ Editor's	1
„ Excise	1
„ in Herbarium	1
„ Laboratory	3
„ Jeweller's	2
„ Surveyor of Taxes	1
Bakers	2
Bath-attendant	1
Blacksmiths	6
Bleacher	1
Boat-builders	2
Boiler-maker	1
Bookbinders	2
„ keepers	58
„ sellers & assistants	7
Boot and shoe-makers	6
Brass-finishers	4
„ founder	1
„ moulder	1
„ scale-beam filer	1
Bricklayer	1
Brush-maker	1
Builders	4
Butchers	2
Cabinet-makers	11
Calico-printer	1
Caligrapher	1
Card-cutter	1
Carder	1
Carpenters	39
Caulkers	2
Chemists and Assistants	22
„ Analytic	2
„ and Dentist	1
„ and Druggists	12
China-dealer	1
„ packer	1
Church (the)	2
Cigar-maker	1
City Missionary	1
Civil Engineers	7
„ „ Clerk	1
„ Service	4
Clerks—Bankers', Commercial, &c.	490
„ in Admir. Registry	1
„ Auctioneers'	1
„ Builders'	4
„ City Rate Office	1
„ Customs'	2
„ Engineers'	3
„ Gas-works'	2
„ Government	1
„ Insurance	5
„ Land Agency Office	1
„ Law, &c.	39
„ in a museum	1
„ in Ordnance Survey	4
„ Post-office	1
„ Printer's	1
„ Railway	22
„ Shipping	2
„ Smith's	1
„ Telegraph	3
Clogger	1
Cloth-dresser	1
„ lapper	1
„ looker	1
Clothiers	2
Coach-makers	2
„ man	1
„ painters	2
Coal-dealer	1
„ miner	1
Collar-maker	1
Collectors	5
Colour-mixers	2
Commercial travellers	5
Compositors	5
Coopers	2
Corporal Royal Marines	1
Cotton-weigher	1
Curriers	2
Customs' Officers	5
Cutler	1
Cut-lookers	2
Dental-mechanist	1
Dentists	3
Designer	1
Dispensers	4
Drapers (and assistants)	31
Draughtsmen	27
Drawer-in	1
Drawing-master	1
Dressmaker	1
Druggists, &c.	21
Drysalter	1
Dyers	10
Electro-plate Manufacturer	1
Engine-driver	1
„ erectors	7
Engineers (apprentices and students)	153
„ marine	3
„ mechanical	5
Engravers	9
Factor	1
Factory operatives	3
Fancy-box-maker	1
Farm-bailiff	1
„ servants	3
Farmers	2
Fellmonger	1
File-cutter	1
Fitters, &c.	51
Flax-buyer	1
Florist	1
Flyer-maker	1
Foreign-correspondent	1
Foremen	3
Foundry apprentice	1
Fruiterer	1
Gardeners	23
Gas-fitters	4
Gilder	1
Glass-engraver	1
„ painters	2
„ stainer	1
Governesses	10
Grease-maker	1
Greengrocer	1
Grinder	1
Grocers and assistants	17
Gun and Pistol-case maker	1
Gunsmith	1
Hairdresser	1
Hat-trimmer	1
Hatters	8
Hosier	1
House-decorators	3
„ factor	1
Inland Revenue officer	1
Inspector of Waterworks	1
Iron-moulders	3
„ turners	5
Ironmongers (and assistants)	8
Jewel-case makers	3
Jeweller	1
Jeweller's-engraver	1
Joiners	82
Knotters	3
Labourers	9
Law stationer	1
Leather-seller	1
Letter-carriers	2
Librarians	3
Light-house service	1
Linen-trade, in the	1
Lithographers	5
Locksmith	1
Machine-fitter	1
„ joiners	5
Machinists	5

Magazine-keeper	1
Makers-up	5
Maltster	1
Manufacturers	6
Masons	7
Mast and Block-maker	1
Mat-makers	4
Measurers	3
Mechanics	115
Medical student	1
Merchants	6
Mill-hands	4
„ man	1
„ wrights	35
Milliners	2
Minders	3
Monitors	3
Moulders	9
Music-seller	1
News-agent	1
Newspaper manager	1
Normal student	1
Office-lads	5
Opticians	2
Organ-builder	2
Organist	1
Overlookers	6
Packer	1
Painters, house, &c.	11
Paper-makers	2
Pattern-book maker	1
„ makers	30
Pawnbrokers and assistants	5
Pen-holder maker	1
Philosophical instrument maker	1
Photographers	2
Pianoforte makers	2
„ tuner	1
Pilot	1
Piecers	15
Pin-grinder	1
Planers	2
Plasterers	2
Plate-layer	1
Plumbers, &c.	4
Pocket-book maker	1
Porters	3
Post-office employé	1
Power-loom tenter	1
Printers	17
„ lithographic	2
Prison officer	1
Provision dealer	1
Pupil-teachers	64
Putters-out	2
Railway porter	1
„ servant	1
Rate collectors	2
Reader (and Secretary)	1
Reporter	1
Roller-coverers	2
Rope-maker	1
Rose-engine turner	1
Royal Engineer	1
Saddlers	1
„ ironmonger	1
Sail-maker	1
Salesmen	15
Sawyer	1
Seal-engraver	1
School-masters	35
„ mistresses	7
Self-actor minders	14
Serjeants	2
Ship-joiner	1
„ wrights and apprentices	48
Shirt-cutter	1
Shopmen	4
Shuttle-maker	1
Size manufacturer	1
Skip-maker	1
Smiths	11
Soldiers	0
Solicitors	6
Sorter in Post-office	3
Spindle-makers	2
Spinners	14
Staff-serjeant	1
Stamper	1
Staircase builder	1
Stationers	3
Stereotyper	1
Stone masons	11
Store-keepers	4
Surgical instrument maker	1
Surveyors and assistants	11
Tailors	8
Teachers (other than pupil-teachers)	82
Tenter	1
Time-keepers	6
Tin-plate workers	4
„ smiths	1
Tobacco manufacturer	1
Tobacconist	1
Tool-makers	2
Turners	42
Twisters	3
Upholsterers	6
Usher	1
Waiter	1
Warehousemen and lads	91
Warpers	3
Waste-dealer	1
Watch-makers	7
Weavers	35
Weighing-machine filer	1
Wheelwrights	6
Whitesmiths	4
Winder	1
Wire-drawer	1
Wood-carvers	5
„ engravers	1
Woodman	1
Wool-sorters	11
Writers	12
Undetermined, or not stated	92
Total	2,525

FISH SUPPLIES.

The following has been supplied, for the information of the Food Committee, by John Hoare, Esq.:—

Abstract of the Supplies of Fish delivered at and sold in Billingsgate Market from the 1st to 31st of May, 1869, with a computation of the value thereof.

Salmon (salmon, grilse, trout), 3,400 packages, at £10 10s., per		£35,700
[These fish packages are usually computed at an average weight, on an entire season, of 112 lbs. each, but it must be borne in mind that, during the early portion of the season, when the salmon are all large "spring-fish," that standard is increased fully 25 per cent.; there has not been more than a score boxes of grilse at market this season, which has been, thus far, one of the scarcest years for salmon known at Billingsgate.*]		
Trawl fish:—		
Per steam-ships (Hewat and Co., limited)—		
Prime (turbot, brill, soles, &c.) 9,420 packages, at £2	£18,840	
Offal (haddock, plaice, whiting, &c.), 32,038 packages, at 10s.	16,019	
[It is principally to these vessels that the inhabitants of the metropolis are indebted for their supplies of fresh fish, particularly in the summer months, when the smacks cannot make the harbours during the prevailing calm weather "in shore." These steam-ships take on board their freights at sea, and the smacks are thus enabled to secure a ready market for their produce, and to remain on the fishing grounds, which is to them a matter of paramount importance.]		
Per cutters and other vessels—		
Prime, 8,400 packages, at £2	16,800	
Offal, 30,000 packages, at 10s.	15,000	
Per railways—		
Prime, 25,000 packages, at £2	50,400	
Offal, 9,600 packages, at 10s.	4,800	
		121,859
Per railways, quality not described,† 3,000 tons, at £25, per		75,000
Per railways, "specials" (no information)		(*nil*)
Lobsters, 5,000 packages		6,400
Crabs, 7,300 ditto		5,500
Shrimps		3,000
Oysters (natives and commons)		7,500
[It is scarcely necessary to remark that during the months of May, June, July, and August, these bivalves are not much in request, therefore the computation cannot be considered as an approximation to what the return would be in the "season."]		
Winkles, whelks, cockles, &c.		5,000
Salt fish (dry), herrings, cod, ling, skate, &c.		8,000
Irish mackerel, 5,500 boxes, at 30s., per		8,250
[These fish are principally caught at Kinsale by the boats of the South of Ireland Fishing Company, Limited, established in 1865, which has since paid an average dividend of about 15 per cent. per annum on the paid-up capital.]		
English mackerel, 20,000 pads, at 10s. per		10,000
[Each pad contains from 50 to 60 fish.]		
Smoked fish—Herrings, bloaters, kippers, reds, &c., haddock (English and Scotch kippered),		

* The total number of packages of salmon sold in Billingsgate Market during this year to 31st May, was 6,977.

† Principally drift-net and hook fish of sundry kinds.

salmon, sprats, &c. (sales during the month computed at)	10,000
[During the Yarmouth "season" 60,000 to 100,000 pads of bloaters are sold in this market weekly, realising from £30,000 to £50,000. The season commences about July.]	
Sundries—Cod, eels, conger-eels, red mullet, flounders, dorce, glossin, hake, gurnard, smelt, charr, grayling, pilchard, white-bait, dab, lamprey, ray, sturgeon (royal), &c.	10,000
	£306,209

Amongst the items contained in a tract, preserved in the library of the British Museum, by John Seller, sen., purporting to be "A Moderate Computation of the Expenses in Provisions spent in the Cities of London and Westminster, in 1691," is the following:—"In salt and fresh fish, at one penny a-day, for half a million of people, for one week, £14,583 6s. 8d." According to our return of the supplies of fish for the past month at Billingsgate, which we consider to be under the average, the aggregate totals only amount to £306,209, which would not amount to one penny per day for each person in the metropolis. Assuming that there were 3,000,000 persons in London and its environs each day during the month, and that their icthyophagy cost them the same rate per head as their progenitors, according to Seller's "moderate computation," the aggregate sum should represent £350,000. However, as we have already observed, the past month must not be considered an average one, for during the Yarmouth season the sales are vastly in excess of that result.

Fine Arts.

The Paris Salon.—This exhibition closed on the 20th June, and although admitted to be very weak in important works, attracted an immense number of visitors. The two great prizes have been bestowed on M. Bonnat, for his "Assumption of the Virgin," painted for the Church of St. André at Bayonne, and M. Perraud, for his figure in marble, entitled "Despair." These are certainly the two finest works in their class in the salon, but the award of one of the great medals to M. Bonnat does not appear to give general satisfaction. The work of M. Perraud is one of great beauty. The figure—that of a young man—is seated by the side of the water, the hands clasped over the knees. The only mistake seems to be in the name given to the work, which might have been called "Grief," or "Disappointment."

Commerce.

Trade between Venice and Alexandria.—Since the establishment of a line of steamers between Venice and Alexandria the trade with Egypt has been greatly increased, as will be seen by the following comparison of the arrivals and departures of ships and the exports and imports to Venice from Alexandria in 1868 and 1867:—

Arrivals at Venice from Alexandria.

Laden.	1868.		1867.	
	No.	Tonnage.	No.	Tonnage.
Sailing vessels	6	1,338	7	1,349
Steam do.	31	18,797	..	..
In ballast:—				
Sailing vessels	2	410	1	372
Steam do.	1	621	1	419
Total	40	21,166	9	2,140

Departure from Venice for Alexandria.

Laden.	1868.		1867.	
	No.	Tonnage.	No.	Tonnage.
Sailing vessels	19	5,444	12	3,463
Steam do.	31	18,372	1	614
In ballast:—				
Sailing vessels	..	..	..	..
Steam do.	..	..	..	..
Total	50	23,816	13	4,077

The following are the values of the exports from Venice to Egypt:—

	1868.	1867.
	Francs.	Francs.
Spirits	7,440	..
Butter, lard	136,290	..
Hydraulic lime	4,920	450
Paper	21,825	..
Cereals	4,952	..
Rope and cordage	3,375	..
Beads and glass ware	141,426	5,500
Cheese	17,000	..
Fruit and vegetables	81,005	..
Timber	579,485	233,805
Books	2,386	..
Medicinal	9,100	..
Cloths	52,600	..
Wines	5,815	12,300
Various other produce	16,999	5,955
Total	1,084,657	258,010

Imports to Venice from Alexandria.

	1868.	1867.
	Francs.	Francs.
Colonial produce	2,210	..
Raw cotton	601,920	..
Fruit	595	..
Gum	79,500	..
Implements	700	..
Raw wool	2,475	..
Books	480	..
Metals	11,752	..
Natron	385,485	241,935
Oil from cotton seed	880	..
Hides	85,750	..
Tamarinds	3,080	..
Broken glass	1,200	..
Wines	600	..
Various other products	3,020	333
Total	1,179,647	242,268

Notes.

Universal Exhibition of St. Petersburg.—The Russian government has issued a ukase for a universal exhibition, to be held at St. Petersburg next year, to open on the 15th of May. It is said that the Emperor Napoleon is expected to visit the Court of Russia on the occasion of this exhibition.

New Streets in Paris to be named after Men of Science.—Three new streets are ordered to be pierced in that quarter of Paris known as Les Ternes, beyond the Arc de Triomphe at the end of the Champs Elysées; these streets are to be named after Lebon, Torricelli, and Faraday. There are already several streets in Paris bearing the names of distinguished foreigners, and the fact deserves to be recorded as an instance of international recognition and courtesy worthy of imitation.

MEETINGS FOR THE ENSUING WEEK.

Mon.....Society of Arts, 4. Mr. Arthur Hobhouse, Q.C., "On the Limits to be placed upon Posthumous Dispositions to Public Uses."
Entomological, 7.
Asiatic, 3.
Royal Inst., 2. General Monthly Meeting.
Wed ...Obstetrical, 8.
Sat .....R. Botanic, 3¾.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb.

Delivered on 17th June, 1869.

258. East India (Registered Debt)—Statement.
267. Edinburgh Churches—Returns.
City of London Gas Act (1868)—Report.
Fortifications—Minutes of Evidence.

Delivered on 18th June, 1869.

159. Bill—Fines and Fees Collection.
166. ,, Poor-law Board Provisional Orders Confirmation.
216. Fisheries (Ireland)—Return.
253. Coal, Cinders, and Culm—Account.
254. Merchant Service—Return.
263. Life Assurances (Stamps)—Return.

Delivered on 19th June, 1869.

164. Bill—Parochial Schools (Scotland).
165. ,, Debts of Deceased Persons.
167. ,, Poor-law Union Loans (amended).
266. Agrarian Outrages (Ireland)—Return.
268. Education—Returns.
Papers relative to the complaints made against Mr. Grenville-Murray.
Public Petitions—Twenty-fourth Report.

Delivered on 21st June, 1869.

168. Bill—Dublin Freemen Disfranchisement.
262. Turnpike Acts Continuance—Report.
270. Navy (Steam Coal)—Report.

Delivered on 22nd June, 1869.

272. Canadian Railways—Statement and Account.
Education (Science and Art Department)—Sixteenth Report.
Statistical Abstract for the United Kingdom from 1854 to 1868—Sixteenth Number.

Delivered on 23rd June, 1869.

120. (1.) Election Petitions—Shorthand Writers' Notes of the Judgments.
265. Militia Regiments—Return.
269. Post-office Savings Banks—Return.
272. (1.) Canadian Railways—Correspondence.
Education—Report of the Committee of Council.

Session 1868.

433. (8) Endowed Charities (County of Huntingdon)—General Digest.

Patents.

From Commissioners of Patents' Journal, June 25.

Grants of Provisional Protection.

Agricultural and garden implements—1844—R. McHardy.
Boiler tubes, &c., expanding the ends of—1805—C. Stuart and W. Walker.
Boots and shoes, apparatus for sewing—1856—A. Destouy.
Carriages, holdbacks for—1839—J. Halliwell.
Chain pulley blocks—1843—C. Stuart.
Cotton, &c., ginning, burring, and cleaning—1813—C. Mather.
Desks or benches, convertible—1862—J. H. Banks.
Doubling frames—1841—T. Knowles.
Electro-telegraphic apparatus—1801—W. A. Lyttle.
Furnaces—1806—J. Hill.
Glass, cutting—1815—L. H. Dennis.
Harmoniums—1848—S. V. Fontana.
Hats, &c., brims or sunshades for—1826—A. W. Moss.
Hats, &c., pad for—1859—C. Marlor.
Hay making and raking machines—1852—R. Hornsby and J. E. Phillips.
Helmets, hats, &c.—1812—J. H. Brown.
Horses, apparatus for stopping—1803—A. A. Ardisson.
Invalid persons, apparatus for carrying—1840—J. T. Masbon.
Iron—1817—R. Brown.
Lubricators—1834—J. Lindley.
Machinery, bearings for the spindles and shafts of various—1837—W. Bottomley.
Mineral oils, purifying—1832—W. Smith.
Necktie fasteners—1808—R. Wilson.
Paper, preparing materials for manufacturing—1855—T. Routledge.
Paper, preparing materials for manufacturing—1857—W. E. Newton.
Pipe joints—1810—J. H. Riddell.
Pipe joints—1816—E. G. Brewer.
Ploughs—1853—W. Woofe.
Railway locomotives, &c., readjusting when thrown off the metals—1791—G. Bedell.
Railway trains, communication in—1835—H. Bathgate.
Reaping and mowing machines—1819—W. S. Underhill and J. Smith.
Reaping and mowing machines, &c.—1851—R. Hornsby and J. E. Phillips.
Roofs, &c.—1793—J. Riley.
Sawing machinery—1830—M. Benson.
Saws, &c., for cutting and dressing stone—1802—E. T. Hughes.
Sewing machine, apparatus for counting the stitches made by a—1860—W. R. Lake.
Sewing machines—1814—W. R. Lake.
Sewing machines—1823—W. R. Lake.
Sewing machines—1845—D. Dishart.
Ships' pumps—1820—W. E. Newton.
Shuttles—1822—J. G. Tongue.
Smoke, consuming—1836—W. Yates.
Spring mattresses and bedsteads—1842—H. Tylor.
Steam cocks, &c.—1697—J. Fletcher.
Steam engines, slide valves for—1821—J. Young.
Steam-engines, &c., governors for—1846—J. Tangye.
Steam gauges—1811—G. W. Howe.
Submarine drilling apparatus—1804—W. E. Newton.
Tablets for advertising, &c.—1631—F. S. Angel.
Velocipedes—1789—C. Denbeigh.
Velocipedes—1799—J. G. Marshall.
Ventilating apparatus—1858—B. Hunt.
Waterproof overcoats, &c.—1847—B. Wartski.
Weighing and registering apparatus—1809—A. Lafargue.
Weighing machines—1827—F. Lejeune.
Wells, &c., sliding top for—1818—J. Taylor.
Wood-planing machines—1828—M. Benson.
Wool, &c., machinery for combing—1838—R. Beecroft.
Yarns, &c., apparatus for sizing and warping—1807—R. Duckworth, W. Greenwood, J. Pearson, and J. Langtree.
Yarns, &c., bleaching—1833—J. Bastow.

Inventions with Complete Specifications Filed.

Castor oil, &c., making more palatable—1850—G. W. Fox.
Culinary utensils—1869—W. R. Lake.
Fabrics, rendering water-repellent—1884—H. A. Bonneville.
Railways—1879—W. R. Lake.
Sulphates, &c., preparing—1868—W. R. Lake.

Patents Sealed.

3953. J. A. A. Landa.
3956. F. A. V. Michel.
3967. T. F. Henley.
3971. G. Davies.
3972. P. and R. Gornall.
3982. A. Barclay.
3989. T. Gibson.
8. B. G. George.
15. A. Carter and C. R. E. Grubb.
18. H. A. Bonneville.
21. J. McKenny.
41. E. Robbins.
54. H. G. Fairburn.
59. J. Daglish.
62. W. T. Waite.
98. C. J. Günther.
110. J. R. Hodgson.
112. E. P. North.
162. G. Brown.
177. G. A. Crow.
193. D. Rivenc.
230. A. V. Newton.
502. J. Newton.
693. C. Fairbairn.
1240. J. C. Ridley.
1278. T. Forster and P. B. Cow, jun.
1444. J. A. Marden.

From Commissioners of Patents' Journal, June 29.

Patents Sealed.

3964. S. and W. Fox, J. Reffitt, and G. Grange.
3969. W. Winter.
3990. J. Seelig.
2. T. Singleton.
3. S. Lyons.
4. W. M. Williams.
13. A. Batchelar.
19. W. A. Biddell and J. Redgrave.
35. W. Dawes.
106. C. P. Coles.
137. S. Russell.
141. J. H. Johnson.
148. F. Braby.
176. C. E. Brooman.
228. W. E. Newton.
244. A. V. Newton.
260. G. Tangye.
295. K. C. Watson.
351. W. E. Newton.
355. F. Braby.
361. J. H. Johnson.
363. A. Clark.
376. E. Meldrum.
431. C. Thomas.
564. A. V. Newton.
753. J. H. Johnson.
847. J. Hamilton and R. Paterson.
968. R. Johnson.
1291. G. Hawxhurst and J. Pollock.
1315. R. B. Forbes.
1321. W. R. Lake.
1462. W. F. de la Rue.

Patents on which the Stamp Duty of £50 has been paid.

1682. W. Poupard.
1700. W. Buckley and L. Smith.
1719. W. Wyatt.
1701. J. Milroy.
1758. T. C. Craven.
1690. J., S. A., G. E., and F. F. Reading.
1739. J. H. Johnson.
1784. J. D. Brunton.
1774. J. Clegg and J. Smith.
1903. R. Mitchell.
1724. J. H. Johnson.
1727. S. C. Lister.

Patents on which the Stamp Duty of £100 has been paid.

1844. H. Ponsonby.
1857. E. C. Nicholson.
1890. I. Holden.
1901. J. Tatham.

Journal of the Society of Arts.

FRIDAY, JULY 9, 1869.

Announcements by the Council.

Improved Cabs.

The Council of the Society of Arts offer the following medals for improved hackney carriages specially suited to the metropolis :—

The Society's Gold Medal for the best and most convenient open hackney carriage for two persons.

The Society's Silver Medal for the second-best ditto.

The Society's Gold Medal for the best and most convenient closed hackney carriage for two persons.

The Society's Silver Medal for the second-best ditto.

The Society's Gold Medal for the best and most convenient hackney carriage for four persons, either open or closed, or both.

The Society's Silver Medal for the second-best ditto.

Lightness of construction, combined with adequate strength and durability, will be especially considered in making the awards.

The awards will be made after actual trials of the carriages extending over a certain period.

Communications describing the carriages must be sent to the Secretary of the Society of Arts before the 1st January, 1870, the carriages to be sent to a place hereafter to be appointed.

The Council also offer the Society's Silver Medal for the best instrument, to be affixed to a cab or other hackney carriage, for indicating the fare as between the passenger and the driver, whether by registering the distance travelled or otherwise, and which instrument shall also indicate, for the convenience of the cab-owner and of the driver, the total distance travelled during the day and the total amount earned. The instruments competing, with full descriptions of their construction, to be sent to the Society's House before the 1st January, 1870.

Competitors may, at their option, sign their communications, or may forward with them sealed letters containing the name and address of the writer.

The Council reserve to themselves the right of withholding all or any of the medals, in case none of the carriages or instruments possess, in their opinion, sufficient merit.

Subscriptions.

The Midsummer subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Conversazione.

The Society's Annual Conversazione took place on Thursday evening, the 1st instant, at the South Kensington Museum, when about 4,400 members and their friends were present. The company was received by Lord Henry G. Lennox, M.P., Chairman of the Council. The bands of the Grenadier Guards and of the Chatham division of the Royal Marines attended, and performed selections of music during the evening.

Free Public Libraries and Museums Committee.—Unexhibited Specimens of Art.

In the House of Commons, on Wednesday, the 30th June, Lord Henry Lennox asked the First Lord of the Treasury whether he would authorize the necessary steps being taken to promote the systematic circulation to local museums, libraries, and institutions of the United Kingdom, especially in Glasgow, Dublin, Edinburgh, and the great hives of Midland industry of the—he would not say superfluous – but duplicate and unexhibited specimens of Art, Science, and Literature now deposited in the national museums and galleries of the metropolis, especially the British Museum and National Gallery.

Mr. Gladstone said the government were very favourable to the object contemplated by the question. Some things had already been done in that direction, especially in the South Kensington Museum. Within the present month, the Treasury had received notice from the trustees of the National Gallery that two collections of Turner's drawings—and since that a third collection—had been made up to be deposited in centres other than London.

India Committee.

The seventh conference on Indian subjects was held on Friday evening, 11th June, John Cheetham, Esq., President of the Cotton Supply Association, in the chair. The subject discussed was "Cotton Cultivation and Supply."

The Chairman, in opening the proceedings, said in the course which this Society had taken during the present session of discussing important questions connected with fibres and other materials, in which the industry of this country is very deeply concerned, he was glad to find the important one of cotton had not been overlooked. It was now six years ago since he had the honour of reading from this platform a paper on the supply of cotton to this country. At that time the American war had broken out, and the operatives of his native county, Lancashire, were in a state of great destitution and distress; and this Society, very wisely and properly, as he thought, brought this question before the public, in order that some measures might, if possible, either by private enterprise, or where government was concerned, by governmental authority, be employed to increase the supply of that material. He was told afterwards by

many of his friends that the paper he had read, and the conclusion he had drawn of the American war, limiting our supply of cotton for a long period, was somewhat too gloomy and too highly coloured in an adverse state. He was sorry to say in fact it had not proved so; and at this moment, when eight years had passed since the commencement of that war, the state of Lancashire with regard to the operations connected with the cotton manufacture was one of great misgiving, and grave doubt and anxiety to all concerned. Employment had been already seriously curtailed, many of the most active and energetic operatives were emigrating to America and our colonies. We had before us, looking at the present year, an inadequate supply of cotton; and even for another twelve months there was not any prospect of any very large increase, sufficient materially to reduce the price, and thereby stimulate the consumption of the manufactured article. In this state of things the question was forced upon us as to the future course of that manufacture; and need he say if that were to go down, if our rivals on the Continent and in America were to any considerable extent to supplant us in the production of cotton goods which this country has hitherto supplied to the markets of the world, a very serious blow would be given to the national strength of Great Britain. Now, in that paper which he read six years ago he stated what was the actual position of the cotton supply at the close of the year 1860, just previous to the commencement of the American war; and without troubling them with figures in detail he would state the per-centage, up to the close of 1860, of the whole cotton supply was, from the United States, 85 per cent., so that at that time the employment of our people depended upon the continuance of the growth of cotton in the Southern States of America. Now, if we looked at the actual state of things in America, we found the disturbance which that war occasioned by the breaking up of the system of slavery on large plantations, worked by slave labour, had led to a complete change in the mode of cultivating cotton—a change which, while it might hereafter give us greater certainty in the supply would for a long time to come very much limit the quantity produced. Previous to the American war, the cotton planter was a man with large estates in his possession; upon those estates he employed hundreds or thousands of slaves, and only employed them in the cultivation of cotton. By means of this forced labour, and the discipline he employed, he could depend (the seasons permitting) upon a steady and large increase every year; and so in 1860 we closed with a production of cotton in the States of America never equalled before, and which would take many long years before we see it again. For what now was the change? Instead of these large plantations, and large numbers of slaves, the plantations were cut up into small farms—not so small as in India, but much in a similar way, and the American planter, instead of cultivating wholly cotton, cultivated food crops, also like the Indian ryot, and so it was inevitable that, whatever might be the price, the increase of the supply from that country would be slow and gradual. Now at the present moment the expectation of supply from that country was supposed to give us about 31 per cent., that was in place of the 85 per cent. upon which we formerly relied. We should not, for this year, obtain more than 31 per cent. The next countries to which we were accustomed to look were Brazil and Egypt. In 1860 they sent 8 per cent. of our consumption; this year we expected 24 per cent.; so that we saw that two countries had made a considerable increase. Egypt, three years ago, quadrupled her supply of 1860; but she had gone back, and for the last two years had not given more than double the supply of 1860. There were many reasons given for that. The main one, he believed, after all, was what was found the great difficulty of every country, except India, and that was the want of labour. Many people supposed that cotton could be easily grown in a climate and soil suited for it; but it was a cultivation which required a large amount of labour and attention, and in no country but India did we find an adequate amount of labour available for extending the growth of cotton to the amount we require. Then some of our own colonies were supposed to be capable of increasing their very limited supply; but, he was sorry to say, he had not been disappointed, because he never expected we should increase the supply from that source. With regard to the West Indies, which formerly sent a considerable supply, the cultivation of cotton had been totally superseded by that of sugar; and, notwithstanding the very high price given for cotton, it had produced no increase of cultivation there whatever. So also with regard to our colonies of Australia and Queensland, which his hon. friend the member for Manchester took so large an interest in, though he admitted that Australia had, during the last few months, sent a larger quantity than was expected, yet with labour at 8s. or 10s. per day, he could see no very large result in the cultivation of cotton to be relied upon. We had, as he had stated, some cotton from Brazil, a country admirably suited for the growth of that commodity, but there again the obstacle of want of labour interfered with the increased production to any great extent. Therefore we were driven, if we would look for an adequate increase in the supply, to India. Previous to the American war the average supply from India was about 500,000 bales per annum; it had been for the last three years 1,500,000. One would say threefold was a fair and adequate increase, but it did not at all satisfy him. Had the recommendations of the Cotton Supply Association been attended to by the government, he ventured to say the sufferings of the operatives would have been spared, and their forced emigration would not have taken place. If there were any gentleman present representing that government he would be happy to prove his words. There laid at their door great and deep responsibility for the sufferings which the population amongst whom he resided had had to pass through. Sir Charles Wood told them government had nothing to do with the cultivation of cotton; that it was interference infringing upon the laws of political economy. He (the Chairman) would answer that. The whole government of India was an infringement of the laws of political economy. It began with the cultivation of tea; it was at present cultivating opium, manufacturing jute, and carrying on iron works, and would any one tell him that all these put together were to be compared with the promotion of a trade which last year took £30,000,000 from this country to India for the payment for the raw material cotton. They never got any assistance from Sir Charles Wood, but, on the contrary, nothing but opposition. But what was done? There was a gentleman whom he had met in this room, who he believed had read a paper before this Society in connexion with the cotton-supply of India — Mr. Shaw. He was a collector in the Mahratta territory. The American planters had been there, and when they left it was officially recorded that the growth of American seed was impossible in the climate of India. Now, Mr. Shaw, of whom he spoke, happened to be a Scotchman, who had had some early training in agricultural pursuits, and it occurred to him that he would himself take up that in which the Americans were alleged to have failed, and he began, unaided by the government, without their sanction or direction, and solely by his influence with the ryots, who looked up to him where they would not look up to a European stranger, he was enabled to introduce with profit the cultivation of American seed in that district, and that seed, when he left the district, produced the best cotton that was grown in India. He was sorry it no longer maintained the position. Mr. Shaw was succeeded by Dr. Forbes, who paid little or no attention to the matter, though he was dignified with the name of cotton commissioner. The Cotton Associa-

tion becoming acquainted with what he was doing, stated their want of confidence in his services, and disclaimed all connection with him in his capacity of cotton commissioner; and ultimately the propositions made by the Cotton Association were assented to in a limited way. The government appointed a gentleman as cotton commissioner in Bombay, purposely to take under his attention the selection of seeds, whether indigenous or foreign, and for the great object of improving the quality, as well as extending the cultivation of cotton, and that was the only public officer the government had appointed in that capacity; and so far they had reason to be gratified with the results of his labours: and he had no hesitation in saying if, instead of one cotton commissioner, there were a dozen in various parts of India, an adequate return would be made in the extension of the cultivation of cotton. The Marquis of Tweeddale, who took a lively interest in the efforts of the Association, invited their attention to a project of his own when they asked for the appointment of this commissioner. It was that they should obtain the services of a skilled man to attend particularly to the selection of seed. The association considered the proper selection of seed, and its distribution in districts cultivated with an inferior quality of cotton, was important. Earl de Grey and Ripon agreed to this proposition, and a practical Scotch gardener was selected for the duty. The government subsequently added three others; and thus the official expenditure of the government in regard to the maintenance of a product of the value of £30,000,000 per annum consisted of one cotton commissioner and four skilled gardeners! Earl De Grey and Ripon was succeeded by the Marquis of Salisbury; and certainly, during the short time that nobleman was in office, those interested in this matter looked for the most favourable results in the promotion of their objects in India. Unfortunately, he retired, and was succeeded in the office by Sir Stafford Northcote, who had not courage to act in this matter. The fact was, the council behind had great influence, and the right honourable gentleman had not the courage to resist them, and nothing was done. Seeing that we had an able man in the person of the Duke of Argyll, he (the Chairman) had the honour to accompany a deputation to the Duke on this question, and a memorial was presented setting forth the objects which it was thought the government ought to take up, and the means by which it was believed they could be accomplished. In America, the cotton cultivation yielded an average of 300lbs. per acre. [Mr. Bazley, 460 lbs.] Official records did not put it so high as that, and he took it at the lower figure he had given. What was the Indian ryot producing? Only 60 lbs. per acre, or just one-fifth what the American grower was producing. If we could bring up the yield per acre in India to what it was in America we should be now receiving three millions of bales per annum from India; and to attain this end was the object of the propositions submitted to the Indian government. He was sorry to say an official letter, which had been received in reply, gave him but little hope of anything being done. Unless we could obtain other assistance from the India Office than had hitherto been afforded, he saw no chance of anything being effected. We could look for no rapid increase of supply from India, and our operations must be left to the slow increase from America, which he thought was a great mistake, whether we looked to the interests of India on the one hand, or the important interests of England on the other.

Mr. Rogers said that he would be happy to give his experience with regard to the Presidency of Madras, having had none in any other part of India. He would say he thought there was very little that the government could do with regard to increasing the supply of cotton. His own opinion was that the cultivation of cotton in India had almost reached its full limit, seeing it was necessary in that country to grow grain for fodder for cattle as well as cotton. He did not know any part of Madras where cotton could be grown entirely, but only in rotation with other crops. As far as he could give an opinion of the portion of country with which he was acquainted, the only way of increasing the supply of cotton was by extending the general cultivation of it. Several years ago, when the price of cotton was very high, a great stimulus was given to the production of cotton. It was produced in too great quantity. The ryots found out their mistake in this way; they found they had not grown enough fodder for their cattle. The consequence was a great reaction, and a great deal of the land which had been devoted to cotton was appropriated to the growth of fodder. The ryots were obliged to buy fodder, which cost them so much that they went to the opposite extreme, and grew too little cotton and too much fodder. That would, no doubt, correct itself in time, and he had no doubt had done so to a certain extent. He thought the government, as far as he knew, were not so much to blame as some persons imagined. The suggestion was now made that government should encourage the extension of the cultivation of cotton by providing for the selection of seeds, and that the collectors should use their personal influence in their several localities in the same direction. It must be recollected that, however willing the collectors might be, the only thing they could do was to use their personal interest with the ryots, with whom they came in contact to a great extent; but people in England had no conception of the varied duties which Indian officials had to discharge, and the enormous tracts of country they had to look after. In Bombay they were also magistrates, and they had really no time to devote their attention, to any great extent, to matters of this kind.

Mr. George Campbell said he was glad that the discussion of these subjects had been entered upon, because it was desirable that those who were government officers should be brought face to face with gentlemen interested in the commerce and industry of the country, in order that they might understand what they required, and that they on their part might be able to say what it was probable the government could give, and what they could not give. This he would say at the outset—that the chairman did injustice to the India government, and also to the old East India Company, when he said they had failed in the endeavour to promote the cultivation of cotton in India. It seemed to him, if there was one fact on which we might feel sure, it was this—That the old East India Company were most anxious to promote the cultivation of cotton, and used every means in their power, according to the lights they had, to promote it. The East India Company was, originally, a commercial body, and it arose from their commercial character that they were anxious to promote the cultivation of cotton as a staple article of commerce. They went about it in the most persevering manner, and, amongst other things, imported American cotton planters for the purpose. He said, distinctly and decidedly what was wanted on the part of that Indian government was not the will but the knowledge of the mode by which India could be turned to profitable account in this respect. That knowledge, he submitted, was still wanting, and that knowledge they should have imparted to them by those who had it in a practical form. He was himself but an executive officer of the India government, but he would say, with confidence, if the Manchester men, or any other men, could show them the way to foster and improve the cultivation of cotton, the government were alive to the fact that it would be an enormous benefit, not only to this country but to India, to promote that great object. The chairman had said Sir Charles Wood was particularly wanting in failing to do what he was asked to do, that he argued the doctrine of political economy and other things that had gone a great deal out of fashion; but the chairman also said the whole government of India was in defiance of political economy, and that they cultivated opium and manufactured salt. So they did, but they did it as following

out the system of monopoly, which was one of the great features of Indian finance. He presumed the Chairman would not desire to make cotton a monopoly of the government, in the same way as the Dutch government had made coffee a monopoly in food. Then he (Mr. Campbell) presumed that the government could only do in a greater degree, and in a more happy method, that which the old East India Company attempted to do when they imported American planters into India, and appointed a cotton commissioner to foster the cultivation. But he failed to perceive what were the exact practical measures which the Chairman would urge. He said one cotton commissioner had been appointed by the government, and that had been a failure; that another had been appointed, which was, in his opinion, a success. The fact stated by the Chairman exemplified what was common to all human affairs, whatever we did; sometimes failure, sometimes success; one commissioner was good, another was bad. He had no hesitation in saying, if the government had good reason to suppose the appointment of twenty cotton commissioners would promote the cultivation in a great degree, the government would be ready to appoint them. He agreed with the gentleman who preceded him, that he could not expect any special fitness for this work on the part of the existing collectors in India, who were, as was said, already overburdened with work; therefore, they must have men specially selected for the purpose. He would put the thing in this way: Supposing the government consented to appoint twenty cotton commissioners, what were they to do? Already there were cotton commissioners who did what in them lay, but he did not think they had succeeded materially in improving the mode of cultivating cotton. It had been said the cotton supply from India had of late years been improved, but he believed it was the preparation of the cotton that had been improved. Except in the district of Dharwar, he was not aware that any great change had taken place in the cultivation of cotton in India. So far as the central provinces were concerned, where the best cotton was produced, the cultivation was carried on by the natives in their own fashion, without any great improvement having been effected by the cotton commissioners. They were merely officers going about collecting and giving information, and supplying statistics in an accessable form; and he hoped, sooner or later, those labours would be crowned with some considerable success; but he denied that the cotton commissioners had revolutionised the cultivation of cotton, or that it was possible they could do so. They wanted not so much to extend the cultivation of cotton. What they wanted to do was to improve the method of cultivation. They wanted to ascertain the mode by which the present produce of 50 lbs. or 60 lbs. per acre of bad cotton could be increased to 300 lbs. or 400 lbs. per acre of good cotton. That was a question to be slowly and laboriously worked out by many processes of many minds, not to be done in a day, and not to be done without laborious and skilful method. The practical point was to improve the cultivation, which the natives had hitherto carried on in their own fashion. He need not say that the great object of the government was to promote good administration amongst the people. The government had carried out what was a primarily essential measure towards successful cultivation; they had established a good and permanent tenure of land: and he thought they might say the ryots had secure possession of their lands. They knew the terms on which they held them, and in that respect there was no difficulty. In the end it came to this—that Manchester wanted the government to do in India what in this country was done by enterprising men and bodies, and the question was, how was the government to do it? He had failed to gather from the Chairman's remarks what those whom he represented required to be done, except the appointment of cotton commissioners; but what were they to do when they were appointed? He thought he might say the result of the several discussions that had recently taken place in this room on the various products and resources of India had been to arrive at a conclusion that there ought to be an Indian department of agriculture; that the government should undertake what the government of France and other despotic countries undertook. After all, he believed the grand difficulty which lay at the root and foundation of the thing was the want of technical education, and more especially agricultural education. It was the case to a great extent in our own country; and it was the case that we had not educated the natives of India in these matters. In that matter we must begin at the beginning. What had we done in India with regard to the higher classes of natives? There was in India a class of people designated by the name of zemindars, who were expected to perform the functions of our English landowners. In the province of Bengal, where the experiment was first tried, those men were educated to a very high point. The consequence was, though they were versed in the classics and philosophy of Europe, if they came to be agriculturists they hardly knew a horse from a cow. They were without the smallest rudiments of agricultural knowledge, and those were the men from whom they expected such great things in connection with the agriculture of India. The ignorance of agricultural matters which pervaded the native landowners was felt by ourselves. An ordinary English gentleman had no education touching agricultural matters. It was much the same with planters who went out to undertake commercial enterprises in India. A good many of them did not know a horse from a cow. Take the case of tea cultivation. Gentlemen paid large sums of money for tea estates, and, in some cases, they engaged gentlemen educated as midshipmen to take charge of those tea plantations, because there was not a supply of technically educated Englishmen, or natives, to do these things. The fact was agriculture in India was a difficult and complicated thing, and under entirely different conditions from those which obtained in this country. It was not enough to import our ideas of subsoil ploughs and agricultural implements and say to the natives, "Here is proper machinery for your use—adopt them!" The natives would tell us they knew the methods which were best suited to their soil and climate. This was illustrated by his predecessor, Sir R. Temple, who went to a great expense in importing into the central provinces the best agricultural machinery that England produced. But what was the result? The people were brought together to see these implements, and they admired them as such, but they could not be brought to use them. We could not *per saltum* introduce our machinery into India. It would be as reasonable to talk to them in the English language as to talk to them of the English methods and appliances of agriculture. They must begin upon an entirely different system, and for that they must not trust to the government alone. The thing could only be done slowly and laboriously. They might have cotton commissioners, but they must be practical men—men educated not only in the details but also in the science of agriculture. He believed that model farms might be introduced with great advantage by the government; and he thought there was a good deal in the proposition for a department of agriculture in India. It might be said, with truth, that in the various provinces there were boards of revenue, whose function was to look after the land revenues, and in doing that to look after the landed interest generally. But here again there was the difficulty that they had not the special knowledge that was required. Therefore he agreed that much might be done by the establishment of a central department of agriculture in India. But, in addition to this, there was another aspect of the matter which must not be overlooked. That was the preparation, or he might call it semi-manufacture, of the cotton, and the imperfect manner in which this was done had occasioned a great deal of the mischief in connection with Indian cotton. On this head he might refer to the success which had been achieved

by the indigo manufacture. That plant was well known before Europeans went to India. They bought the indigo from the natives, manufactured it, and worked it up for the market. He believed Europeans could do great things by purchasing and preparing cotton in the same way. All he could say, in conclusion, was he had not heard from the chairman the exact particular practical methods by which he would have the government proceed to improve the cultivation and supply of cotton. The government was doing what they could, and he (Mr. Campbell) as an individual officer protested his willingness to do all he could; but those interested in this country must put their shoulders to the wheel also.

Mr. Chadwick, M.P., having expressed his concurrence with all that the Chairman had said with respect to the conduct of the government, remarked that it had been his lot to take a humble part in connection with the cotton movement in Manchester for many years; therefore, it was with some interest he had listened to the observations of Mr. Rogers and Mr. Campbell in defending as far as possible the action of the government in regard to the cultivation of cotton in India. Mr. Campbell thought all had been done that could be or ought to be done, and that it rested with Providence, or a department which time might bring forth, to cultivate cotton to the extent which he thought ought to be attended to immediately. He would like to say to Mr. Campbell, in reply to his inquiry what it was the Manchester people wanted, that they had told the government of India, Sir Charles Wood's predecessors and successors, and other officials of the Indian government, a thousand times what they wanted. In few words, to repeat it, it was this: There was a great demand for cotton in England; we had been mainly deprived of the American supply; India could produce it in unlimited quantity; we had the opportunity of extending the cultivation in a country under our own government; why not, then, take practical measures to do so? He denied that the government had adopted the practical measures which had a thousand times been pressed upon them. Mr. Campbell said, what could the collectors do, who had so many other duties to perform? He did not blame the collectors; they had more duties than they could attend to. But he said a government which was paternal, and had almost absolute power, could do ten times more in fostering the cultivation of that article than a constitutional government like that of England. He said there were hundreds of thousands of acres capable of producing cotton, but the government had failed to apply the proper stimulus or the growth of that staple. It was true that during the last ten years the export of cotton from India had increased threefold. That showed to what extent it could be increased; and if it had so increased under existing discouragements, to what extent might it have been increased if proper encouragement had been given. With a trade already worth £30,000,000 per annum, what should a paternal government do? They should make more roads, and make arrangements to stimulate trade; it should encourage every facility that could be given to that trade. He had for some years taken a part in this matter with his friends in Manchester, and they were taunted with "Why do you not send your capital out to India?" He had no hesitation in saying a large sum of money had been expended to stimulate the growth of cotton in Dharwar, under the solemn promise of Sir Charles Wood that he would provide roadways to Sedashegur, and the whole of that money had been lost through the defection of the government in not fulfilling their solemn promises. He believed in the next ten years the growth of cotton in India might be increased sixfold or tenfold. There could be no better trade for India than the production of cotton. If they continued their labours in this direction he believed they should obtain from the present government some great advantages in the appointment of cotton commissioners, and in the establishment of agricultural colleges and model farms in India; and from these measures, in conjunction with the introduction of the best qualities of seed, the cotton producers might in a few years be increased tenfold.

Mr. J. B. Smith, M.P., after reviewing the history of cotton supply during the last thirty years, went on to say that Manchester men were told they were seeking to promote their own personal interests. No doubt; but they were promoting the best interests of India at the same time; and he asked whether the thirty millions sterling which we now paid for the cotton of India was not a most important acquisition to that country, and whether if the production could be doubled the welfare of India would not be doubly promoted? The government might do a great deal towards this. A gentleman had mentioned irrigation. No doubt the production of cotton might be immensely increased by irrigation. He had seen samples of Indian cotton, grown by means of irrigation, which he thought were better in quality than any short-stapled American cotton he had ever seen; and that cotton produced 300 lbs. per acre by means of irrigation. The great disadvantage which India laboured under, as compared with America, was with respect to the means of carriage. In America they could bring cotton a thousand miles down the Mississippi for half-a-farthing per lb. There had been no Governor-General sent out to India for many years without receiving a deputation from the Manchester Chamber of Commerce, pointing out the advantages which would accrue to this country and to India from the extended cultivation of cotton. He had himself the honour of addressing Lord Elgin on this subject previous to his going out, and he then endeavoured to impress upon his lordship the importance of opening out the navigable rivers of India as a means of bringing cotton to the market at a cheap rate. In the province of Berar the finest cotton was grown, and up to the time of Lord Elgin's departure for India no supply of cotton from that province was received in this country. The reason why that cotton had never made its appearance before was this—the distance was about 500 miles from Bombay, and the only means of transporting the cotton was on the backs of bullocks, and that could not be done at a cost of less than 1½d. or 2d. per lb., and the reason why it found its way into the English market at all was this, that cotton which used to sell at 3d. or 4d. per lb., got up to 1s. per lb., and the freight of 1½d. or 2d. per lb. was of very little consequence when the price rose from 4d. to 1s., and, therefore, the cotton was brought overland to Bombay, and thence found its way to Liverpool. What he wanted to impress upon Lord Elgin was, how easily that cotton might have been brought to a port of shipment at a cost of not more than a farthing per lb. by opening out the river Godavery, When they urged the Indian government to give its aid and countenance to the production of cotton, they were told that such a course was opposed to the principles of political economy, that a good demand and a good price would always bring an ample supply, and no doubt that was a general truth. If we wanted a supply of corn or any other article from America, we had only to offer a good price to obtain what we wanted. But the difference between America and India was, that in the former country cotton was grown by skilled capitalists devoted to the growth of one kind of produce, while in India it was grown by poverty-stricken ryots, who, for want of roads to facilitate the interchange of produce between one part of the country and another, were obliged to grow everything they required for their own use, and therefore could not, as in America, devote their attention solely to the production of cotton. Whilst this state of things existed, the growth in India must be limited, and, as we have seen, the stimulus of high prices has not had the same effect as in other countries in increasing the supply. Mr. Campbell says "he had failed to gather from the Chairman's remarks what those he represented required to be done." Mr. Campbell appears not to be very well informed of the efforts which

have been made for the last thirty years to induce the government to promote the growth of cotton in India. In 1841, the Directors of the East India Company were induced, at the recommendation of the Manchester Chamber of Commerce to send out American cotton-planters to India. Their mission was a failure, and the government, who had spent considerable sums in the endeavour to increase and improve the growth of cotton, considered all further efforts as hopeless. At this juncture it happened that Mr. Shaw, the collector of Dharwar, being strongly impressed with the value and importance to India and to England of the growth of an improved quality of cotton in India, and having seen the experiments of the American planters, was convinced, notwithstanding their failure, that he could grow good cotton from American seed. With great difficulty Mr. Shaw prevailed upon the government to allow him to try the experiment. He commenced by superintending the cultivation of twenty-five acres with American seed, which he afterwards increased to 25,000 acres. Mr. Shaw had great difficulties to encounter in overcoming the prejudices of the ryots, which could only be accomplished by great firmness and perseverance, but he had no less difficulty in encountering the prejudices of his own countrymen. The American planters having declared that Mr. Shaw's experiments had failed, and that the cotton he grew from American seed was inferior to that grown from native seed, samples were sent to Bombay, and the merchants there agreed in opinion with the American planters. Mr. Shaw still maintained his opinion, and the government then, at his instigation, ordered 500 bales of native cotton to be purchased and saw-ginned, and sent to Bombay with 500 bales of Mr. Shaw's cotton grown from American seed. The two parcels were sold by public auction, and the Bombay merchants, true to their opinion, gave the highest price for the cotton grown from native seed. When Mr. Shaw heard of this result he felt, to use his own words, "fairly done up." The laugh went against him, but he had only to wait a few months, when the laugh was turned the other way. The cotton was shipped from Bombay to Liverpool, where its true value was understood and appreciated. At the sale by auction there Mr. Shaw's cotton was sold for 6¼d. per lb., while the cotton from native seed, for which the Bombay merchants had given the highest price, was sold for only 3½d. per lb. Now, it happened that the late honourable member for Manchester (Mr. A. Turner) purchased some of this cotton grown from American seed at 6¼d. per lb.; he tried it, weight for weight, with ordinary Orleans cotton, which cost 6¾d. per lb., and the result was that the Indian cotton produced three per cent. more yarn than the American, and of equal quality. He (Mr. J. B. Smith) thought that these facts settled the question of India being able to produce a quality of cotton equal to ordinary Orleans; and what was most important to be known was, that the quality of cotton called ordinary Orleans formed the bulk of all the cotton consumed in this country, so that if India could supply a similar description of cotton, which Mr. Shaw had demonstrated she could, she would be able to meet all our demands. Mr. Shaw was compelled to return to England on account of ill-health, but he generously acceded to the wishes of the Cotton Supply Association to return to India with his son, expressing the greatest confidence in being able to extend and improve the cultivation of cotton in different parts of India as he had done in Dharwar. Mr. Campbell asks what we require to be done. We answer that we require that the government should send out Mr. Shaw again. That was a practical suggestion, but Mr. Shaw was an enthusiast, a character distasteful to old Indians, and Sir Charles Wood, instead of complying with so reasonable a request, ordered a book to be written to show that all government efforts to improve Indian cotton had failed, and with astounding hardihood, in the face of Mr. Shaw's success, the author declared that such improvements as have been made were "mere cultivation in a flower pot." The growth of cotton from American seed had, in 1861, increased from 25,000 cultivated by Mr. Shaw, to 300,000 acres, but for want of that European superintendance, which is indispensable in India, the quality has deteriorated through the carelessness of the natives in mixing the native with the American seed. If Mr. Shaw had been sent out to India again, the production of cotton there would have been nearly doubled, the American seed yielding about 100 lbs. of cotton per acre, while native seed only yields about 50 to 60 lbs. per acre. Mr. Campbell had hinted at one or two means of carrying out improvements in the cultivation of cotton. He had mentioned as one, the establishment of a Board of Agriculture. He (Mr. Smith) thought that was a good idea; but there was also wanted a Board of Public Works. He believed he was justified in saying that if the Marquis of Salisbury had remained in power he would have laid out £50,000,000 in the development of India. The expenditure in public works in India must be increased. In proportion as the country became more civilised the wants of the people would increase, and with the expenditure on public works the revenue would increase; and there was no better way of adding to the public revenue of the country than stimulating and encouraging an increased production of cotton. He was sorry to say the Indian government, up to this time, had not shown a desire to meet the views which had so repeatedly been urged upon them on this subject. He hoped the time was coming when they would be disposed to listen even to the interested people of Lancashire, because in so doing they would advance the general prosperity both of this country and of India.

Sir Charles Wingfield, M.P., agreed with Mr. Campbell in thinking that those who had cast blame upon the government had made no specific suggestions as to what they wanted. They talked of encouragement and stimulus to the cultivation of cotton, but did not tell them in what way they wanted the government to assist. He thought too much was expected of the government. They seemed to be under the impression that India was like a Carolina plantation, the whole soil of which could be applied to the cultivation of cotton; but they forgot that the Indian government was not the landowner. Throughout the whole of India there was a right of tenure as secure as it was in England, provided the proprietor paid the land tax or tribute that was imposed, and the government had no power to dictate to the ryots what particular kind of crops they should grow on their land. Take the province of Oude. He did his utmost at the time of the American war, to promote the cultivation of cotton. In that province the land was held, in large estates, by individual proprietors, and, to oblige him, they evinced their readiness to promote the cultivation of cotton. He procured seed from the Manchester Cotton Supply Association, and a large portion of that seed was sent into the province of Oude. The proprietors of the land distributed that seed among their tenants; for two succeeding years a very beautiful quality of cotton was produced, but they said it did not pay them so well as sugar. It was a mistake to suppose that the laws of supply and demand did not operate in India. As a proof of that, he would mention the enormous increase in the exports of oil seeds and jute consequent upon the Russian war. He had told gentlemen interested in this question during the American war, that if they wanted superior cotton from India they must send their agents there, who must not only furnish the seed, but show the natives the sample they required, and also give an assurance that they would meet with a market on the spot, with ready-money payments for their produce. He believed if that was done the demands of the home market would be readily met. With regard to roads, he believed the upper provinces of India and the whole of the north-west provinces were admirably supplied with roads, and with the exception of the Ganges and Jumna, which in some of the principal lines of traffic were bridged with

boats, there was scarcely a stream which was not bridged wherever a road of any importance led to it. There was scarcely a part where a laden hackery cart could not go. In fact the great complaint in India at the present time was, that the price of produce had risen very greatly. Why was that? Because of the facilities of communication. When there was scarcity of an article in one part, a supply was brought from another part where the article was abundant. The question was, what could the government do to promote the cultivation of cotton. The government could do little or nothing through their present officers; they could not, as he had already said, bring pressure upon the ryots because they held their land independently of the government, but even supposing they wanted scientific instruction in agriculture, the collectors and officers had not leisure to give attention to it. Those officers were already weighed down with the various duties they had to perform. But he thought a suggestion which was made by Mr. Bazley, a few days ago, was worthy of attention, viz., that the government could establish schools of agriculture and model farms, where the best implements and modes of tillage could be shown to the natives, and where the best seeds and plants might be grown and distributed to the natives. In conclusion, he would say he had served the government for many years, and was aware of the dissatisfaction expressed in this country at the seeming backwardness of the government. He thought that was a wrong impression. He knew Sir Charles Wood had given dissatisfaction, but he thought, in many cases, the result proved he was right, especially in refusing his sanction to the sale of waste lands except by public auction, inasmuch as those who bought those lands came begging to the government to be relieved of their liabilities. On the subject of irrigation, he believed it was the intention of government to spend thirty millions in irrigation works. He thought such works as irrigation should be undertaken by the government, because they gave great returns in the improved fertility of the soil. He did not believe they would pay in the case of companies, because the mere sale of the water would never yield a large return.

The discussion was adjourned to Friday evening, June 25th, on the motion of Mr. Thomas Bazley, M.P., seconded by Mr. Hyde Clarke.

The adjourned Conference was held on Friday evening, June 25th, John Cheetham, Esq., in the chair.

The following communication from Lord William Hay was read:—

The importance of developing the cultivation of cotton is recognised by all parties. Probably no one is ignorant of the extent to which the natives of India have profited, both morally and materially, in consequence of the large demand for raw cotton created by the American war.

Nothing lowers the moral tone of a people more effectually than wide-spread indebtedness, and it is no exaggeration to say that the wealth poured into India in payment of its cotton, during the American war, raised not thousands but millions of our native subjects from a state of humiliating dependence to one of independence, and, in many instances of affluence. The causes which produced the exceptionally high prices prevailing in India within a comparatively recent period no longer exist.

The cultivation of cotton has shown a tendency to fall off, and it is not unnatural that those interested in the manufacture of cotton goods should be most anxious to prevent the production of that valuable article from dwindling into its former narrow limits. The merchant has thus been brought face to face with the government. The merchant charges the government with having done practically nothing to encourage the growth of cotton, while the government replies, "On the contrary, we have done all that a government can do without infringing the laws of political economy."

On Friday last, the conduct of the government was criticised in severe terms by many gentlemen of weight and knowledge. They were defended by two distinguished members, one of whom, Mr. Campbell, stated that no practical suggestions had been offered for the consideration of the government. The best answer to this allegation was to be found in Mr. Campbell's own speech, in the course of which he made several recommendations which he thought ought to be adopted. They were, first, that a separate department of agriculture should be instituted; second, that practical and scientific agriculture should be taught in our Indian schools; third, that model farms should be introduced; and fourth, that gentlemen appointed to the post of cotton commissioner should be practical men, conversant not only with the details but with the science of agriculture.

Now, here we have a considerable catalogue of measures, which even a warm defender of the government believes might be advantageously, but have not been, carried into effect; and let it be remembered that they are neither new nor original. The principal one, viz., that of a separate department of agriculture (a plan which I myself prefer to the introduction of mercantile members into the council), having been proposed, three years ago, by Mr. Ayrton, in an elaborate speech in the House of Commons on the night of the Indian Budget.

The truth is, that every measure which has been adopted within recent years for the extension of cotton cultivation has been the result of strong external pressure, brought to bear upon an unwilling government. Even such trifling measures as the appointment of a cotton commissioner, and of three or four experienced gardeners, would never have occurred if such pressure had not been used. The practical lesson to be drawn is, that nothing will be done by the Indian government except in deference to a strongly expressed public opinion, and that therefore the motto of the merchant should be—"Agitate—agitate—agitate."

It is quite true that there are some things which the government can, and some which it cannot be called upon to undertake. It cannot, for instance, be asked to increase the breadth of land devoted to cotton. The natives must be left to themselves to decide what they shall grow in their fields. To employ any sort of compulsion would be to follow the short-sighted policy which is now embarrassing the Dutch in Java.

The government must confine its efforts first to such indirect means as improving communications both by land and water; and secondly, to showing, by experimental farms and other similar methods, how "two pounds of cotton may be made to grow where only one grew before."

Again, the law that a demand will always produce an adequate supply must not be taken literally in a country under such peculiar conditions as India. Take, for instance, the cultivation of cinchona. In no country in the world is the want of quinine more constantly felt, but that want has produced no corresponding supply, and we should have no prospect of seeing the deficiency supplied if government had not undertaken the trouble of introducing the cinchona plant into India. The same may be said of tea. Indeed, it would be interesting to have a comparative estimate of the sum of money spent by the government on the promotion of tea and cotton cultivation. We suspect that tea would be found to have been favoured out of proportion to its value as an article of commerce, and it is curious to note that, in the Indian accounts laid the other day upon the table of the House of Commons, not a farthing appears to have been spent upon promoting cotton.

Mr. Cheetham declared that our government in India was constantly infringing the laws of political economy; but he would have been still more correct if he had said that India was precisely in that condition recognised by

political economists as one justifying a departure from the ordinary laws of that science. This is a point which Indian statesmen are too apt to forget. A memorable example was furnished by the Orissa famine—on which occasion, rather than break the laws of political economy, hundreds of thousands of our native subjects were allowed to die of starvation.

But besides, the government of India does not act up to its own economical doctrines. At this moment it is spending annually immense sums of money upon a bad telegraph through Persia, and thereby doing all in its power to promote one private enterprise to the detriment of another. It is this inconsistency which has more to do, probably, than anything else with the unpopularity of the Indian government. The following passage from the writings of Mr. Mill should be written in letters of gold over the entrance to the India Office:—"It is, however, necessary to add, that the intervention of government cannot always practically stop short at the limit which defines the cases intrinsically suitable for it. In the particular circumstances of a given age or nation, there is scarcely anything really important to the general interest which it may not be desirable, or even necessary, that the government should take upon itself, not because private individuals cannot effectually perform it, but because they will not. At some times and places there will be no roads, docks, harbours, canals, works of irrigation, hospitals, schools, colleges, printing-presses, unless the government establish them, the public being either too poor to command the necessary resources, or too little advanced in intelligence to appreciate the ends, or not sufficiently practised in conjoint action to be capable of the means. This is true, more or less, of all countries inured to despotism, and particularly of those in which there is a very wide distance in civilisation between the people and the government, as in those which have been conquered and are retained in subjection by a more energetic and more cultivated people. In many parts of the world the people can do nothing for themselves which requires large means and combined action; all such things are left undone, unless done by the State. In these cases, the mode in which the government can most surely demonstrate the sincerity with which it intends the greatest good of its subjects is, by doing the things which are made incumbent on it by the helplessness of the public in such a manner as shall tend, not to increase and perpetuate, but to correct that helplessness. A good government will give all its aid in such a shape as to encourage and nurture any rudiments it may find of a spirit of individual exertion. It will be assiduous in removing obstacles and discouragements to voluntary enterprise, and in giving whatever facilities and whatever direction and guidance may be necessary; its pecuniary means will be applied, when practicable, in aid of private efforts rather than in suppression of them, and it will call into play its machinery of rewards and honours to elicit such efforts. Government aid, when merely given in default of private enterprise, should be so given as to be, as far as possible, a course of education for the people, in the art of accomplishing great objects by individual energy and voluntary co-operation."

Mr. Bazley, M.P., after expressing his thanks to the Chairman for presiding over these conferences, and to the Society of Arts for affording these opportunities of discussing this important subject, said, about eighteen years ago he had the honour of reading a paper in this room, when the late Prince Consort honoured him by occupying the chair; and he then stated at considerable length the views which, he was sorry to say, remained to the present time as patent as they were then. The cotton trade at that time was largely supplied from the United States of America, and very slightly indeed supplied from other parts of the world, and he felt convinced that the forebodings of future supply were disastrous; and on that occasion he asked this pertinent question, "Might not disease or revolt materially destroy the culture of cotton by the Southern planters of America?" That prediction had been lamentably fulfilled, and at the present time, in the cotton trade, perhaps there was a degree of suffering and distress never previously existing. Capital was diminishing in amount, the labouring classes were deprived of their ordinary comforts, multitudes were unemployed, and many had diminished means of subsistence. Now the question was, where should we turn to obtain the relief that was so much needed? We had seen that America had failed us. At the time he had referred to, America was supplying us with 85 per cent. of the cotton we consumed, and at that time the British dominions only supplied us with 7 per cent., whilst other sources sent us the small balance of difference. Well, now we were in the position of having to some extent altered the condition of things, for the American supply had been unavoidably diminished, and he was glad to do India the justice of saying the supply from that great dependency was increased. Before going further into the questions touching the general interests of the cotton question, he would refer to the great fact that the Chamber of Commerce of Manchester had, for a considerable period of time before the period he referred to of 1851, made efforts to induce the East India Company to form roads, to introduce railways, to construct canals, and to promote irrigation, he was sorry to say, without much effect. At the same time he would do full justice to the East India Company for having had the spirit to send to the States of America for a number of cotton-planters, to initiate the cultivation of cotton in India. He need not tell them that was a failure. The Chamber of Commerce felt the difficulties were so great of governing India by a commercial company, that at last they determined to apply for the substitution of an Imperial government. That Imperial government was established under the government of which Lord Stanley was a member, and he issued a most enlightened proclamation. In 1858, the East India Company ceased to exist as a governing power in India, and the Imperial government was called into existence. It would have been well if that new policy had had the practical application which Lord Stanley put forth. He would not deny the progress that had taken place since the Imperial government had been established; on the contrary he admitted perhaps no country in the world had made progress so rapid as British India since the establishment of the Imperial government. But that government stood almost alone. We knew quite well that in India there was scarcely a public opinion existing. We knew quite well that there were no capitalists in India, as in this country, willing to launch into different enterprises, none who would have projected railways, none who would have projected public works, none who would have entered into the cultivation of the soil with any spirit, and very few indeed who were prominent as leading merchants. At the same time there were bankers who had great wealth, and who had evinced by their pecuniary transactions all the avidity for pecuniary accumulation that other men had; and he would do the Parsees the justice to say, that there were few cleverer men than the Parsee merchants of Bombay; but there was no public opinion and no enterprise on the part of wealthy middle-class men; and, with the paternal government which Mr. Campbell referred to the other evening, it was clear unusual and important duties devolved upon the Imperial government. They stood in the position of controllers of that great territory which had been accumulated by a commercial company—a company that did very little for commerce, but paid a great deal of attention to the addition of territory to territory; but the present Imperial government, he hoped, having consolidated the empire, would not aggrandise by additions which would not add to the power of their position, but would rather pursue a course of conciliation and improvement which would benefit the great body of people, and raise them in the scale of civilisation amongst the nations of the earth, while the intercourse between Great Britain and India should give rise to a prosperity to

which alike India and this country were both strangers. He would now proceed to the analysis of this great question which they had met to discuss. We must have public works established; we should, he ventured to say, have not less than twenty millions expended as quickly as possible in great public works, in additional railways, and roads of communication that would be feeders to the railways. We ought to have canals, and above all a great increase in the means of irrigation. The quality of Indian cotton was very inferior; but he condemned the powers that ruled in India by an authority peculiarly their own. He had the pleasure of knowing the late Dr. Royle, the botanist of the East India Company, and a more enlightened and intelligent man he had rarely met with; he was sorry that death had deprived them of his services. Dr. Royle had put on record this clear and explicit statement. He said:—"Facts respecting quality and price afford sufficient proofs that India is capable, in many parts, of producing good and serviceable cotton, and at a rate cheap enough to contend even against the large returns of America." Now, we had beautiful specimens of cotton, from time to time, from model farms, and from gentlemen who had speculatively directed attention to the growth of a little cotton, and he had seen specimens of cotton from India as good as we could desire to possess. He had been so anxiously desirous of doing everything in his power to direct public attention to the necessity of having large supplies of cotton from new sources, that thirty years ago he was himself induced to make experiments in the cultivation of cotton in the city of Manchester. He was then successful in producing cotton that had never been excelled in quality in any part of the globe. He had brought specimens of that cotton with him, and that article which he produced in Manchester took the highest position, while the Indian cotton at that time took the lowest position. When the American planters were on their way to India, and came through Manchester, he took them to see his plants, of which he had a considerable number, and they did him the honour to say that they never saw stronger or better plants in the States of America. The plants grew to a height of six feet, and produced cotton abundantly. If, then, he could produce cotton of that quality in the gloomy climate which Manchester was reputed to possess, surely in a country where the plant was indigenous, and where it had been cultivated for 2,000 years, it was possible to improve its quality and increase its growth to an almost indefinite extent. He felt confident that might be accomplished, if more attention and decided application were given to the matter on the part of those who had the direction of affairs in British India. The Cotton Supply Association of Manchester had assiduously prosecuted the attempt to get increased supplies of cotton from India; but he could not say that their labours had been crowned with that success he thought they were entitled to, though he thought they had done much good, but such services as they had rendered had been surrounded by difficulties. They sent out to India the New Orleans cotton-seed; and he was glad to see a friend of his, Mr. Cassels (of the firm of Peels, Cassels, and Co., in the room), because it was through that house they were enabled to send a supply of American seed to the cotton-growers of India. He did not attach blame exclusively to the Imperial government or the East India Company, for unless an effort was made by the commercial community, as well as by the governing power for the time being, we should effect no improvement in the cotton cultivation of India. He took a more favourable view of the prospects than his hon. friends the Chairman and the Member for Stockport had done; however, he believed that reasonable suggestions to her Majesty's present Governor-General, through the Secretary of State for India, would lead to reasonable efforts being made, to which he thought the great industry of the cotton trade was really entitled. He believed by agricultural reforms a great result might be achieved. He was glad to hear the very excellent remarks of Lord William Hay on the subject of sending out cotton inspectors, gardeners, &c.; and, to the credit of the Marquis of Tweeddale, he sent out a gardener to improve the cultivation. The results he had not yet heard; but he felt convinced if an additional number of cotton inspectors were appointed, with a suitable number of assistants, for the purpose of grounding the people fairly in the principles of improved agriculture, the results would be exceedingly beneficial. Now, in this great and enlightened country we had a Royal Agricultural Society, and he did not hesitate to say the result of the action of that society had been to increase the yield of the soil of Great Britain, perhaps to an extent of more than 25 per cent. He found that, not only had the yield of wheat and other grain been greatly increased, but the improvement of the breeds of cattle had been very much promoted; and if, in a great wealthy country like this, it was found necessary to have a great organisation for the purpose of teaching farmers who had not been acquainted with those very principles on which their prosperity was founded, how much more necessary was it in India, with a population unaccustomed to European civilisation and to the cultivation of the soil on enlightened principles, to make every effort for the attainment of the objects we had in view. He had himself represented to the Marquis of Salisbury how desirable the appointment of a Minister of Agriculture for India would be. He believed Lord W. Hay made the same suggestion. It was known that in France the Minister of Agriculture exercised very important functions, and was a very useful member of the government. He did not know that there could be better service performed by any Minister of State than that of increasing the yield of the soil. After peace was settled, and good and honest laws had been established, he thought the development of the industrial resources of the country should be first and foremost. Therefore, he trusted reasonable representations made to her Majesty's government would induce them to remove obstacles and give every possible facility for increasing the production of cotton in British India. In the year 1860, the consumption of Indian cotton in this country amounted to about 3,000 bags per week; but at that time we exported to Europe a considerably larger quantity of that cotton than we used. We then exported to Europe about 8,000 bags of Indian cotton per week. The quality being so inferior, and the American being so excellent, the British spinner would not even look upon Indian cotton. In the last year, he was glad to acknowledge, the quantity of Indian cotton we consumed amounted to 15,000 bags per week, or about thirty per cent. of the consumption during the year. The American consumption last year amounted to about 40 per cent. of the whole consumption, or about 20,000 bags per week, having been, in 1860, 85 per cent. of the consumption. But even last year we exported to Europe a large quantity of East Indian cotton. We exported it to the large extent of 12,000 bags per week, which we still refused to use on account of its inferiority; and yet, of course, the English spinner was not unwilling that the Indian cotton should possess the advantage of the highest price he could obtain, and no doubt higher prices were obtained on the Continent than in England, and therefore it was shipped to Europe. In his opinion, the great effort should be to promote the execution of public works; after that the science of agriculture should be engrafted on the people. Now, in his own experiments in the growing of cotton, he founded his labours upon such knowledge as he was enabled to obtain through friends and from published works on the subject of cotton cultivation, and he formed the soil of a mixture of good alluvial soil with sand and saline manure; but above all, he took care to give depth to that soil, in which to sow the seeds of his future plants. Nothing could have been more successful. The cotton-plant threw out a deep, long root, called the tap-root, and it must have a soil that it could penetrate to obtain nutriment

and moisture. They knew that the ploughing operation in India did not exercise any great disturbing effects upon the soil. The plough did not penetrate probably more than three inches. He submitted there should be penetration, by ploughing or digging, to the extent of from twelve to fifteen inches, and the plants should have dressings of guano and salt, or of other saline manure. Guano found its way to every part of the globe save India. He knew, from his own experience, it was a successful means of stimulating the plant to yield abundance of excellent cotton. He could state the gratifying fact that, in the States of America, they had recently begun to use guano and salt as a dressing for the cotton-plant. Cotton was an exhausting plant to the soil, and either new soil was required, or dressing the soil with saline manure. They knew quite well that in Georgia, in the States of America, the yield of cotton hitherto had not been more than half the quantity that was produced in the great valley of the Mississippi; while the yield there was, on an average, more than 500 lbs. an acre, Georgia did not produce more than 250 lbs. or 300 lbs. per acre; but a personal friend of his own, who was interested in the cultivation of estates in Georgia, had informed him that, by the dressing of guano and salt, the yield of cotton in Georgia had been doubled, and was now quite 500 lbs. per acre, the same as in the valley of the Mississippi. His hon. friend the Chairman thought the yield of American cotton was not so much as he asserted, but he could state, for his information as well as that of his audience, that Mr. Edmund Ashworth, at a recent meeting in Lancashire, expressed his belief that the yield was little short of 700 lbs. per acre by the application of guano and salt to the plants. He was aware that, on an average of past years, the yield of cotton in India had not exceeded 50 lbs. or 60 lbs. per acre. There were exceptional instances where as much as 300 lbs. per acre had been produced. Previously to the American convulsion, the yield, in a pecuniary point of view, did not exceed, perhaps did not approximate to, an average of 10s. per acre. The simple solution of the question would be this—If, instead of cultivating five acres of ground with cotton, the ryot cultivated one acre, and cultivated that one acre well, he believed the yield would approximate 400 lbs. per acre; but then he was assuming that the earth should be disturbed in such a manner that the roots of the plant could penetrate into it and obtain nutriment and moisture; that the plants should be supplied with the nutriment of saline manure; and that all the advantages of modern cultivation should be given to that one acre. instead of the attempt to cultivate a great number of acres imperfectly. If they came to a product of 400 lbs. per acre, and estimated the value of that at the normal rate of 6d. per lb., the yield would be exactly £10 per acre. Surely, with such inducement as this, there ought to be an effort made to secure the advantages offered; but at the present moment such cotton was worth 1s. per lb., therefore the yield at that rate would be £20 sterling per acre. Without the effort to improve the cultivation, he was sure there would be no beneficial result. As had been stated in this room, the cultivation of indigo had been vastly improved; no indigo was grown superior to that from British India. They knew also that sugar had been immensely improved; and he was glad to acknowledge that excellent tea was to be had, the growth of India, though all the tea-planters there had not been particularly successful. He believed that was in a great degree owing to persons being sent out to superintend the plantations who had little or no knowledge of agriculture, or of the special cultivation of tea. Let them not send persons to cultivate cotton who did not understand the first principles of agriculture. He was glad to acknowledge that Mr. Carnack had rendered eminent service in the superintendence of cotton plantations, and he believed, during the last seven years, the quality of cotton had improved. Mr. Campbell stated he attributed the improved value of cotton to the better process of cleaning, but he was glad to differ from that gentleman, and say that he thought the fibre was better and longer; and he had seen cotton from India, grown under ordinary circumstances, equal to middling American. He felt if the difficulty of growing cotton in India were fairly grappled with, the object of increased supply and higher quality would be obtained, but it would require the co-operation of government to take that position which, in the absence of public effort in India, must take the place of spontaneous effort in other countries. When we saw the state of the labouring classes in this country, we were bound to do what was in our power to ameliorate their condition; and a more melancholy spectacle he did not know than that of men able and willing to work, and not finding employment; and yet such was the case in our own country in the present day. But humanity had little to do with governing principles; at the same time, self-interest had a great deal to do with every government effort, and he was only surprised that the government of India had not, acting upon the great principle of self-interest, developed the agricultural resources of that great country. He would conclude his remarks by exhorting public opinion in this country to direct its attention to a source of wealth that only needed development to be secured to us, and he hoped her Majesty's Indian government would second the efforts of capitalists and the labouring classes engaged in the cotton trade, and that there would be less acrimony and more meritorious co-operation than had hitherto been witnessed. This week a number of labouring men came up to London, to seek an interview with the Duke of Argyll; his Grace received them kindly, and promised to give such facilities as the government could do without interfering unduly with private effort. For himself, he asked for nothing that could not be accepted within the rules of political economy. It had been said that a man was a benefactor of his race who raised two blades of grass where only one grew before; now, if they only got two bales of cotton grown where one only had grown, the promoter of that desirable result would indeed be a great benefactor. If we increased the quantity of the yield of cotton in India, it arose from two causes. If we could double the length of fibre, and doubling the length would only make it equal to ordinary American, generally speaking, we should double the yield by that process alone; but when we could increase the number of fibres as well as double the length, we almost indefinitely increased the yield, and, at the same time, added to the value of the article very considerably indeed. He hoped the measures which had been so strongly urged upon the government would meet with a proper response, and contribute to the revival of the prosperity of the cotton trade in this country, and to the enduring benefit of India.

Mr. Hyde Clarke (late Cotton Commissioner in Turkey) said he had derived very great information from the remarks which had just been addressed to them, and he had felt the more encouragement in this the last of their Indian Conferences this session, because they were now in a position, in some degree, to measure the work in which they were engaged. There had now come to hand Indian newspapers containing the proceedings of the first conference on tea cultivation. The *Calcutta Englishman* and other papers had given those proceedings at considerable length, and there could be no doubt they were producing a large amount of good in India; and he had much gratification in learning, from the secretary of one of the tea companies, that he had eliminated the practical points of those conferences, and sent them to the managers of the company with whom he was connected. He could not but feel assured that the proceedings in which they were now engaged would lead to no less useful results; in fact, he was in some degree confirmed in this by those whom he hardly dared call the opponents of the increase of cotton cultivation in India, but those officials of the government who had spoken in defence of the proceedings of the government.

Their friend, Mr. George Campbell, had shown plenty of reasons for doing what was right, though he apprehended neither that gentleman nor any other member of the government had shown any reasons against doing what he (Mr. Clarke) thought was pretty well proved to be right in reference to this matter of cotton management. In fact, if the government was not in a position to carry out any measures for the extension of cotton cultivation, he should consider it a great reflection on the government of India and the able men concerned in carrying out its administration. It was an unfortunate difficulty they had in dealing with a question of this kind, that those who were the best authorities on India—those who had lived there and had the best knowledge of it—were in the habit of giving very contradictory statements, and this partly arose because they spoke of different parts of the country. Thus, there was one remark made by Sir Charles Wingfield, in corrobation of others who had spoken, in which he affirmed that the roads of India gave full satisfaction, and that the government of India had done its duty in that respect, and consequently, so far, the complaints of those interested in cotton cultivation had not adequate foundation. They knew the high position which Sir Charles Wingfield occupied; they knew, likewise, that neither he, nor any one of those who had spoken, was capable of making a deliberate misrepresentation of the facts, but he apprehended there must be a wide divergence of opinion as to India in general between those who maintained that the roads were adequate and those who complained that they were far from being satisfactory for such purposes. It was agreed on all hands that, before the improvements of the government, there was scarcely a road in India generally; and if we looked to the book published every year showing the progress of India, and looked to the department of Roads and Public Works, we should find there very little to prove that India could be adequately supplied. Considering that India was deficient in roads 30 years ago, even if the 30 years since had been altogether periods of absolute improvement, instead of the expenditure having been checked by various causes, it was not easy to see how that want of roads had been supplied from the funds available. These funds have been the ferry funds, which have not been so very big in operations, which were very small in their original amount, and which, except in some collectorates, are still very limited. The municipal funds are only of recent institution. The imperial funds have been limited, sometimes stopped in times of financial difficulty and revolt, and have been chiefly applied to the main trunk roads. The Act No. xxii., "For Works of Public Utility by Private Persons and Companies," was only passed in 1863, and can hardly have had much effect as yet. It was not the cotton people solely who complained of the want of roads, but every one who came in contact with the government on that subject. In the case of the Bombay and Baroda railway, the company reports as a cause having operated prejudicially on the traffic, "the want of roads in the stations." The Chairman (Lieut.-Col. French) said (*Herapath's Railway Journal*, p. 614), "the reason the present section of the line would not pay better was that there were no roads to the stations." In reference to the Oude and Rohilcund Railway, the engineer (*Herapath's Railway Journal*, p. 612) reports—"The course taken by the lines in Rohilcund is over a country very favourable for the construction of railways; the traffic met daily, passing over roads anything but good, is particularly heavy, and highly promising for the commercial success of the line." Then a point had been made that certain products were confined to particular soils and districts, and that there they had received adequate encouragement. Indigo was pointed to, but if we looked at those products which received great development, such as indigo, jute, oil-seeds, &c., we should find these were produced in districts well provided with cheap means of water transport; but cotton was an article which could be grown all over India, and it was a product which particularly required a cheap means of transport, and it wanted water transport, or something equivalent to it. In a great part of India there was no adequate water transport for cotton, and if it had to be carried in bullock-hackories, as Sir Charles Wingfield spoke of, the cost of such transport was very heavy—8d., 10d., and 1s. per ton per mile. He had to make an investigation of these figures some years ago, and could not help being struck with the fact that, however small the charge appeared when calculated at per maund on bullock-carts, yet it came to 8d. or 1s. per ton per mile. It was a matter of the greatest importance to bring down those rates of transport if we were to encourage a cultivation like cotton. He would like to have said a few words about the American planters who had been alluded to, but he would simply call attention to the fact that the Ottoman government likewise invited American planters, he believed it was about the same time that the Indian government invited American planters to go to India. They failed in Turkey, throwing a very heavy loss upon the government, and likewise upon a great many private proprietors of estates. But did the Ottoman government flinch on that account? No; the government set to work again, and succeeded where the American planters failed. We must not be disheartened by results arising from casual circumstances, which had no real relation to the great operation itself. With regard to transport, it was a matter of the greatest importance to cotton that the cost of transport should be reduced, inasmuch as the growing price of that as well as other articles was the price at the port of shipment; therefore, the price to the cultivator was the price at the port of shipment, less the cost of transport there. If they took the price of cotton given by Mr. Bazley at 6d. per lb., if the price of transport swallowed up half that, the cultivator would only receive 3d. per lb. If we could reduce the price of transport a halfpenny or a penny, that money went into the pocket of the cultivator, enabling him to extend and improve his cultivation. In conclusion he would say two or three words with regard to the question of a Minister of Agriculture, which so many speakers had supported. Only the other day, at the Statistical Society, Mr. Walowski, a member of the French Institute, referred triumphantly to the fact that, through the exertions of the government—because we all know it was the government and not the public—the production of wheat in France had been increased from a measure of 50 to 130. Comparisons had been talked of between the governments of France and India. The people of France were not the people of India, but the people of France were much freer than the people of India; and if under such circumstances they could derive so much advantage from the intervention of a Minister of Agriculture, we might infer that something like an equivalent advantage might be obtained in India itself. He would say with regard to the measure of limit of political economy—he would go further than Mr. Mill, and say the science of political economy was one thing and the science of politics was another; and though in a country like this we might come nearer to pure science, yet in a country like India we must look to the practical application of the science of politics itself.

Mr. Login, C.E., began by drawing attention to the mode of cultivating cotton in the North-Western Provinces, and stated that it was sown "broadcast;" therefore it was necessary to flood the whole field. He said that very little water was used for irrigation, and that cotton had seldom more than two waterings, the first to moisten the soil, to enable it to be ploughed during the hot and dry season, early in June. He then went on to state that, where irrigation was carried on from wells, each watering equalled in depth of about 2½ inches, and that for a crop of wheat four such waterings were sufficient, or, in all, 10 inches, but, where canal-water was used, two or three times as much water was expended; so that, in his opinion, the natives injured the cultivation very often

by using too much water. In comparing the cost of water raised from wells an average height of 30 feet, he stated that the cost of one continuous discharge of one cubic foot a second, in the Punjab, he had found cost the cultivators £383 12s., while the cost of the same volume from a canal was only £50 a year. Mr. Login said he could not speak from personal experience of the yield of cotton from a given area, but gave an example where the yield from sugar-cane, under proper cultivation, yielded six times the value of produce to what the natives were able to get from an equal area. This experiment was made 30 years ago, at the Jaharmpoor Botanical Gardens by the late Dr. Falkner; and Mr. Login believed that equally good results would be obtained from the careful cultivation of cotton. He then went on to say that even now, with canal water, by his calculations, irrigated land could support 1,319 inhabitants per square mile, while Lieutenant Scott Moncreif, in his work on irrigation, states that in Valentia, in Spain, no less than 1,774 are fed by the produce of one square mile of irrigated land. Mr. Login, therefore, drew the conclusion that, as the Doah had on an average 460 inhabitants per square mile, if all could be matured the land could feed three times its present inhabitants, and therefore one-half of the thickly inhabited part of India might be set apart for the cultivation of sugar, indigo, cotton, &c., for the European market. Mr. Login next stated that the catchment basin of the Ganges was estimated by Colonel Kennedy at 760,000 square miles, and if only one-eighth of this area was set apart for produce for the European market, this would represent an area of nearly 100,000 square miles, and, as the climate was as good as any in the world, there need be no longer any want of cotton in our markets. In discussing the question of transport, Mr. Login advocated navigable canals in Northern India, to be carried as far down country as Allahabad, where the Ganges became navigable all the year round, and he believed this could be done with advantage to the present and all future railways, by relieving them of the transport of bulky and cheap goods. After stating that the North-Western Provinces had several good roads, some of them better than any in England, though in Northern Bengal there were hardly any, in proof of which he spoke of a road known by the name of the Panch Coss ka Sirick (the ten mile road) from a traveller being able to go over it a distance of ten miles during the rains, Mr. Login concluded by drawing attention to what was said by Sir Charles Wingfield at the previous meeting, about the natives complaining of the English rule having made food dearer, and said this was a remark he also often and often heard, and he himself had known wheat selling at 10s. the quarter in some districts, but probably in other parts of the country the inhabitants were starving. Canal officers had, perhaps, better opportunities than any of hearing what the people say, and on one occasion an intelligent zemindar, when speaking to Mr. Login of the beneficial effects of the Ganges Canal in 1860, the famine year, said the villagers from being "kastcars" are now "sowcars," that is, from being ploughmen are now men of property. In support of what fell from Sir Charles Wingfield, he had drawn on the board a diagram showing the rise of the price of wheat along the line of the East India Railway during 1866, the year of the famine in Orissa, and great scarcity in Bengal. Meerut is highly irrigated, and so is Alighur, yet for all that the prices were much higher at Alighur, because it was on the line of the railway and nearer to Bengal, the place of demand. By the calculations he gave in a letter of his, which appeared in the *Calcutta Engineers' Journal* of October, 1867, he proved not only that the price of grain rose the further it was away from the highly irrigated districts, but that the profits at Cawnpore, Allahabad, and Benares, were one and the same, namely, 26 per cent. on the outlay of the corn-dealers. This diagram, therefore, at once showed how improved communications raise the prices of food in some localities. In that year the prices were 28s. a quarter at Delhi, 29s. 7d. at Alighur, 41s. 9d. at Cawnpore, 44s. 8d. at Allahabad, and 47s. 1d. at Benares. During the present winter, at Delhi the average price of wheat was 40s. a quarter, or double the average, though the produce of the neighbouring district, Alighur, was only 12½ per cent. below that of a good season. So some idea may be formed of the scarcity in other districts, and of what benefit the railway and the roads in Upper India must have been to the country in a year like that just gone by. Regarding model farms, Mr. Login stated that he had advocated their introduction for more than a dozen years back, and he was now glad to see abler and stronger advocates were now coming forward in support of them.

Mr. Cassels (of Bombay) remarked that a good deal had been said about roads, principally, he believed, with regard to the North-Western Provinces and Bengal. He would say a word or two about the Presidency of Bombay, which was the most important with regard to this question. If roads were wanting, it certainly was in the southern Mahratta country. A railroad there, with roads branching out, would bring cotton to market in large quantities before the monsoon in better condition than it would after the monsoon; and the roads would open up the trade of the great province of Mysore, which was now shut up. In Guzerat, roads were wanted to feed the Great Trunk Railway. It was fair to add, there was difficulty in making roads, as there was nothing but black soil, and the metal would have to be procured to make them. This was a question which had always been one of great interest to him, and he was one of those who took a gloomy view with regard to future supplies from America. He never expected the same quantity again as before the American war. He believed labour in the Southern States, under the burning sun, would never be congenial to the white man, and he believed the negroes, when left to themselves, instead of multiplying and increasing, would decrease, and ultimately die off the face of the earth; consequently, it was more and more necessary that the attention of the government and the public at large should be given to India, for from that country alone could we obtain cotton to feed the mills of Lancashire. The quality of East India cotton, during the last fifteen years, had greatly improved; he thought he might say it was 30 per cent. better than it was twenty years ago. What they wanted was, in the first place, good roads. They could not put compulsion on the natives to grow improved cotton. The land they held was heritable and transferable. It could be bequeathed or sold so long as the tax was paid to the government, and there were many reasons of state policy why we should not compel the natives to grow certain produce. But what the government could do was to carry out works of irrigation by means of large loans. They ought not to be afraid of doing it. He believed the government might lay out fifty millions of money with the greatest advantage. He thought a great mistake was made in paying so much money out of the revenue to public works, by which a large deficit was shown which really did not exist. The cost of keeping up works should be paid out of revenue, but not the cost of constructing them. Almost all public works might be considered as reproductive works, even barracks, if carried out with a proper regard to sanitary science, would save many valuable lives. If the government would not be timid, but would raise large loans to open out the country right and left, it would greatly increase the quality of cotton from India.

Mr. Allan said the few remarks he would offer had reference to Western India. He had the honour of being sent, three years ago, at the instance of Mr. John Fleming, to obtain a local knowledge of the country, and the results of his six months' tour from Scinde to the Deccan enabled him to form an opinion as to what might be one of the most effectual means of promoting the object now under discussion, viz., the improved and extended culti-

vation of cotton. There could be no doubt the first object was the establishment of good roads, and throughout Western India there was a lamentable want of good roads. They had now a main line of railway from Bombay to Nagpore, 500 miles through the cotton-growing districts. There was also a line through the Deccan, to the extent of 300 miles. Those two lines were now bringing the cotton as fast as it was delivered to them. The want of cross-roads had been severely felt, as also the maintenance of the existing district roads in a better state of repair. The line through Central India would open out that part of the country immensely. Many of the local roads leading to the main-line to Delhi, and also to Calcutta, were being put in order, especially, he believed that from Kundewar to Indore, which, at the time he was there, was a most miserable road. From what was told him at Nagpore it was contemplated to proceed vigorously with that road. He thought one of the most practical means of promoting the objects in view was the establishment of a Department of Agriculture in India. If a Minister of Agriculture were appointed, with a cotton commissioner in each district, that would be a means by which practical results would be quickest and best obtained; and there could be no doubt the appointment of a cotton commissioner in Western India had been one of the main causes which had led to the development and improvement of cotton cultivation which had already taken place. He could speak of this personally, from what he had seen in Kandeish and Central India. He could also bear his testimony to the efforts of Mr. Carnac in stimulating the production of cotton, and bringing it in the best condition to the market. He had established an excellent market in the district, and everything had been conducted by him on the most systematic principles. In this course he had been zealously aided by the ryots themselves, who saw that in all that was done there was the single desire to benefit them; and this had been, he believed, more or less the conduct of all the cotton commissioners. What was wanted was that government should appoint a Minister of Agriculture, and cotton commissioners throughout the country. If that were done, no doubt an immense and rapid improvement would be observed.

Dr. Archibald Campbell remarked that he had never been stationed in any great cotton-producing district, but he had a recollection of the manner in which the roads leading to the Ganges were blocked up with cotton carts, and the difficulty with which the packages were piled upon the rafts like haystacks. That was to a great extent remedied by the railway, which was a trunk line along the great river, with but few feeders from the interior. He knew many large districts where cotton might be grown to a large extent, but that there was no real internal communication. People at Allahabad imagined they were in the interior, but it was merely a large trunk road. What was wanted were village roads between one producing part and another. As far as Bengal was concerned, there might be said to be no roads at all. With regard to Mr. Bazley's experiments in Manchester, he (Dr. Campbell) made some experiments in the Darjeeling Terai, at the foot of the Himalayas, with Sea Island cotton. He got the seed from England, and sowed it on the low lands of the Terai. Having no practical knowledge of the cultivation, he gained such information as he was able from the natives, and he followed their plan, except that he took care to keep the plants clean, and not mix them with other crops, as the natives did. The result was, the production of cotton which, when sent to England, was pronounced of long fibre and excellent staple, and would be a valuable article in the market. That experiment, if it had been followed up as it ought to have been, might have led to large results; but it was sufficient to prove the fact that Sea Island cotton could be grown on waste land at the foot of the Himalayas, of superior quality to the cotton of the country; and if manure was applied, he believed the produce would rise in the ratio Mr. Bazley said. If an acre of land in an impoverished state would grow 50lbs. of cotton, it was quite certain it would grow five or six 50lbs. if it was nourished with manure. The moral he drew was, that the government might be properly urged to promote cotton cultivation in the waste lands of the central provinces, and especially along the foot of the Bhootan hills, which we had recently acquired. He thought it was a reasonable suggestion that the government should begin, though it was late in the day, with cotton as they did twenty years ago with tea. With regard to the American planters sent to India, he recollected seeing them there, and he believed they failed from two causes. It was said it was predetermined that they should not succeed, and that they were not the most competent men. The principal settlement was Bundilcund, where the climate was very dry, and there was no rain till June or July. In the Terai there were showers from March, and the seed-time was in February. The consequence was the plants got the benefit of the rain and grew rapidly. He believed the experiment was not tried at the foot of the hills, but principally in Bundilcund. He entirely agreed with the admirable suggestion of Mr. Bazley, that further attempts should be made by the government to improve the cultivation of cotton, by placing it under the superintendence of persons practically versed in agricultural and horticultural science.

Dr. Burn said, having spent 32 years of his life in India, and having had the charge of the American planters referred to, he had large opportunities of inquiring into this subject, with regard to the increased production and improved quality of Indian cotton. The East India Company had been at work for upwards of 50 years trying to grow cotton, by all manner of means, and all kinds of experiments, and with the assistance of all kinds of men. He believed they had spent upwards of a million of money in those experiments in the last 50 years, and the results had been, as the hon. member for Manchester said, almost *nil*. They still continued to receive almost the same quality of cotton from India, though improvement was spoken of, which no doubt proceeded from improved agriculture. The natives of India were a most wonderful race of people. They were vastly superior to the slaves of the United States, and they were altogether a class of people that England ought to take the greatest care of, because while almost all the races capable of working in hot climates were dying out, these men were able to labour in India and to cultivate the products of tropical climates to an advantage, without risking the sacrifice of European life. He would further remark that the cotton-plant of India was a totally different plant to that of America, both in habits and product. The American plant grows rapidly under a nearly tropical sun with constant showers of rain, which continued during nearly the whole growth of the plant. The best quality of cotton was grown in Western India, and the straight lines of the plants in the cotton-fields at Broach were something wonderful to look upon, and the ryots of that part of the country were famous for their knowledge of agriculture; they had a thorough appreciation of the value of manure and rotation of crops. It was wonderful to find this knowledge in men who had no education in such matters, except what they derived from their forefathers. He believed the produce of the Broach plantations was quite equal to 400 lbs. per acre, and was of a staple which he was sure Mr. Bazley would approve of, and adapted to half the looms of Manchester. Having contrasted the produce of agriculture in this country fifty years ago with what it is at the present time, Dr. Burn, in conclusion, remarked that he approved of the idea of instructing the natives of India in the principles of agriculture, and bringing under their notice improved implements of agriculture. He thought it was a mistake to look to irrigation as the salvation of India. It would, no doubt, tend to mitigate the miseries of famines, but

would not wholly prevent them. The only safeguard against such visitations was that adopted by the natives of former days, viz., by the storing of two years' supply of grain and water, as well as the same amount of fodder for their cattle, because it was very rare that dearth of grain occurred in that country in two consecutive years.

The Chairman, in closing the discussion, remarked that he was gratified to find, from the observations that had been made, a confirmation of the views he had expressed in his opening remarks, that private effort in this country would not succeed in improving either the quantity or the quality of cotton grown in India. It could only be done by the instrumentality of the government there; and, as he endeavoured to point out, in all eastern countries they could not carry out the doctrine of political economy. The people of all eastern countries were dependent upon the government to initiate any improvement and its adoption amongst them. If that principle was a sound one, it ought long ago to have been put in operation by the government of India, but especially so at a time when the Cotton Supply Association began its labours and pressed the subject upon them. He regarded it as a fortunate circumstance that the Association commenced its labours before the American war broke out. They were then in possession of information from every part of the globe, and it was singular enough to find that, though in various parts of the world the climate was not quite equal to America for the growth of cotton, yet in every country except India there was the stumbling-block of the want of labour, by means of which materially to extend the cultivation of cotton. When we came to India, we find there two remarkable things which should not be forgotten—first, that they grew the most inferior cotton on the face of the earth; and secondly, they grew the least quantity per acre. How were they to alter these two things? They were told by Sir Charles Wood to get up a cotton company and go out to India. As he showed at the time, supposing they had taken up the waste lands which were offered them, they could only have grown a specific quantity, which might have come within the limits of the company; but they had the whole community of the cotton trade in want of cotton, and what little the company could do would be nothing; whereas, if the government brought its influence to bear upon hundreds of thousands of cultivators throughout the country—an influence which would have raised the produce from 60lbs. to 120lbs. or 200lbs. per acre—the whole of the work would have been done. How was that influence to be brought to bear? It had been shown that the introduction of American seed into India had been the cause of introducing a new quality of cotton in Dharwar. The quality was improved. The seeds of that plant were carried into Kandeish, and there was a vast improvement in the produce there. What they wanted the government to do, and what they had promised time after time for years to do, was to give instructions on this subject to the collectors of every district where cotton was cultivated, to stimulate them to it by increased salary or civil distinction, and then the work would be done as in the case of Mr. Shaw and Mr. Ashburner. If they found that the collectors were so much occupied with their present duties that they would not undertake others, it was urged upon the Government that they should appoint cotton commissioners charged with this specific duty. They could get nothing from Sir Charles Wood, but they pressed upon him the difficulties with regard to Bombay. There was actually no tenure of land; there was no protection of the rights of the ryot; and he was driven to the thirty years' tenure. Then they found there were neither roads nor railways; and he assured the meeting, from his personal labours in that office, nearly every railway in India had been forced most unwillingly upon the government. Then they asked that there should be an agricultural department of the government, not confined to cotton alone, but embracing the whole agriculture of the country. Look what had occurred within the last three weeks, in consequence of the absence of such a provision. The Cotton Supply Association received a letter stating that the seed in Kandeish had failed through drought, and unless £10,000 was provided for the purchase of fresh seed in other parts of the country, they could not cultivate cotton for the forthcoming year. This matter was represented to the Duke of Argyll, and when he ascertained what the state of things was, he telegraphed to the government at Bombay, directing that sum of money to be paid over to Mr. Ashburner for the purchase of seed. It was said at the last meeting the cotton interest had not stated what it was they wanted. He replied, first, cotton commissioners; then they wanted them to plant in some districts exotic seed, and in others indigenous seed; then they asked them to introduce the most improved descriptions of agricultural implements. The Cotton Association had, at its own cost, sent out manures and fertilisers to have them tried. Look at the predicament they were in. There was no public officer in Bombay to receive them, and it was only through Messrs. Peel, Cassels, and Co. that they were sent to Mr. Ashburner to be distributed by him to such cultivators as he could get hold of. At this moment there were thousands of operatives in Lancashire willing to work; they could not work; many of the mills were closed. Hundreds had taken ship from Liverpool, to transfer their experience and their labour and energy to the States of America. All this he laid at the door of the Indian government, boldly and openly. The only pressure put upon them had been a long official letter, recounting the failures of those American planters who were thought to be dead and buried. The exceptional thing the government had done was to appoint two cotton commissioners and four gardeners, and this latter petty cost was all they had done to preserve a trade which was now thirty millions per annum, and he saw no reason why it should not be forty or fifty millions. He could not talk calmly on such a state of things when his thoughts turned to the thousands of operatives at this moment suffering from the diminution of labour; he hoped some of his friends in Parliament would not let the session pass without bringing public opinion to bear upon the state of things described.

Mr. J. C. Wilson writes on this subject as follows:—"I cannot help remarking, in a few words, upon the position which it seems to me the Indian government occupies upon this question. That position is this:—Its members say to us, 'We recognise the importance of your question; we are willing to assist you, but what can we do?' Is that, I ask, a position which is worthy of a government which professedly represents the intelligence of a nation? It is surely deplorable to be told, as we have been told by Mr. Bazley, Mr. Cheetham, Mr. Smith, and Mr. Cassels, that they — gentlemen representing the cotton interest of this country, one of its most important trades—have been vainly knocking at the door of the Indian administration for the past fifteen years, seeking to gain an entrance into its councils, for the purpose of inducing it to take real action in this matter of improving and extending the cultivation and supply of cotton in India, a matter which, if skilfully pursued, must end by unfolding a perfect mine of wealth to the country, seeing that, whereas there is only grown there at present from 40 to 50 lbs. of clean cotton per acre, there might be grown, under intelligent direction, from 300 to 500 lbs., this increased quantity being simultaneous with improved quality, and therefore of many times increased value. Surely, a government, which is really a government of India, ought not to require even any external pressure to induce it to take up that which I will venture to call its proper position, viz., the lead in such a matter. Now, what is the cause of this supreme unwillingness to deal with this and similar questions? We have such a very patent effect, there must be of necessity an equally

potent cause. I think, and I say it with sentiments of respect, and without wishing to raise a class question, that it is to be found in this fact, viz., that the functionaries of government in this country, and more especially in that of India, are drawn too much from the upper classes of society—classes which, however estimable in themselves, have not had that education, in an experience of the pursuits of trade, which alone gives intimate and special knowledge and familiarity with its subjects, such as to enable a man to enter confidently upon the path of progress and reform, and courageously encounter those difficulties which are certain to be found there, and with genius and skill overcome them. This being the case, what is the remedy? What would Mr. Bazley do, if he wanted to improve the cultivation and supply of cotton upon a property of his own in India? He would not attempt to fumble with the matter himself, but would create a department specially charged with the duties of that particular business, and put an able man at the head of it, to act under his inspiration. Is that not also the clear cause which the Indian government ought to pursue? Supposing such a department created—viz., a government trade department for the cultivation and supply of cotton in India (under a Minister of Agriculture, it may be), with its headquarters say at Bombay, and ramifications throughout all the cotton-producing districts of the country, what would be the results which might be fairly expected to follow? The position of the Indian government would be at once improved, for it would be recognised to have taken an important step towards the solution of this pressing problem; the cotton interests of this country would be satisfied, for they would find themselves in direct communication with a central agency of their own in India, open to their advice, and ready and able to disseminate their views and wishes, hints and experiences, throughout that vast country; and the growers of cotton might be expected to rejoice in finding an organisation established also for their benefit, instead of the distraction and uncertainty which now prevail. They would very soon find out that they were free to resort to it for information and advice, and all questions relating to manures, implements, and seed would quickly come under its notice. Indeed, I can see it might be possible to make this institution self-supporting. But it must always be under government control, in order to give it unity, strength, and authority; and because it is essentially a revenue department, not for its collection merely, but for its creation. It might have the very important duty to perform of reporting to the higher powers of government what public works were found to be necessary in its practice or experience (such as roads, railways, canals, or improved river navigation), for the purpose of promoting the supply of cotton by means of cheaper carriage alone. And there is the question of irrigation. In truth, if presided over by men well-acquainted with their business, such a department might very soon be engrossed in most useful work. And is it not really needed? We have lately heard it argued in the Society's rooms by a late governor of Madras, an able and eminent man in his way, that because a cast-iron wheel of a threshing machine, when broken, could not be quickly or certainly replaced at present in the country districts of India therefore, it was undesirable and impolitic to encourage the importation of agricultural machinery into that country. To anyone acquainted with the subject, it would seem more intelligent to say that all machinery likely to be beneficial to India ought to be imported, and if village foundries are required to execute repairs, let them be by all means established. They would constitute another industry, if only in the first instance for repairs. Further, we have been told by some of the officials of government in India that they are already overburdened with the number of their duties, and each of them is yearly increasing in amount with the increase of population, &c.; another good reason why they should not be called upon to undertake those duties which relate to this trade matter, with which they are comparatively unacquainted. I feel, if these Indian Conferences that have been held under the auspices of the Society, should result in nothing more than the establishment of these trade departments in the government of India—not for cotton alone, but for other fibres, also for silk, oils, tea, and coffee—they will have done much good both to this country and to India; and we shall have once more exhibited to the world that we are not a nation of talkers, nor yet of dreamers, but of determined, practical, and progressive Englishmen.

Meeting.

On Monday afternoon, the 5th instant, at 4 o'clock, p.m., a meeting took place in the Society's Room, when a paper "On the Limits to be placed upon Posthumous Dispositions to Public Uses," was read before the members of this Society, and the members of the Association for the Promotion of Social Science, by Arthur Hobhouse, Esq., Q.C. The Right Hon. Lord Stanley, M.P., presided, and a discussion ensued, which was adjourned to this (Friday) morning, the 9th instant, at 11 a.m., to be re-opened by Mr. Edwin Chadwick, C.B.

A report of the paper and discussion will appear in next week's *Journal*.

TRAINING OF CHILDREN IN SCHOOLS UNDER THE POOR-LAW BOARD.

On Saturday, the 3rd inst., a considerable party of ladies and gentlemen, at the instance of the Council of the Society of Arts, visited the North Surrey District School, at Anerley, for the purpose of witnessing the results of a system of mixed mental, physical, and industrial instruction, imparted on the half-time principle, and which is now common to several of the schools for metropolitan children established under the Poor-law Board.

Amongst those present were Earl Fortescue, the Right Hon. Wm. Cowper and Mrs. Cowper, Lady Wharncliffe, Lady Tankerville, the Hon. Auberon Herbert, General Eardley Wilmot and Mrs. Wilmot, Admiral Ryder, Mr. Henry Cole, C.B., and Mrs. Cole, Mr. Edwin Chadwick, C.B., Mr. Peter McLagan, M.P., the Rev. Thos. Helmore, Mr. E. Carleton Tufnell, Mr. and Mrs. J. G. Fitch, Mr. James T. Ware, Dr. Pick, Mr. Hyde Clarke, Mr. Samuel Redgrave, Mr. C. Vignoles, Mr. Botly, Mr. G. C. T. Bartley, the Secretary and Assistant Secretary of the Society of Arts, &c.

The programme of the arrangements, as carried out, was as follows:—

11.0—Inspection of children's drawings in the board-room.

11.15.—Drill and exercises in the school-yard. Military band and marches until 12 o'clock.

12.0.—March to dinner. Singing, &c. Visitors' inspection of the bed-rooms, kitchen, &c.

1.0.—Choral singing, and instrumental music by the band in the hall, recitations, including a representation of a debate in the House of Commons, given by the boys.

2.0.—Children in school, where they were examined in mental arithmetic and geography.

2.30.—The boys of the Lambeth School, a similar institution, marched into the grounds, and were drilled separately.

The following explanation of the objects of the visit, kindly furnished by Mr. Edwin Chadwick, C.B., was circulated with the cards of invitation:—

The object of the invitation is to present for consideration an example of mixed mental and physical and industrial training, imparted on the half school-time principle of instruction,—showing practically how much can be imparted by an improved school organisation, within the eleventh year, or by the time children of the wage-classes are usually required by their parents to leave school for some productive occupation.

The school is one of a class of schools of districts of poor-law unions, to which are sent orphan and destitute children, chargeable upon the poor-rates. The class of children are of the most unfortunate, and of the lowest of the community—generally born amidst filth and squalor, and under the worst moral and physical conditions. Nearly half of them, as brought in, require immediate medical treatment, and some are brought in in such a condition as only to die. As a class, they have been commonly as difficult to teach as to rear. They are of stunted growth, and, even when they have had a military training, and volunteer for the military service, only a small proportion are found to come up to the military standard. Since, however, the sanitary conditions of the common lodging-houses, where numbers of them are born, have been improved, under Lord Shaftesbury's Act, and since the like sanitary improvements have been extended to others of the low tenements from whence this class of children chiefly come, it has been noticed that the proportion of the decrepit has diminished, that the children are of a less repulsive type, and of an improved physical and mental standard.

When the children admitted are freed from pronounced disease, or when they are of moderately good health, the effect of the improved sanitary conditions under which they are placed, of sufficient wholesome food, improved ventilation, personal cleanliness, frequent head-to-foot ablutions, clean body-linen, and physical training and exercise in the open air, is remarkable. The spontaneous children's diseases (except, indeed, ophthalmia, which remains to be dealt with) are almost banished, and they have a higher degree of health than the children of the independent poor, or than those of the general community. The death-rate of the children of the same ages of the general community is about ten per cent., but —except those who may be called the hospital children, and those who are brought in to die—the death-rate amongst the children of this institution has not exceeded two per cent.

The physical and industrial training begins in the exercises of the infant school, then afterwards, at about the ninth year, they have the military drill and school gymnastics, and exercises of the hand and eye in elementary drawing; the voice is also exercised in singing. As the orphan children have not the advantages of any of those small but important manual occupations which are found in decent homes, and which contribute aptitudes for productive work, neither have they regular manual work, such as factory children who come to half-time schools are engaged in—preparatory exercises are therefore given to boys in carpentering, tailoring, shoe-making, in attending the steam-engine; and to girls in washing, cooking, sewing, and household work. Instrumental music is taught to the most apt boys as a means of occupation in army bands, which have been largely supplied from these schools, as well as a means for the discipline of the school. This course of physical training of hands, arms, eyes, and legs, gives aptitudes for *all* industrial occupations, and beginning in the infant school, and going on with elementary drawing, is an exercise of the mental habits of attention. In the military drill, it is an exercise in habits of attention, and moral and industrial aptitudes, and in all that is implied in the term discipline—self-restraint, silence when under orders—patience—prompt attention, and prompt and exact obedience. For industrial occupations it prepares them for combined order, to act together, to move together, to lift together. This manual exercise is found practically to impart to four the efficiency of five, even with the ordinary drill; and with special gymnastics superadded to that drill, the efficiency of five, for all purposes of ordinary civil labour, is imparted to three. The example, in an intellectual point of view, presented by this and the same class of educational institutions, appears to be of primary importance for the question of national education, and especially of technical education, to which the attention of the Society of Arts has been of late so much directed.

It is admitted on all hands that an improved technical education, and an improved superior education of any sort, must be based upon an improved national elementary education. Of the schools for elementary instruction throughout the country, it has been stated on wide observation by the Rev. Mr. Fraser, the school inspector, that about one-third of them, according to common standards, are tolerably good, about one-third are indifferent, and one-third are positively bad. But in the best of the common parochial schools it takes about seven years, beginning from the sixth to the seventh year, to impart fairly reading, writing, and arithmetic alone, by five or six hours of daily school attendance, up to the thirteenth or the fourteenth year. Children of the wage-classes are, however, taken away taught imperfectly, or half-taught, by the eleventh year; and persons of the lower middle classes cannot generally afford to leave their children beyond their thirteenth or fourteenth year, and cannot give them any additional school time for technical education of any kind. But the example presented in this institution is of an organisation of teaching power, applicable to the greater part of the country, by which better elementary instruction, in half the daily time usually devoted to it, is given in half the number of years, so as to give the wage-classes as good elementary instruction by the eleventh year as is now commonly given by the thirteenth year—and thence there may be gained for the children of the middle classes two or three years of time for technical instruction, or for special preparation for any superior instruction, and this time is gained here at a reduced expense for teaching power. The average expense of teaching power throughout the country, according to the report of the Newcastle Commission of Inquiry, was £1 9s. per head per annum. That expense was for teaching of the common low average, but teaching in a school of the general average of fifty pupils, by a trained teacher with the assistance of a pupil teacher, could not be accomplished for less than £2 per head, or £14 for the seven years' tuition. In the Anerley institution, the teaching power, by a subdivision of superior educational labour, costs only about 15s. per head per annum, or, including the infant school teaching, about £4 10s. per head for complete elementary and comparatively superior school instruction, in between three and four years after leaving the infant school. Examples of the gain of time, and improvement in the quality of the teaching, and of an extension of the range of instruction, by the aggregation of numbers, and by direct simultaneous teaching in large classes, may be presented from the aggregation of day scholars of children of the wage-classes in a union of the parish schools of Faversham, and in several large day-schools of a similar character.

The special example presented, in the instance of this institution and others of the like class is, shows the means available for getting children out of the gutters into training schools, getting them into places as servants or as productive labourers, and preventing them becoming burthens on society as mendicants, paupers, or delinquents. In the small poor-law schools formerly, and in many of the small poor-law union schools now, not more than one-third were found in places of productive industry. The great majority, or sixty per cent., "went to the bad." In this institution, and in others the like, the moral failures of those reared in them from infancy

APPENDIX.

ADMINISTRATION OF FUNDS FOR EDUCATION.

Table Illustrative of School Organizations for the Augmentation of Efficiency with Reduction of Expense.

[In this Table—which has been prepared on request by Mr. T. P. Allen, an experienced and skilful teacher who had charge, under Earl Russell, of an Elementary School at Petersham—it is assumed that the pupils enter school at seven years of age. At the end of the several periods mentioned in the third column, they would write a clear hand, and would read intelligently, and would be capable of passing with credit the ordinary Examinations in Arithmetic approved by the Privy Council; they would have thoroughly mastered the usual rules, including Proportion, as far as Decimal Fractions inclusive.]

No. of Scholars.	Annual Cost per Head.	£	s.	d.	Time of Teaching.	Total Cost per Head.
40	Master and Mistress*	70	0	0	6 to 7 years	About £16 10 0
	Monitor	2	10	0		
	Expenses†	10	0	0		
	House Rent‡	20	0	0		
	Annual Cost per Head	£2	11	3		
70	Master and Mistress	75	0	0	7 years§	About £12 10 0
	One Pupil Teacher	15	0	0		
	Expenses	15	0	0		
	House Rent	20	0	0		
	Annual Cost per Head	£1	15	6		
120	Master and Mistress	105	0	0	6 years	About £9 0 0
	Two Pupil Teachers	30	0	0		
	Expenses	25	0	0		
	House Rent	25	0	0		
	Annual Cost per Head	£1	10	10		
200	Master	135	0	0	5 years	About £6 0 0
	Four Pupil Teachers	60	0	0		
	Expenses	35	0	0		
	Annual Cost per Head	£1	3	0		
400	Master	185	0	0	4 years	About £4 0 0
	One Assistant	70	0	0		
	Six Pupil Teachers	90	0	0		
	Expenses	55	0	0		
	Annual Cost per Head	£1	0	0		
700	Master	240	0	0	3 to 4 years	Nearly £4 0 0
	First Assistant	110	0	0		
	Second Assistant	70	0	0		
	Twelve Pupil Teachers	180	0	0		
	Expenses	100	0	0		
	Annual Cost per Head	£1	0	0		

* It will be seen that no mistress is allowed when the number of scholars exceeds 120. In those cases separate establishments are maintained for boys and girls.

† By Expenses is meant disbursements for Stationery, Cleaning, Repairs, &c.

‡ Small Schools, especially in the case of the so-called National Schools, are usually provided with teachers' residences. In estimating cost, therefore, in the small schools, we must include a fair per centage (£5) upon the capital employed in the construction of the residence, the teacher's income being affected to the full extent of the supposed rental.

§ A school of 70 is perhaps rather more obstructive to progress than one of 40. In the latter, though the organization is necessarily very imperfect, the surveillance of the master can be more readily directed to every individual. In much larger collections this advantage in favour of a small number is much more than counterbalanced by the constant general supervision of the master, by the aptitude and intelligence of his subordinates, &c.

who are not bodily or mentally disabled—that is to say, the failures to get into a place and keep it—failures that disqualify them for respectable employment, are found not to exceed three per cent. This is known from the visits of the chaplain, whose duty it is to visit them in their places for the first two years, and to see how they get on. The orphan children of soldiers and camp followers have formed a large contingent of the mendicant classes. The Military Orphan Asylum at Chelsea, and the Royal Hibernian School in Dublin, for the children of soldiers, are schools of mixed physical, industrial, and mental training, like this, on the half-time principle;—and as the inquiries as to the outcome of each are carried further into the after-life of the children who volunteer for the army, the following return of the outcome of the latter school may be presented as statistics of results generally obtainable for civil life, as well as for military service—many of the pupil teachers, certificated teachers, and others who have matriculated at the London University, having come from these institutions.

"The following table is an epitome of a return drawn up from reports received from the several regiments to which the boys of the institution have volunteered. Of 521 children trained in the schools, and afterwards enlisted in the army, 6 have by their conduct and talents raised themselves to the grade of commissioned officers. Less than 3 per cent. are classed as bad characters, and only 6 per cent. as indifferent."

Rank.	
Officers	6
Staff Serjeants	2
Colour Serjeants	5
Band Masters	2
Serjeants	35
Drum and Trumpet Majors	10
Corporals and Bombardiers	42
Drummers	164
Privates	255
Total	521

Character.	
Exemplary	28
Very good	149
Good	304
Indifferent	31
Bad	12
Very bad	0
Total	521

A large majority of the boys who enlist for the army are placed in regimental bands.

There is no doubt that, by a legitimate application of compulsory powers to juvenile mendicants and vagrants, who constitute the seed-plots of the adult criminal population, they might be converted, as in these institutions, into good subjects.

One collateral object of the exhibition at the Anerley school is to show that the introduction of military drill and gymnastics into schools, besides the distinct advantages of bodily training for civil service, offers important national advantages for the military service of the country. It enables the transference of a large part of military training from the productive adult stages to the non-productive infantile or juvenile stages of life. It converts that portion of military training from a burden into an economical advantage. It augments the efficiency of labour and the productive power of the country. It creates a predisposition to a higher order of volunteering and recruiting for the army, now much needed. Experienced drill-masters declare that they can begin to teach the children to walk, and to practise motions, at from five to six years of age, and can impart before the eleventh year a drill with permanent effect, such as is seldom if ever attained in after-years, when the limbs are stiffened, and the habits more fixed. It is found that one drill-master can drill and exercise about 500 boys. Throughout the country, in the day-schools, about 130 boys might be trained well at the ordinary expense of keeping and training one militia-man comparatively ill. At the Stepney half-time school, naval exercises with a mast and sails have been practised with great advantage, and they are found to be a beneficial preparation for the sea service, that might, with much economy, be introduced in school unions in seaport towns. Swimming is also taught in the summer at a trifling charge, with much sanitary benefit, and may generally form part of such a national system of physical training.

The notice of patronesses and committee of the Ladies' Sanitary Association, and of other lady visitors is solicited to the training of the female children.

The following remarks were made in presence of the visitors by Mr. Carleton Tufnell, the Government Inspector of the schools:—

"Before seeing the arrangements of the school, it may be useful to explain what you are invited here to see. You must not expect to see fine, well-grown children. All who are admitted here come from the lowest class, generally born amidst filth and squalor, and under the worst moral and physical conditions. You will see proofs of their origin in their countenances. They are all, you will observe, of stunted growth, the results of the hardships and privations they have had to endure previously to entering this school; in fact, their low stature and physical defects are the chief obstacles we have to surmount in preparing them for the business of life. You will see here the products of the lowest London life, and I don't believe England can furnish a worse material than what supplies these schools, and you are asked to witness what this system effects in reforming this unpromising material. Their mental instruction is pushed further here than in ordinary village schools, as will be proved to you by their examination, but you will not think that too much time is devoted to it when I state that, this being a half-time school, only 18 hours weekly are employed in book-learning, the rest of their time being taken up in physical and industrial work. Music is cultivated to a considerable extent, both vocal and instrumental. All are taught singing, all the male pupil teachers are taught to play the organ, and about 60 boys, who form the band, are taught to play, mostly on brass instruments, under an efficient band-master. This instrumental music is entirely industrial, that is, it is intended to prepare those engaged in it to gain their future livelihood. The pupil teachers turn into schoolmasters, and the band boys are enlisted, when old enough, into regimental and naval bands. The metropolitan schools under my inspection now furnish about 200 musicians yearly to the Royal service. This musical instruction has also an important moral influence on the school. We find practically that nothing has so powerful an effect in softening and humanising the rough, coarse natures of these children as music. Its effect in contributing to the order and discipline of the school cannot be overrated; and though perhaps the expense we are obliged to incur in forming the band would not be justifiable, if this instrumental music were not strictly an industry intended to prepare the boys for their future careers, still I should regret extremely to give it up, as it assists so markedly in civilising the rough specimens of humanity we have to deal with. You will have the opportunity of witnessing their proficiency both in vocal and instrumental music. Their drawings you see before you; and though I can't ask Mr. Cole, with the Kensington Museum in his mind, to praise them, I think they are such as may materially assist those who are subsequently engaged, as many of them will be, in the business of carpenters, upholsterers, and decorators. You will also witness their drilling, which is found to be extremely useful in improving the physical development, inculcating habits of prompt obedience, and, beginning as it does in the infant-school, giving them aptitudes for all industrial

occupations. In fact, next to music, I think it the most powerful means of disciplining these children. Their industrial training includes shoemaking, tailoring, carpentry, gardening, baking, blacksmithery, and engineering, as there are two steam-engines on the establishment, employed chiefly in pumping water, and six boys are constantly trained to stoke and manage the steam-engines. The girls wash, scour, and make all their own clothing and the boys' shirts; the boys make their own coats, trousers, and shoes, supply all the vegetables from the grounds around, tend the cows, and make all the bread. They are bathed twice a-week in a bath large enough to swim in, which it is necessary to warm, as it is dangerous to bathe children with their feeble circulation in cold water more than two months in the year. Besides, these children, subject as they are to cutaneous disorders, require more than ordinary attention to cleanliness in order to preserve their health. Neglect on this point might cause the whole school to be laid up with ophthalmia, scald-head, or other skin diseases. You will find several children in the infirmary, mostly young ones, who have entered the school ill. But their standard of health, as indicated by the yearly mortality, is high, for the deaths never exceed two per cent., and in the past year there was not a single death. Now what is the outcome—the result of all this? I can only make this apparent by comparing it with the whole system of keeping the London pauper children in workhouses. Under that system, two-thirds of the children went "to the bad," that is, became either paupers, thieves, or prostitutes. By this system we do not lose more than three per cent., in other words, the failures in converting this class of children into honest workpeople have been reduced from 60 per cent. to 3 per cent. We learn this through the chaplain, the Rev. O. Vignoles, whose duty it is to visit the children twice a-year during the first two years of their service, and report their condition to the managers of the school. I cannot conclude without alluding to an objection to these schools which I have sometimes heard, and of which I think a noble lord present (Earl Fortescue) is a fair exponent. It has been said that we do too much for these children. You take them from the lowest class and educate them beyond their station. No labouring man can supply his children with education equal to what is given here. Now it is well known that in common day schools the children do not stay beyond ten or eleven. Here we cannot get rid of them before the age of fourteen. No one will take into service and board such physically inferior children before that age. If, then, we were to forcibly stop their education when they had learnt as much as a labourer's child gets at the age of eleven, and endeavour to stunt the mental development which begins at that age, I believe we should turn them out, friendless and parentless as they mostly are, quite unable to hold their own in the struggle for life; in fact, we should make them paupers or thieves, or worse. Such was the result in the former system of London workhouse training. A child so brought up may cost his parish £100 before he dies, or, as a thief, may plunder the community, and impose on it a loss of several hundred pounds. Thus there is a strong economical reason for the system of education established here, besides the feeling, that I trust animates most of us, that it is our Christian duty to do our utmost to raise these poor children from the miserable lot in which they have been born. But I believe that this jealousy is wholly uncalled for. I do not believe any artificial system, such as we see here, can be equal to that designed by nature, where the child is brought up under the roof of an honest and industrious parent. Sixty per cent. of these children at least are orphans or foundlings. None of them have ever known the kind nurture of the parental roof; in fact, as mournful experience shows, the greatest enemies of these poor children are their own parents. We can insure, with almost mathematical certainty, the future good conduct of the orphans. We cannot be equally sure of those who have parents. When they leave this establishment, attempts are often made by their parents or relations to lead them to vice and ruin, which we hope are mostly counteracted by the training they receive here. In truth, I do not think we do more than just give them sufficient training to ensure their safe course through the troubles and difficulties of this world, and brighten their passage to a happier world hereafter. The system pursued here is not peculiar to these schools; it is followed, with some variations, in all the London schools under the poor-law; and a neighbouring school, belonging to Lambeth, will march down here with their band at half-past two, and give you a specimen of their drill and musical capabilities."

The following additional information, relative to the origin and objects of these district schools, has been furnished by Mr. G. C. T. Bartley:—

To many persons the origin and object of these district schools, as they are called, is quite unknown, and as they are either doing a great work for good or evil on the future aspect of the country, it would be well if every person at all interested in education, and also each one who studies the great question of crime, were acquainted at least broadly with their working and success.

In the first place, everybody is aware of the fact that in each district of the country a workhouse is found for receiving the destitute under certain conditions. Among the persons who inhabit these workhouses many have children, and further, orphan and deserted children are sent as a matter of course to be there brought up. The State has provided this for centuries, and for many years she has also provided that these children should be educated, and, if possible, depauperised. Schools were formed in the union houses, but with little or no good till about the year 1838. After the New Poor-law system had come into operation, a report on the subject led to considerable alterations and improvements.

Among the suggestions in this report was one which may be considered as having been the commencement of district schools. The great object of all education and training is, of course, to make the children develop into men and women, able and willing to earn their own livelihood. While they lived in the workhouse this was found to be impossible; their associations were bad, they came out tainted with a name almost as bad as that of crime, and all the education in the world did not seem to get them out of the rut in which they had sunk by no fault of their own. It was proposed, therefore, to establish large schools of these children, by mixing together a certain number of unions, and by thus removing them from the influence of the habitual workhouse bird, and giving them a chance in life as little associated as possible with their antecedents, or rather with the antecedents of their parents. Such institutions have since been formed, and, for want of a better name, have been called school districts.

A school district must, therefore, be understood to be a combination of several unions for the education of the pauper children who are inmates of the workhouses of those unions. Several legislative reasons have prevented their rapid increase, and there are at the present time strictly only six of these schools, situated as follows:—

1. Hanwell provides for 1,200 children.
2. Farnham „ 131 „
3. North Surrey „ 724 „
4. Reading „ 124 „
5. South-East Shropshire 165 „
6. Sutton „ 1,150 „

Several are at present either in course of erection or under the consideration of the guardians.

The management of these schools is vested in a board, which is composed of gentlemen elected by the different unions which have combined to make up the district.

The duty of this board is to look after the school, and they have not the usual parish duties to trouble them; consequently, they are, as a board, much more fitted for superintending an educational establishment than in the case of an ordinary workhouse school, where attention to the children is merely a part of the general work of the collective parish board.

Although it has been said that this board has the management of the school, this is not strictly the case, as without the Poor-law Board it has little or no power. Changes in the school of all kinds have to be referred to the Poor-law Board, and the inspector of that government department visits the school, and contributions from the public exchequer are made towards the expenses of certain teachers and other persons employed. The whole cost of the institution, with this exception, is paid by the unions in connection, in proportions varying according to the size and population of each union, and the number of children drafted from it.

Such, then, is an outline of the plan of working these district schools, and the North Surrey school district may now be briefly considered.

The district embraced by this institution, as its name implies, is that south-west of the Thames, and includes the unions of Croydon, Kingston, Lewisham, Richmond, and Wandsworth and Clapham, to which has been added Chelsea. These six unions comprise thirty-six parishes, and although there are some remarkable specimens of lowness of type in the children, yet, as a body, they are certainly superior to those in some of the other districts, as, for instance, at Hanwell. This is, no doubt, accounted for by the fact that these unions, with the exception of Chelsea, are to a certain extent rural, and the criminal element is not so strong as in the more neglected parts of the heart of the city, from which locality the children at Hanwell are chiefly imported.

When brought from the workhouse, the children, who vary in age from two to fourteen, are placed in the receiving ward, where they remain until all chance of their containing the germ of some contagious disease is ascertained. This arrangement for the health of the school is most salutary, or rather essential, for it must be remembered that these children are oftentimes in a most deplorable state, and a large per-centage have to be removed to the infirmary, and their physical powers somewhat restored, before anything in the way of mental training can be attempted.

By dint of care and attention, tepid baths, physical training, and drill, most remarkable results are obtained. Many, judging from their emaciated appearance, it might be supposed only entered the school to die, yet it is a fact that out of the 800 children who are now on the books—for the school is over full—there have only occurred three deaths during the last twenty-two months.

Such, then, is the work of the school from a sanitary point of view, and this, it must be remembered, is no slight portion of its work, for, even if it stopped here, the result would be important, as preventing the spread of the diseases which the children so often bring with them.

The course of training at the school is necessarily dependent somewhat on the health of each child. The system is entirely that of the half-time, that is, one day of six hours at mental study (this six hours of course broken by meals and recreation), and on the alternate days ten hours are devoted to physical exercise, as drill, digging, farming, carpentering, shoemaking, tailoring, music, singing, &c.

Music and singing are regarded by Mr. Tufnell, the Poor-law Inspector, as the most important means of softening these rough natures, and consequently all are taught vocal music, and those who show any taste are instructed in the use of some instrument. By this means, a large number are annually sent out to the military bands of the army. The part-singing is excellent, and no one can watch the faces of the children when all are joining in some simple song without being impressed with the truth of Mr. Tufnell's opinion of this as a humanising medium.

The drill is a great feature in the school, and to its proficiency must be attributed a large portion of the success of the children. Unaccustomed to control and the instant obedience of orders, it initiates these principles in perhaps a less galling manner than any other, and at the same time adds quickness, smartness, and tone to a regiment of boys and girls who are peculiarly deficient in these qualities.

The mental training of the children includes the usual elementary instruction in reading, writing, arithmetic, and drawing, in which branch considerable proficiency is attained, a few cases even showing that latent talent of promise lies dormant in several of these rough exteriors.

The staff of the school is, as in all such cases, appointed and paid by the board, subject to the approval of the Poor-law Board. It depends on the chaplain and superintendent to direct the working of the school, and as these officers are men of great energy and ability, as is also the head master, the work is performed in a highly satisfactory manner.

In addition to the head master and mistress, there is an assistant to each, and seven pupil-teachers, together with all the staff of mechanics and industrial teachers necessary for instructing and directing the children in their various physical occupations.

During the last few months a discussion has taken place concerning the advisability of discontinuing the present system of pupil-teachers, who rise from the children in the schools, and appointing in their place a smaller number of assistant masters and mistresses. The chaplain, in a letter addressed to the board, and published by it, gives strong reasons in favour of continuing the present system, whilst the clerk to the board urges a change, on account of its economy and efficiency. It would seem probable that the right course would be to continue the pupil-teacher system, modified as explained in the superintendent's letter, also published by the board, this modification, which has been tried at Hanwell with success, being to take the pupil-teachers from a superior class, such as the children of the officers in the institution or tradesmen in the neighbourhood, and not select them from the regular inmates of the school. These children are softer in manner, have the advantages of parents' and home influence, and are not so likely as the district school child to be despotic and tyrannical when given a little authority.

The cost of the schools is a point which enters largely into the minds of all who are interested in the scheme of reforming pauper children, and, as nearly all is paid directly by the unions, these bodies keep a jealous watch over the details. In spite of this, it is a fact that in most cases more is spent than should be, this particular school costing the ratepayers about £20 per head per annum, while the one at Hanwell costs about half as much again. By very careful management it seems possible to reduce this lower sum about 25 per cent., as has been done in a large school of a somewhat similar description at Liverpool.

Finally, the result of these schools must be considered in balancing their actions. Under the old workhouse-school plan very nearly all the children returned to the gaol or the parish; in fact, they often learned their business as thieves in the recreation time between their school hours. The returns kept from these district schools, however, show a different result. It has already been mentioned that every child is kept on the books for at least two years after leaving, and is visited by the chaplain, who finds that the number who go wrong is remarkably small.

Such, then, is a brief outline of the origin and working of the school district system, and few will probably doubt of its success after personally investigating any one of

these institutions. Were it extended so as to embrace the 300,000 pauper children under sixteen years of age who are at this moment growing up in England and Wales without any sort of training or teaching, it must create social changes greater and more lasting than it is easy to appreciate.

Commerce.

Commerce of France.—The official accounts of the outer trade of France, during the first four months of the present year, exhibit the following results:—The imports amount to 934, against 1,068, millions of francs in 1868, which latter is superior to the amount of any other year. The imports of 1868 were largely increased by the demand for cereals; these being deducted, leave a total of only 894 millions, or 40 millions less than the total of the four months of the present year. The exports of the same period amounted to 1,052 millions, being 151 millions more than those of 1868, but 100 millions less than in 1866. Examining the items of the accounts, we find that less meat and bread-stuffs came into the country this year than in 1868; raw materials were almost precisely the same, while manufactured products show an excess of 17 millions of francs. This excess was made up principally of silk, woollen, cotton, and other tissues, and straw plait and hats. The increase in the exports was made up of manufactured articles and agricultural products in nearly equal quantities. Textile fabrics, prepared skins, tools, and several other items show progress, some of them in a remarkable degree; thus articles of fashion and artificial flowers show an increase of 500 per cent. since 1861. Wine shows a large increase, the exports amounting to 108 million francs this year. Butter, eggs, hops, and some other agricultural products also show a large excess. The precious metals show an import of 220 millions against an export of 147 million francs. The indirect taxes show an increase of six million francs in the four months — the customs showing an increase of two millions; the taxes on fermented liquors, four millions; and tobacco, two millions; while the tax on home-made sugar shows a diminution to the extent of two millions. But the income from French and foreign sugars, taken together, amounted this year to 35 millions, against 34 millions in 1868.

Colonies.

Public Works in New South Wales. — Some important public works to be carried out in the neighbourhood of Sydney have been sanctioned by the Colonial Parliament. Perhaps the most noteworthy of these is the construction of a railway wharf at the head of Darling Harbour. The sum of £25,000 has been voted for this work, with an additional £10,000 which will be required for steam-cranes, &c. It is intended that the front pier supporting the wharf shall be tubular cast iron screw piles, those at the back being of wood. When the work is finished it is expected that it will place at the disposal of government from 16 to 18 acres of land, which will be available for railway and other purposes. At present the railway is about a mile from the principal wharf of the city, and there are no facilities for immediate trans-shipment of goods to the railway. When, however, this work is finished, the produce of the southern and western interior may be brought by railway direct to the seaboard, and, on the other hand, the consignments of goods arriving at Sydney for the country will be forwarded direct to their destination, without the damage, delay, and expense of cartage through the city. The increased trade which the completion of the present lines of railway may be expected to bring to the city, will make this wharf accommodation of the utmost value.

Flax in New Zealand.—A Nelson paper says:—"The general depression of affairs in New Zealand is inducing persons to turn their attention to long-neglected industries, which are now found to return fair remuneration to capital and labour. The foremost of these is the dressing of flax, which in Canterbury is exciting a good deal of attention, and improved machinery for preparing the fibre is likely to be introduced. Although the quantity of flax growing in Nelson is not so large as in many provinces of New Zealand, there are districts which could well find employment for a few of these machines, which are very simple in construction, and capable of turning out a large quantity of fibre, said to bring a highly remunerative price."

Notes.

The Paris Savings Bank.—The report relating to the Banque d'Epargne of Paris for the year 1868, gives a satisfactory impression of the condition or of the economy of the working classes. The amount of money in the bank on the 1st of January was 49,702,348 frs., and on the last day of the year it amounted to 52,591,933 frs.; this increase of 2,700,000 frs. was not, however, so large as that of 1867, when it reached 3,300,000 frs. The number of depositors increased in the course of 1868 from 260,750 to 266,239. The amount paid into the bank exceeded 22,000,000, nearly a million over the receipts of 1867, and the number of new accounts opened was 37,393, or 2,254 more than in the preceding year, while the average of the deposits rose from 86 to 92 francs. The number of accounts closed was 30,934, less by 6,459 than than that of new ones opened. The interest on deposits amounted during the year to 1,613,762 francs. The population of Paris is 1,800,000; and dividing by this number, we find the amount in the savings bank to have been equal to about 23s. 4d. per head of the entire population, and the deposits during the year to nearly 10s. per head; comparing, however, the amounts in the bank at the beginning and end of 1868, the increase is only equal to about 16d. per head on the average. The Emperor has appointed a commission to inquire into the best means of extending and improving the Banque d'Epargne; and the directors propose that a higher maximum than the present one of 1,000 francs shall be allowed to depositors.

Paris Omnibus Company.—The report of the Paris Omnibus Company for the year 1868 gives the following information:—The company employed 694 carriages, of which 682 ran over a distance of rather more than 57 miles a-day on an average, and of which the receipts amounted to £3 7s. per day. The average number of horses in the stables was 8,227; each omnibus employed twelve horses per day, and each pair of horses performed a distance of ten miles within a fraction. The number of passengers carried during the year was 113,348,041; of these 50,000,000 rode outside, and upwards of 64,000,000 inside; 18,500,000 took advantage of the system of correspondence tickets. The company possesses 43 depots and four building establishments. There are thirty-two lines of omnibuses, of which one quarter do not cover their expenses. The controllers, conductors, and drivers are paid according to a scale which rises with time of service. The controllers are divided into three classes, and receive from £48 to £80 a-year; the conductors and drivers receive each 4 francs a-day during the first year, 4 fr. 25c. for the second, 4fr. 50c. for the third, and 5 francs afterwards. The secret inspection to prevent fraud is said to cost the company £2,500 per annum. The expenditure of the company amounts to more than £2,000,000 sterling per annum, of which £320,000 is expended on the omnibuses and horses.

MEETING FOR THE ENSUING WEEK.

Wed ...Aeronautical, 8 (at the Society of Arts).

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb.

Delivered on 24th June, 1869.

156. Bill—Sea Fisheries Act (1868) Extension.
169. ,, Bankruptcy (as amended in Committee, and on Re-commitment).
170. ,, Sunday and Ragged Schools (amended).
171. ,, Fines and Fees Collection (amended).
276. County Financial Boards—Return.

Delivered on 25th June, 1869.

174. Bill—Suburban Commons.
176. ,, Stipendiary Magistrates (Deputies).

Delivered on 26th June, 1869.

96. Bill—Courts of Justice Salaries and Funds.
257. Shipping—Returns.
271. Foreign Import Duties—Return.
279. Informations, &c.—Return.
Public Petitions—Twenty-fifth Report.

Delivered on 28th June, 1869.

173. Bill—Poor Law (Ireland) Amendment (No. 2).
178. ,, Assessed Rates (as amended in Committee, and on Re-commitment).
81. (v.) Railway and Canal Bills—Sixth Report.
273. New Law Courts (Sites)—Report.
274. New Law Courts—Report.
Money Orders (Great Britain and Belgium)—Convention.

Delivered on 29th June, 1869.

175. Bill—Special and Common Juries.
179. ,, Imprisonment for Debt (as amended in Committee, and on Re-commitment).
170. Weights and Measures—Return.

Delivered on 30th June, 1869.

182. Bill—High Constables' Office Abolition (amended).
184. ,, Shipping Dues Exemption Act (1867) Amendment.
46. (iv.) Trade and Navigation Accounts (31st May, 1869).
185. Metropolitan Police—Accounts.
281. Election Commissioners—Returns.
285. Gold Currency—Report.
Public General Acts—Chap. 14 to 22.

Delivered on 1st July, 1869.

185. Bill—Medical Officers Superannuation (Ireland) (amended).
186. ,, Railways Abandonment.
187. ,, Pensions Commutation.
200. Hungerford-bridge and Wellington-street Viaduct—First Report and Evidence.
284. Sea Fisheries Act (1868)—Report.
Bank of Bombay—Report of the Commissioners.
Water Supply—Report of the Commissioners.
Public Petitions—Twenty-sixth Report.

Delivered on 2nd July, 1869.

278. Mortality (Barking, &c)—Returns.

Delivered on 3rd July, 1869.

189. Bill—Dublin Freemen Commission.
190. ,, Fisheries (Ireland).
167. (ii.) Trade Accounts (Foreign Countries).
283. Army (Supersession of Colonels)—Report.

Delivered on 5th July, 1869.

64. Bill—Steam Boilers Inspection.
192. ,, Local Government Supplemental (No. 2).
193. ,, Inam Lands
251. East India (British Burmah)—Return.
275. Coventry Election—Minutes of Evidence.
Public Petitions—Twenty-seventh Report.

Patents.

From Commissioners of Patents' Journal, July 2.

Grants of Provisional Protection.

Animal and vegetable substances, preserving—1893—M. Olsson.
Bands, fasteners for—1864—W. McNabb.
Boots and shoes—1867—C. and E. Brightman.
Camera obscuras, portable sketching—1913—H. T. Munns.
Carriage wheels—1900—W. R. Lake.
Carriages, axle-boxes for the wheels of—1876—G. Molland.
Cereals, &c., treating—1897—A. Manbré.
Cloth, &c , rendering waterproof—1903—J. Martin.
Cooking ranges, &c.—1875—J. Napier.
Drilling machines—795—W. R. Lake.
Fire-arms, &c.—893—F. J. Manceaux.
Furnaces—1901—T. F. Cashin and J. Green.
Furnaces, supplying with fuel—1910—R. R. Kelly.
Gas regulators—1922—H. A. F. Duckham.
Glass, &c.—1825—P. Jensen.
Grain, drying, &c.—1895—A. J. Glas.
Hammers for forging metals, &c.—1781—H. W. Hammond.
Hydraulic or steam cranes—1898—P. G. B. Westmacott.
Indigo presses, &c.—1892—R. Olpherts.
Iron and steel—1890—E. H. C. Monckton.
Kettles, &c., handles of—1877—W. Topham, jun., and S. Wells, jun.
Lamp shades, &c.—1872—J. G. Tongue.
Land, machinery for tilling—1891—S. Nicholls.
Letter-printing machinery—1831—F. C. Bakewell.
Letters, &c., device for holding—1881—T. Silver.
Locks and latches—1878—M. Andrew.
Locomotion, mechanism applicable to—1894—W. Pidding.
Looms—1882—J. Bullough and C. Catlow.
Mail bags, &c.—1863—J. Harding.
Microscopes, binocular and stereoscopic—1883—S. Holmes.
Mines, &c., apparatus for indicating signals in—1904—G. Musgrove.
Mortising machines—1829—M. Benson.
Paper, &c., treating wood for obtaining fibre for the manufacture of—1790—G. Fry.
Picks, adzes, &c.—1865—J. H. Johnson.
Ploughs—1907—J. C. Norman.
Railway carriages, apparatus for moving—1880—E. Haas and V. Wanostrocht.
Safety lamps—1921—A. M. Clark.
Semaphore signals, &c.—1902—C. D. Abel.
Sewing machines—1751—F. Hohmann.
Ships—1854—E. Cardon.
Ships, &c.—1679—D. Evans.
Ships, &c., affixing sheathing to—1896—B. Bell.
Show cases and fancy boxes—1886—H. Bauerrichter.
Steam engines—1899—W. R. Lake.
Steam generators, injectors for feeding—1916—J. H. Johnson.
Steam rollers, &c.—1914—R. Moreland, jun., and D. Thomson.
Stuffs, machines for callendering—1918—A. J. Deblon.
Sugar—1866—J. H. Johnson.
Throstle frames, &c., drag motion applied to—1873—I. Gregory and E. Ainsworth.
Tin plates, apparatus for cold rolling iron for—1909—J. I. Evans.
Tobacco pouches, &c.—1885—A. S. Harington.
Typographical composing and printing—1912—M. Henry.
Velocipedes—885—F. Rudrum.
Velocipedes—1871—T. Bourne.
Velocipedes—1889—F. Forder and J. Traves.
Velocipedes, &c —1870—S. Adams.
Vessels, cleaning the bottoms of—1917—D. B. Park.
Vices—1908—G. M. Harris.
Weights and strains, apparatus for ascertaining—1887—C. E. Brooman.

Inventions with Complete Specifications Filed.

Carding engines—1929—J. Taylor, R. & J. Ingham, and J. Sharples.
Yarns, twisting—1923—R. Counce and M. G. and B. Bradley.

Patents Sealed.

24. L. Hannart.
26. W. Prosser.
27. E. W. and J. Voce.
29. J. J. Hays.
30. J. Balbirnie.
36. S. Remington.
42. K. Walter.
43. A. Tyler.
45. G. Eveleigh.
50. F. R. A. Glover.
65. M. Wilkin and J. Clark.
67. W. E. Gedge.
70. M. Saunders & H. Forrest.
118. A. M. Clark.
154. N. Voice.
159. G. R. Postlethwaite.
739. A. Moncrieff.
960. H. Y. D. Scott.
1081. R. J. Morison.
1200. H. Y. D. Scott.
1260. J. Major, W. Wright, and G. H. Jones.
1430. W. R. Lake.

From Commissioners of Patents' Journal, July 6.

Patents Sealed.

3739. G. Cooper and J. Cotterill.
60. R. Wigram.
63. T. B. Sydserff.
71. E. Gray.
80. J. Petrie.
86. C. McDougall and C. H. Eden.
89. A. P. Price.
91. Sir F. Sykes.
104. J. Schlösser.
111. T. Mortlock.
121. C. H. Lea.
146. W. Thomas.
150. W. R. Lake.
164. A. M. Clark.
186. H. A. Bonneville.
206. A. Maw.
212. W. Burgess.
246. C. Gil.
248. C. Mather.
366. C. G. Hill.
472. B. J. B. Mills.
570. W. A. Ives.
89. F. Brady.
915. W. R. Lake.
1098. J. Hynam.
1404. G. N. Mansfield.
1408. J. G. Tongue.
1409. F. C. Knowles.
1426. W. E. Newton.
1431. H. Bessemer.
1432. H. Bessemer.
1433. H. Bessemer.
1434. H. Bessemer.
1435. H. Bessemer.
1452. P. W. and W. Flower.

Patents on which the Stamp Duty of £50 has been paid.

1735. J. Imray and J. Ellis.
1775. T. Sager and T. Richmond.
1793. C. Harvey.
1880. W. Clark.
1776. J. Brotherton.
1790. C. Heptonstall.

Patents on which the Stamp Duty of £100 has been Paid.

1918. C. Lungley.
1935. G. Bedson.

Journal of the Society of Arts.

FRIDAY, JULY 16, 1869.

Announcements by the Council.

Council Meeting.

At the meeting of the Council on Monday, the 5th inst., Lord Henry G. Lennox, M.P., was unanimously re-elected Chairman of the Council for the ensuing year.

Designs for Channel Steamers.

The very defective state of the accommodation afforded by the Channel steamers, plying between this country and the Continent, having been brought under the notice of the Council, they have determined to offer the Gold Medal of the Society, and the large Silver Medal of the Society, for the best and the second-best block model of a steamer, which shall afford the most convenient shelter and accommodation to passengers on the deck of the vessel crossing the Channel between France and England. The steamer is not to exceed in tonnage and draught the best vessels now in use between Folkestone and Boulogne, and the model must be on a scale of a quarter of an inch to a foot. The models, marked in cypher, are to be sent in to the Society of Arts' House, John-street, Adelphi, on or before the 1st November, 1869, with a sealed envelope, giving the name and address of the designer.

The Council reserve the right of withholding either or both medals, in case, in their opinion, the models sent in do not possess sufficient merit.

The following particulars of the South-Eastern Channel steamers, *Victoria, Albert Edward,* and *Alexandra,* are given for the convenience of competitors, but it is not intended to confine the designs to them, except as to tonnage and draught :—

Length between perpendiculars, 200 ft.
Breadth of beam, 24 ft.
Depth underside of deck amidships, 12 ft. 6 in.
Draught of water, 7 ft.
Bow, clipper.
Stern, elliptic.
Rig, polacca with two masts, lug foresail, gaff mainsail, staysail, and flying jib.
Engines, oscillating.
Paddle wheels, 17 ft. 6 in. diameter.
Tonnage, 568 tons.
Speed, 17 miles an hour.

Subscriptions.

The Midsummer subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

India Committee.

DEPUTATION TO THE SECRETARY OF STATE FOR INDIA.

At a meeting of the Committee, held June 17th, the following resolutions were passed :—

"That the Council of the Society move the Indian Government to offer a money premium for the best manual on "Tea Cultivation," affording the greatest information to the intending planter.

"That the Council of the Society move the government of India to take steps for providing, by means of a Department of Agriculture or otherwise, for the diffusion of information and for the encouragement of productions, after the manner of France and other countries. The subjects to which such recommendation would more particularly apply are:—Information regarding waste lands and the opportunities for acquiring or renting them; the various methods of agriculture which are or might be adopted in India; agricultural results and statistics; the use of manures; the cultivation of tea, coffee, cotton, silk, wool, and the other staples.

"That a deputation wait on the Secretary of State for India, with a view to urging such recommendation."

His Grace the Duke of Argyll received the deputation from the Council and India Committee on Tuesday, the 13th inst., at three o'clock. The deputation was introduced by Mr. Thomas Bazley, M.P., and consisted of Sir Charles Wingfield, M.P., Major-General Clarke, Colonel Haly, Captain Thackeray, Dr. Archibald Campbell, Messrs. Edwin Chadwick, C.B., Briggs, Hyde Clarke, J. Cheetham, jun., Maxwell Turnbull, Frederick Hendriks, W. S. Thompson, Andrew Cassels, J. Meppen, and Thomas Login, C.E., with the Secretary and Assistant-Secretary of the Society.

Mr. Thomas Bazley, M.P., in introducing the deputation, remarked that it was no new-born zeal which had actuated the Society of Arts in this matter, the Society having for many years been desirous of improving the general condition of British India, which it conceived could best be done by developing its agricultural resources. His Grace being so fully aware of the necessities of India, it was not necessary to trouble him with a detailed repetition of them, but he might refer to the matter of seed cotton, as being one of great importance. Any system by which sound, good seed could be furnished to provinces where it was known to be defective, could not fail to be of great advantage, particularly as his own examination of Indian seed this year proved to him that a great deal of it was shrivelled and feeble, showing great want of vitality. He did not think one-tenth of what had come under his own observation was really sound, good seed. This was seed sent to England for mercantile purposes. The great cause of bad seed he believed to be lack of nutriment in the soil for the proper growth of the plant, which probably might be remedied by the use of suitable manures. He was not there simply to advocate the encouragement of cotton-growing in India, but also of sugar, tea, coffee, flax, grain, and other things, which might be produced with great advantage both to the cultivators in that country, and to manufacturers in England. He could not, however, forbear mentioning

the lamentable news received this week of the comparative failure of the cotton crop in India.

The Duke of Argyll inquired what part of India the report referred to.

Mr. Bazley said he had only received information by telegraph, and the locality was not mentioned. He should state that Lancashire still remained in a state of great distress, capital was continually diminishing, and the working-classes were still suffering great privations with a wonderful degree of patience. Nothing could remedy this state of things but an increased supply of the raw material. American cotton was now 12¾d. per lb., and good Indian 10½d. to 11d., which was nearly double the ordinary price before the American war. He was glad to find that the ryots were now beginning to reap some benefit from this advance in price, which, for a considerable period, they did not do. Indeed, an agent of the Manchester Cotton Supply Association found, two years after the commencement of the civil war in America, that in some parts of India that fact was still unknown. He felt convinced that if the government turned their attention to the development of agriculture in British India, it would have the most important results, not only in that country, but at home; and before concluding he might mention that at the various meetings which had been held recently under the auspices of the Society of Arts, the conviction seemed pretty general that more canals, roads, and means of irrigation were the main instruments required for developing the great natural resources of British India. With reference to the tea-cultivation he was able to state, from his own experience, that the commercial failure which had attended the operations of many tea companies arose solely from appointing as managers gentlemen who were, unfortunately, totally ignorant of agriculture in general, or the growth of tea in particular. He felt certain that his Grace would favourably entertain the application he now made, and that his powerful aid would ensure the success of any well-considered scheme for obtaining the objects sought.

Sir Charles Wingfield, M.P., said he had accompanied the deputation, believing that the information asked for on the subject of the different productions of India would be most useful, and that it did, in fact, exist in the records of the different governments, and only required collating and digesting in order to be made available. The dissemination of knowledge of that kind could not fail to be useful, and he believed it would be very acceptable; he also thought the establishment of a department of agriculture a matter well worthy the consideration of the government. If such a thing were determined upon, a certain number of new officials would be required as inspectors or something of that kind, for the servants of the government were already over-weighted by their regular duties, besides being deficient in the special knowledge requisite. Having conducted a great many agricultural experiments, he was in a position to speak as to the great blunders which inexperienced persons might easily make in such matters; and the natives being dependent on their crops for the payment of the revenue, it would be unjust to induce them to undertake the cultivation of articles which might not prove profitable. With regard to tea-cultivation, he was quite satisfied that the failures had arisen almost entirely from the inexperience or dishonesty of the persons who were entrusted with the management. The tea cultivation itself was not a failure, but most of the companies which had undertaken it had been ruined, the plantations being then sold to persons on the spot, who looked after them better. There might have been some little difficulties connected with the labour question, but he did not think they could have affected the result to a greater extent than five per cent. on the profit and loss account. In conclusion, he thought it right to add that, at some of the Society of Arts meetings, strictures had been passed upon the conduct both of the home and Indian governments for a series of years, but he had been obliged to state his conviction that such strictures were undeserved. He was quite certain that there never had been, on the part either of the home or Indian governments, any desire to throw any obstacles in the way of developing the resources of the country, but, on the contrary, every wish to encourage, as far as possible, the growth of cotton and any other agricultural staples which it was capable of producing.

Mr. Hyde Clarke, as acting Chairman of the India Committee, begged leave to support the statement of Mr. Bazley. He hoped in a few days to be able to lay before his Grace, in a convenient shape, the reports of the conferences which had recently been held on this subject. The Society had exerted itself with a view to promote information on these matters in India, and had offered a medal on the subject of tea-culture. It appeared to the Committee that the government might constitute a department of agriculture for India, to act in a similar manner to the Minister of Agriculture in France and in other countries in Western Europe, not interfering with, but supporting, local improvements as far as possible. India, of course, was in a very different position to England or the United States, where parties were able to form local voluntary societies, but the Agricultural and Horticultural Societies had done a great deal of good in this direction. The Committee, therefore, begged leave to suggest that there should be a system of assisted exhibitions, such as the government had already begun in some parts of India, with a view to promoting and stimulating agriculture. They ventured to think that the government would be justified in so doing, inasmuch as it derived so much of its revenue from the land-tax, so that really any expenditure of money in this direction would, sooner or later, be reproductive. One great object to be borne in mind, of course, would be to relieve the present servants of the government from many of the demands made upon them, for every one who had had any special experience knew that it became a very burdensome tax on officials to be called upon to assist in the cultivation of cotton or tea, of which probably they were entirely ignorant. It was hoped, however, that by a greater division of labour, and by the application of European intelligence, the government of India would be able more effectually to attain the great ends which they had in view.

Mr. Edwin Chadwick, C.B., said he attended as a member of the Council of the Society of Arts, who he believed had been of great service in bringing together the large consumers of tea, cotton, and other commodities, and those who had struggled with the difficulties of producing these commodities in India. There was one topic bearing upon agriculture on which he had some special information, viz., the question of irrigation, and with respect to that he believed it would be of essential service to India if the results of experiments which were constantly being made in England and in other parts of Europe as to the application of sewage to irrigation, and so on, were systematically published in India, so as to prevent what he knew to be the case at present, experiments which had already failed in the West being repeated in the East. Most important alterations and improvements were now going on in France, which were well worthy attention. But even if only those methods which were unsuccessful were made known in India, it would be a source of great economy, and would be the first step towards arriving at perfection. For instance, one mode of irrigation which had been prevalent in Europe was one that created marsh surfaces, and that had been carried on to an enormous extent in India, so much so that the line of one large canal could be traced by the mortality of the people living near it. From his own private information, he was enabled to state that important experiments were now being conducted in Italy on this subject, and it would be very desirable that the results of all such should be systematically collected and transmitted to the East.

Dr. Archibald Campbell said he had been asked to say a few words on the subject of tea-cultivation in

India. There could be no question that, as regards quality, the experiment had been eminently successful, and the quantity was only limited by the amount of labour that could be procured, in order to send it to England at a remunerative price. The government, after nearly twenty years' efforts to bring it fairly before the public, in the course of which it was clearly proved that it could be grown well and advantageously, had withdrawn from the cultivation; and notwithstanding the efforts made by the Agricultural and Horticultural Societies to aid in developing this branch of industry, he believed there was abundant room for the action of such a department as had been recommended by Mr. Bazley and Sir Charles Wingfield. The recommendation that a money prize should be offered for the best essay on tea-cultivation, though of secondary importance, would also, in his opinion, be highly useful.

The Duke of Argyll, in reply, said the suggestions which had been made were of considerable importance, and appeared well worthy of consideration. There was no doubt whatever of the immense benefit which had been derived in this country even, from the establishment of voluntary agricultural societies. The Highland Society had had a very powerful effect upon the agriculture of the country, and the corresponding society in England had also done a great deal of good. He was afraid there were not the same materials in India for getting up a purely voluntary association of such a character, but the intelligence and education of the native princes were now so much improving, that he was not at all sure that, with some assistance from the government, some such organisation could not be established, and perhaps that would be the best way of setting about it. He would, at any rate, communicate with Lord Mayo upon the subject immediately. From what had been said by the gentlemen who had addressed him, he did not conceive that the present application was made in any spirit of accusation of the government of India, and certainly he was not about to take an apologetic tone; but it so happened that, having been examining certain statistics with a view to a financial statement, he found that in the decennial period since the mutiny, the purely agricultural products—exclusive of opium, which, being a government monopoly, and in other respects exceptional, he omitted—had increased nearly £23,000,000 in declared value. A very large proportion of this amount represented cotton, for in one year the amount was £18,000,000, and in another year it was still more. The export of grain had also largely increased, showing that the agricultural prosperity of India was rapidly progressing. Then, there were several items which were comparatively new, as oil-seeds, wool, coffee, tea, jute, all of which had only appeared in any quantity since the mutiny, but they now figured for about two and a-half millions. This comparison was not taken in any extraordinary year, but represented the increase in the last year, for which they had complete returns, 1866-7, over the year before the mutiny, 1856-7. If an exceptional year were taken, when the stimulus of extraordinary prices operated, the result would be still more astonishing, for during one year of the American war, the increase of exports was £27,000,000, the total amount being £41,000,000, of which £34,000,000 represented cotton alone. With regard to tea-cultivation, that might be said to be entirely the child of the government, but they had now, he believed, got rid of all their plantations, and left the matter in the hands of commercial men, who would no doubt conduct it to much greater advantage. He was sorry to hear of the failure of so many of the earlier enterprises in that direction; but unfortunately that was too often the case in any new branch of industry, railways or otherwise—the first projectors were ruined, but the country gained the benefit. As far as he could judge by the returns before him, the production of tea was steadily increasing.

Mr. Bazley remarked that the quality of Indian tea was superior to any obtained from China.

Mr. Hyde Clarke desired to add that Mr. Dickins, the president of the Silk Supply Association, and Mr. Cheetham, the president of the Manchester Cotton Supply Association, had been much indebted to his Grace for information afforded to them; but, in order to do any real, lasting good, there must be a systematic following up of the subject in some such way as that which had been suggested.

The Duke of Argyll inquired if it were not the fact that sufficient knowledge existed in India to ensure average crops under ordinary conditions.

Sir Charles Wingfield said there was sufficient knowledge, it only required the stimulus of high prices to increase the production. There were a great many subjects on which there were abundant statistics, if they were made generally available, as, for instance, the growth of sugar and the quantity produced per acre. Again, after the Russian war, an inquiry was set on foot as to the growth of jute and other fibres, the cultivation of which had since been much increased in every district of India, and a great deal of information had been collected on the subject of silk cultivation, which was carried on for three years in the province of Oude, and abandoned, simply because it was found that the dry heat of April, May, and June was destructive to the insect. There was an immense fund of information in the records of the different governments, which only needed collating and editing.

The Duke of Argyll said that such a course would be likely to save the expense of unsuccessful experiments being repeated.

Mr. Chadwick said that was exactly what he referred to with regard to irrigation. Unfortunately, in England, most of these works were carried on by engineers who were not agriculturists, or by agriculturists who were not engineers.

Sir Charles Wingfield remarked that the canal before referred to by Mr. Chadwick as causing malaria, was one of the ancient Mogul canals, which had been re-opened.

The Duke of Argyll said he was very sorry to find that the season had been very unfavourable in India, and that, but for the constant action of the government, thousands of people must have died. In the central district alone, by the last accounts, about 14,000 persons were actually supported by the government, on what were called relief works. In dismissing the deputation, he repeated his intention of immediately communicating with Lord Mayo on the subject which had been brought under his notice.

Meeting.

On Monday afternoon, the 5th instant, at 4 o'clock, p.m., a meeting took place in the Society's Room, when a paper "On the Limits to be placed upon Posthumous Dispositions to Public Uses," was read before the members of this Society, and the members of the Association for the Promotion of Social Science, by Arthur Hobhouse, Esq., Q.C. The Right Hon. Lord Stanley, M.P., presided.

ON THE LIMITATIONS WHICH SHOULD BE PLACED ON DISPOSITIONS OF PROPERTY TO PUBLIC USES.

By Arthur Hobhouse, Esq., Q.C.

It has occurred to me to speak twice in public on this dry subject, and I shall make no apology for briefly recapitulating what has been said before, because it forms a necessary introduction to that which I have now to say.

The first address* dealt principally with the past, and

* "Lecture on Charitable Foundations, delivered at Sion College, 12th March, 1868." Booth, 307, Regent-street.

was mainly an historical answer to the question,—"How did we arrive at our present standpoint?" The second* dealt principally with the present, and aimed at answering the question,—"What is our present standpoint?" Before I sit down to day, I shall attempt an answer to the much more difficult and conjectural question,—"At what ought we to aim for the future?"

Indeed, each of these questions is inseparably bound up with the other two; nor have I done so idle a thing as to attempt the treatment of one without trenching on the others. The bearing of the past cannot be traced without an exhibition of the present and some forecast of the future. The position of the present cannot be explained without examining its two out-looks—the retrospect and the prospect. And to make plans for the future without an accurate analysis of that which is, and at least some study of that which has been, is a rash proceeding likely to result in failure.

The first thing I endeavoured to show was, that whereas the English nation has been keenly alive to the mischiefs of perpetual settlements in other cases, and has, in ways more or less orderly, defeated them, it has, from a variety of causes, allowed to founders of what are called charities, in other words, to settlors of property to public uses, a power of posthumous disposition, unlimited in point of time, and almost unlimited in range of object. This power has, like other arbitrary and excessive powers, been used with little self-denial, little public spirit, and more especially with little wisdom. It has been used selfishly and blindly, according to the ordinary passions and capacities of ordinary men. Yet we have chosen to remain in bondage to the fetters which men no wiser nor better than ourselves, and long since dead, have forged for us. I have endeavoured to trace out the causes of this singular phenomenon; have combated what I think the unreasonable and superstitious regard for the commands of persons who have shown no claim to be regarded beyond their fellows; have denied the right (apart from positive law) of any human being whatever so to enforce his will on posterity; have contended that the positive law which does in this country allow such extravagant power should be altered, and that the management of property should be resumed by those who alone can either manage or enjoy it, viz., the existing generation of men; endeavouring to express my doctrines in this simple formula—that property is not the property of the dead but of the living.

My next proposition was, that we are making no substantial progress towards sounder views; and for the proof of this I relied principally on the evidence afforded by the various essays at legislation on this subject for some years past. One object in doing so was to controvert an opposite opinion expressed by Mr. Mill—an opinion which was calculated to stop all exertions in the direction of progress, and, indeed, to turn them backwards, as it appears to have done in his own case. Mr. Mill thinks that people at large are sufficiently convinced of the impolicy of perpetual settlements to public uses, and that now there is danger of their not allowing enough of posthumous power to rich people. I think that there is not the smallest symptom of any such danger, if danger it is to be called, and fear that we have made no appreciable advance towards shaking the absolute dominion of founders.

Notwithstanding this, I have been urged to examine, and I now propose to examine, how far the existing powers of founders ought to be curtailed. And in so doing I will again deal with the doctrines advanced by Mr. Mill, in the paper to which I have already referred. I do so for two reasons. First, because those doctrines seem to me to contain much error; and error from a man of such mark, and on a subject, too, which hardly anybody has taken the pains to study, produces disastrous effects. I have already come across cases in which people who really shrink from and wish to suppress the whole discussion, are delighted to quote so great an authority in favour of quiescence. Secondly, because arguments (I am not speaking of assertions) in favour of the authority of founders are so scarce that it is refreshing to find one of substance enough to grapple with, and useful to know whither to direct one's force.

First I will perform the more pleasant task of noting points of agreement. Mr. Mill allows that gifts to public uses which work a clear and positive public mischief ought at once to be interfered with, and he instances doles or distributions of direct alms. Again, he thinks that in all cases there ought to be some limit of time beyond which the founder's intention should be wholly disregarded, or, in other words, when his ownership over the property should cease. In both these propositions, as far as they go, I heartily agree, merely observing that they have not yet found acceptance; that the evils arising from their non-recognition are very serious, the powers engaged in opposition to them very great, and that there is no chance of these or any other useful reforms being made acceptable to the nation at large, until they have learned to estimate the right of posthumous disposition more nearly at its true value.

But when we come to consider at what point of time the founder's ownership shall cease, Mr. Mill propounds schemes which seem to me objectionable, and founds them on reasoning which is absolutely fatal to all effective reform on such a subject.

His first and most characteristic argument is that variety, and not uniformity, is the thing most essential to human progress. Minorities, he says, ought to be protected. The experiments of individuals to promote the public good ought to be allowed; and to disallow them in the supposed interest of the public, is an offence against human liberty. And he inveighs against the intolerance of the majority respecting other people's disposal of "their property," of "money of their own," of what is "lawfully their own," after their deaths. Now, that the thoughts and speculations of adult reasonable beings should be left to play freely and without restraint, I agree. Their actions should be as free as is consistent with the avoidance of injury to their neighbours. To justify restraint of individual action on the ground of detriment to others, the detriment should be clear and indubitable; or, in legal language, the benefit of the doubt should always be given in favour of individual freedom. So much the perfect law of liberty requires, and so much is essential for the due progress of mankind. These principles demand that, in the expenditure of money as in other things, adult reasonable beings should be left to act nearly as they please. While a man is alive, you have a tolerably sure guarantee that he will not, for any public object, expose himself to privations, to blame, to ridicule, to the chances of failure, or even undergo the exertions which any original or eccentric course of action involves, unless he has some strong enthusiasm or conviction that he is right. This guarantee might not work in all cases, but it would in so many that the others may be safely disregarded.

But when a man's deeds are to have no operation till he is dead, what security have we that he will be guided by any considerations of public spirit or benevolence; that he will feel the weight of responsibility, that his passions will be chastened by conscience, or his fancies corrected by sober reason and reflection?

I have intimated on previous occasions my deep distrust of *à priori* reasoning on practical subjects. Speculation and conjecture are doubtless essential to all discovery, but they should be carefully collated with facts, and if unverified are worth very little. To my mind the conjectural reasoning is against Mr. Mill's view. But I willingly turn from it to the teaching of experience. And it seems to me that if there were any truth in the notion that, in order to have useful experiments properly tried in matters

* "On the Authority accorded to Founders of Endowments." Address delivered at a meeting of the Social Science Association, 10th May, 1869.

of public interest, we ought to put it in the power of men to make posthumous dispositions for this purpose, our history, and especially our history of the last 250 years, would abound with instances of valuable discoveries being made by means of such dispositions. We should be able to point to institutions and arrangements of great and acknowledged value taking their origin in some bequest, and which, but for that bequest, could never have flourished. Where are they? I ask Mr. Mill and those who agree with him to point out one, and when I am told of it, I promise to examine it.

At present, though our law has favoured gifts to public uses beyond that of any other country, though the wealth of our testators has exceeded that of any other country, I have never come across a single case to support Mr. Mill's hypothesis, that the power of binding the public to accept property on a testator's own conditions, is of value in the discovery of new modes of benefiting the public. But I have come across many, very many, cases in which that power has visibly operated to demoralise the testator himself, and all whom his actions affect. After my accustomed method, I will proceed to cite some.

The first case* is one of very blameworthy character, both as regards motives and results. I have, on a previous occasion, attempted to classify the motives of founders, with a warning as to the difficulty of referring any act to a single motive. In this instance, however, the founder appears to have been remarkably single-hearted. His motive was spite.

George Jarvis was a man of property in Herefordshire. The neighbours tell us that no charitable intentions entered his mind until he was displeased at the marriage of his only daughter, or at some incident therewith connected. He lived to see his daughter become a mother and a grandmother, but he nursed his resentment through all changes and chances of life. His grandson had to sell a settled family estate to pay off charges upon it. Jarvis was then heard to say that he could clear the young man's estate and make him all right, but he would not. He made a will, by which, with moderate exceptions, he disinherited all his issue, and gave his property (about £100,000) to trustees, bidding them apply the income to the poor of three specified parishes, in money, provisions, physic, or clothes. One Mr. Holford, a friend of his, to whom the design of this will became known, remonstrated with him, saying, "The infant children of your grandson cannot have disobliged you;" but he was unrelenting. He died in 1793, without change of purpose.

The fruits of his act were, like its root, evil. The whole population of all classes in the three parishes was, by the census of 1801, under 900. To describe the state of things thus produced, I borrow the language of Mr. Hare, who officially inspected the place:—"The distribution of £2,300 a-year in alms brought into the parishes, not labourers seeking employment where it was likely to be found, but persons naturally desirous of participation in gifts which could be obtained without labour. The landowners, or wealthy inhabitants, were not likely to make any provision for the residence of increased numbers, whose immigration they did not invite; but, as habitations were necessary, the cottages became more crowded; houses, not more than sufficient for one family, were divided into two or more; and other dwellings were built, not the production of capital directed to the supply of a social necessity, or in situations adapted for the convenience of the employer and the employed, but built by the poor themselves, or those little above them, some on waste and others on remote spots, with regard to little else than mere shelter. I will not venture to repeat the traditions which are current of the evils which this state of things created; but the inhabitants of the country round these parishes, who remember their state some years ago, are uniform in their testimony of the demoralisation of which the poor were by this means made the victims. Their mode of existence is said in some respects to have resembled that alternation of want and repletion which is characteristic of the savage state. The absence of regular employment for so many persons often occasioned at times want and suffering, whilst the large quantities of food distributed at other times led to great excesses. No habits of care or providence taught them to husband that which it had cost them no labour to obtain; and where poverty was the title to participation, there was little encouragement to that steady industry which could alone avert it. Idleness, discontent, and improvidence were found to be the fruits of this ill-conceived and ill-judged gift, to which must be added an immorality of life, the results of which are yet distinctly felt." I need add no more, except to say that this miserable state of things took place under a Chancery scheme settled by Lord Eldon in the year 1802, and was not altered till the year 1852, when an Act of Parliament was passed. This, by the way, is just fifty years, the minimum time for which Mr. Mill thinks that living men ought to submit to founders' experiments for the public good.* But with the subsequent history of the foundation, unsatisfactory enough, we have now nothing to do. Its origin and early history are a standing monument, though only one of many, warning us not to trust our happiness to the good feeling or the good sense of persons who know that they will be safe from the disasters their acts may cause.

I turn now to a very different kind of man, one who may be credited with a sincere wish to do well in the disposition of his property. George Abbott, Archbishop of Canterbury, was a man of learning and accomplishments, not unversed in State affairs, and of more than average worth and integrity. He was a native of Guildford, and desired to benefit the town he loved. It seems that at an earlier date manufactures had been carried on in Guildford, but that this trade had ebbed away from it. Abbott's notion was to restore the trade, and also to build an almshouse for the poor.

My principal reason for examining this case is, that it has been brought forward as an admirable specimen of foundations, and as an example and reason why they should be more encouraged by the law than they are. The most eminent witness examined by the Parliamentary Committee, who reported on this subject in the year 1844, was the late Sir Francis Palgrave. His evidence is very voluminous, and full of learning. He is a warm advocate for eleemosynary foundations, and he selects Abbott's as worthy of especial eulogy. It is a "munificent foundation," a "great and good design," "ungrudging and unstinted bounty," and so forth. I take it, therefore, that in the opinion of a man having most extensive knowledge of such matters, and much interested in them, this is as favourable an example as he can adduce.

I find that some questions were put to Sir F. Palgrave, with a view to find out how much property the Archbishop actually parted with in his lifetime. They were not answered, and I do not propose to pursue them further here, for they relate to the motives of the founder, and we may fairly in this instance assume them in his favour. The more important question as to the wisdom and success of his arrangements was not raised.

Now Abbott died in the year 1633. He left one property for the purpose of setting up manufactures of stockings and other things, that the place might flourish as theretofore. Other property was left to endow almshouses, which he had built in his lifetime, for twelve men and eight women. In about twenty years time† the

* This account of Jarvis's foundation is taken mainly from a letter written by Mr. Hare to the Bishop of Hereford, in the year 1856.

* It is true that the foundation in question was for doles, which Mr. Mill would proscribe. But, in 1801, perhaps most men thought almsgiving was necessarily good. Certainly great quantities of persons left money in this way, hoping to have it imputed to their credit in the great account. And after all, the remark would not touch the present question, which is, whether it can safely be permitted to men to play fantastic tricks at the expense of posterity alone.

† Charity Commission Reports, vol. 31, p. 887.

Guildford people demanded relief, showing that manufactures of different kinds had been tried, had failed, and had "been found to be even prejudicial to the town." This was in the time of the Commonwealth, when foundations were dealt with somewhat more boldly than at present. A decree of the Lords Commissioners, made in the year 1656, put a stop to the manufactures, but, following the *cy près* doctrine, and clinging to the notion of fostering trade, they could find no better use for the funds than a distribution among the poor honest tradesmen and housekeepers of the town who might want stocks. This led immediately to the practice of money-doles. In the year 1785, an information was filed, stating "that the distribution of the money had been found to be of little use, and often to operate as an inducement to idleness and drunkenness." A fresh decree was made, leaving still a moiety for the doles, and devoting the other moiety to the establishment of four additional almswomen. This arrangement was, as may well be conceived, no great improvement. Another Chancery suit was set on foot, and, in 1855, the Court, happily finding the ground very much cleared by the decree of 1656, made over the whole fund to a middle school.

So much for this honest man's attempt to bring back trade to Guildford. Two centuries of failure and degradation have resulted from it. What may yet result is hidden in the womb of the future. As for the almshouse, it would seem to be much like other institutions of the same kind—not worse than its neighbours, and not better. The almspeople were made a corporation, so that a number of old, illiterate paupers became owners and managers of what was, to them, a large property. The mismanagement was great, and on this ground the corporation has recently been dissolved, and the management placed in other hands. I have not come across any proof that the town has derived any benefit whatever from the almshouse, and as, whenever similar cases are examined with a view to test their working, it is usually found that almshouses are no benefit but a burden to the places where they exist, so it may be at Guildford.

The inference I draw is, that even could we secure honesty of purpose on the part of all founders, we cannot trust their wisdom to make arrangements for the conduct of their neighbours' affairs.

But the great majority of foundations occupy a middle space between the consciously bad and the consciously good motives. They proceed from a mixture of motives, and are characterised by a very small amount of thought for others. When thought is bestowed, it is generally for the founder's own self.

Take the following mixture of bitterness, vanity, and eccentricity, in one Thomas Nash:—"I do also hereby give and bequeath to the mayor, senior alderman, and town-clerk of Bath, for the time being, the sum of £50 per annum, in trust, payable of the Bank Long Annuities, standing in my name at the Bank of England, for the use, benefit, and enjoyment, of the set of ringers belonging to the Abbey Church, Bath, on condition of their ringing on the whole peal of bells, with clappers muffled, various solemn and doleful changes, allowing proper intervals for rest and refreshment, from eight o'clock in the morning until eight o'clock in the evening, on the 14th May in every year, being the anniversary of my wedding-day; and also on every anniversary of the day of my decease to ring a grand bob major and merry mirthful peals, unmuffled, during the same space of time, and allowing the same intervals as above-mentioned, in joyful commemoration of my happy release from domestic tyranny and wretchedness. And for the full, strict, and due performance of such conditions they, the said ringers, are to receive the said £50 per annum, in two payments of £25 each, on those respective days of my marriage and decease. And now that dear divine man—(to use Mr. Nash's own words)—the Rev. P. B., may resume his amatory labours without enveloping himself in a sedan-chair, for fear of detection." This gentleman did not give much thought to the welfare of the ringers, who are the objects of what is conventionally called his "bounty," nor to that of society at large.

Take again such an instance as this. The lord of the manor of Barton founds a school for the poor of several parishes. There are to be forty children, all of whom are to be appointed by the lord of the manor. All the children are to be taught to read, but none are to be taught the dangerous arts of writing or arithmetic, except such as the lord of the manor shall think fit. I need hardly say that difficulties have arisen in the conduct of this school. Is this one of the experiments to which we ought to submit ourselves for 50 or 100 years? The foundation was in the year 1807.

Now, will anybody say that the spite, the short-sightedness, the narrow spirit, the carelessness evinced by different classes of founders, is deserving of our respect, or that it can benefit the public to accord to them even one year of absolute power over property which the course of nature has compelled them to relinquish? Those who contend for this are at least bound to show on what experience they found their opinion. For myself, I will venture here to repeat words that I have used before*:—"It may be that private endowments were useful in the times when they were first devised. Like monasteries and trade guilds, they may have been the hard shell protecting a kernel of great virtue, destined one day to germinate into life, and shatter its protector into fragments. It may be so, though except as to institutions for learning or religion, it is not easy to think that it was so. To me it seems that, in this matter of charitable foundations, we are reaping simply as we have sown. We have committed a vast power to fortuitous and irresponsible hands; and they have used it according to the measure of their goodness and their wisdom. It is difficult for the wisest and the most patriotic man to see clearly the needs of the age he lives in. We have said that any man, however selfish or stupid, may assume to foresee the needs of all future time. It is much to permit that anyone should force his countrymen to take, on his own terms, wealth of which he denudes himself. We have said that he may force them so to take wealth of which he only deprives others. What wonder if there is poverty of result from acts for the performance of which we require neither wisdom, nor public spirit, nor self-denial."

But Mr. Mill uses other arguments. He thinks that the right to impress on property trusts affecting the public stands on the same grounds with all other testamentary power. "If," he says, "it is right that people should be suffered to employ what is lawfully their own in acts of beneficence to individuals taking effect after their death, why not to the public?" Why, for two very plain reasons:—First, because a man may very easily be, and usually is, wise enough and concerned enough in the result to choose his successors; but few are concerned enough in the result, and no one is wise enough, to judge what may be the needs of society even a few years hence. And secondly, if a private person receives property coupled with injurious conditions, he may get rid of the property and the conditions together. But the public is the ultimate heir; it cannot renounce the gift; it is bound to accept it, conditions and all; for ever, according to our present law and according to most opinions; for fifty or a hundred years according to Mr. Mill.

To show the singular tenacity of opinion on this subject, I refer again to Sir F. Palgrave's evidence before the committee, merely remarking on the singular state of the mind which, knowing of the case mentioned in answer 176, could utter the answer 175.

"174. Would you not leave a large power to some competent tribunal to alter the application of charities when the prescribed means are found to be comparatively inadequate to attain the end?—I would leave the matter,

* Lecture on the "Characteristics of Charitable Foundations in England," p. 33.

as it now is, to the Court of Chancery or to Parliament, between whom any particular evil would be redressed.

"175. Chairman.—In point of fact are they cases which happen with sufficient frequency to make you think that a sufficient guarantee?—I think they are; I am not aware of any charity whatever subsisting for any purpose grossly inconvenient or improper.

"176. Mr. C. Buller.—Supposing, for instance, at the time the Manichæan doctrines were prevalent in England, and there had been an alarm in the mind of some pious person respecting the prevalency of these doctrines; suppose he had left a dozen preacherships to preach against the Manichæan doctrines, would you perpetually devote these foundations to that purpose, which by this time would become so utterly useless; or would you give some competent tribunal a power of alteration for religious purposes with the application of these funds?—I should say that I would leave that to the discretion of the trustees and the preacher; without alluding to Manichæan doctrines in particular, he might preach against other errors sufficiently near these doctrines to satisfy his own conscience, and that of the trust. It is impossible to deal with extreme cases; when they do arise, the law and Parliament always deal with them. There is a case at Norwich, where there is a foundation for the Walloons; the minister preaches annually a sermon in Low Dutch, which nobody understands.

"177. Sir G. Grey.—Is that the condition?—Yes; the sermon is preached every year; it was for a long time preached by one who had had his education in Flanders; I believe the clergyman now learns a sermon by heart and preaches it.

"178. Mr. C. Buller.—Do not you think that went rather to a desecration than to any good religious object?—It may be so; I would not deal with it."

Of course, if a man is dealing with "what is lawfully his own," there is an end of the question. And this leads me to Mr. Mill's next argument. He says that, to treat property given to public uses as given to the public, and for the public to insist that they understand their own affairs best, and will apply the property, not to what they see to be hurtful, but to something else, is an offence against property as well as liberty.* That it is an offence against that law of property which happens to exist in England we all know, for it is that law of which we are complaining. The expression must mean that it is an offence against what ought to be the law of property. It is no offence against the law of that large portion of the world which has adopted the Code Napoleon, nor against the law of Austria or of Prussia.† Other civilised countries have thought it proper that the public should have a voice in the matter of their own improvement, and not be improved after the fancy of any private person. And this law is not, like our law, an ancient result of a number of beliefs, feelings, and political needs, now long extinct, but the result of deliberate policy, and one of the later products of civilisation. Why, then, ought the law of property to give every rich man a definite term of years after his death in which he may, according to the extent of his riches, work his will upon the public? Why should Christopher Tancred arrange, for 100 years, that twelve human beings should be confined in what has been called "a hell upon earth" because he wishes his land to be kept together and called by his name? Why should honest Archbishop Abbott be allowed to inflict misery upon the town of Guildford for 100 years, because, in his blindness and ignorance of economical laws, he thinks he can bring back the trade of the place? Did Abbott or Tancred create the wealth they had in life? Because a man is fortunate enough to enjoy great possessions in his lifetime, is that any reason why he should be invested with extraordinary and unalterable legislative powers after his death? One man, say Mr. Mill, devotes himself to mental cultivation, to speculations on most important subjects, to efforts at redressing social wrongs; he obtains fame, esteem, influence, all the nobler objects of man's ambition; but there is one thing of which he does not get much, and that is money. Another man, say Mr. Thornton, devotes himself to the turning and making of money, and his industry and acuteness are rewarded with a great quantity of it. But what is there in this which shall induce us to say that the labourer in the field of wealth is, to the extent of his two or three millions, to become a legislator for us by laws unalterable for a century, while no such power can be exercised by the labourer in the field of intellect? No; the rich man may well be content with his own enjoyment of his riches, and his power of choosing a successor who may enjoy them in like measure. And if he chooses the public for his successor let him do so; but then the public must be the owner of its own property, and not be treated as a child, unfit to judge what is for its own good, and to be placed under the dominion of trustees and guardians even for a term of years. To contend for the emancipation of our nation from this tyranny may be wrong on other grounds; but to say that it is an infraction of the law of liberty is, indeed, to take the sacred name of liberty in vain.

I have now done with the arguments advanced by Mr. Mill, but I cannot leave the subject without a protest against the use of a sort of regulation-language, which one expects from ordinary quarters, but not from a man of accurate thought. To talk of the piety or benevolence of people who give property to public uses, is a misuse of language springing from confusion of ideas. As a matter of fact I believe, as I have elsewhere said more at length, that donors to public uses are less under the guidance of reason and conscience, and more under the sway of the baser passions, than other people. But, supposing it otherwise, what possible reason can there be for attributing to them higher motives than actuate those who leave their property to private persons? A man is quitting this world, and cannot carry his riches away with him; he must leave them for other, and what title of beneficence can there be in saying who that other shall be? Whether he gives it to A or to B, and whether his donee represents public interests or private, his beneficence surely stands at the same level. He may perform this act, as he may perform any other, with or without good feeling and good sense, but how the choice of one heir instead of another enables us to judge of this, unless we know many other circumstances, it is hard to see. But test this language as we should test everything, by comparison with facts. There is something ghastly in the thought of Tancred's beneficence. To talk of the beneficence of Jarvis seems like a bitter and hideous jest. A man cherishes his wrath, originally unrighteous, against those who are closest to him, for a long series of years; transmits it from the parent to the children unto the third generation; and adjusts his property for the very purpose of giving pain to some in a way which spreads ruin and corruption broadcast among others. And then, forsooth, we are to be told of his beneficence. I trust that when these matters have been more thought of, we shall hear no more of such misplaced encomiums.

Another reason sometimes assigned for giving an absolute term of years for the exercise of a testator's power, is the analogy afforded by the testamentary power over gifts

* I believe I am not misrepresenting the position, though abbreviation is necessary. In pp. 372–381 of his Essay, I understand Mr. Mill to contend that, except in cases of clear and positive public mischief, every man has a right to a term of years during which he may devote his property to experiments on the public welfare.

† See the evidence of Mr. Adolphus Bach, given before the Committee of 1844, pp. 95 *et seq.* "I have not myself any original acquaintance with the law of Austria or Prussia, and very little with the Code Napoleon: but it so happened that, when at the bar, I had to argue the case of Lord Henry Seymour's will, and to look into the French Law of Charitable Bequests for that purpose. That case affords striking evidence of the great superiority of the French law to our own in this respect. Under the same bequest 'to the hospitals of London and Paris,' the French enjoy their share without a word of dispute, while over the English share years of expensive litigation have taken place, and it is not yet ready for use. This is entirely owing to our superstition about the 'founders' intentions.' The French take it as a gift to the public, and use it accordingly.

to private persons. If, indeed, this is brought forward merely by way of analogy and illustration, the foregoing considerations are sufficient (though many more might be added*) to indicate the difference between the two cases. But if urged, as it frequently is, by way of substantive argument, we are driven to consider the propriety of the existing law of posthumous disposition to private uses.† Time will not suffer me to enter into anything approaching a full discussion of this topic, which is hardly less complicated, and is of far more extensive social effect, than the law affecting public uses. I can do little more than indicate the nature of the reasons which lead me to think that the dead have too much to say to all our arrangements.

I have elsewhere stated what the law of perpetuity is, and have briefly sketched its origin.‡ It was not the result of any national deliberation, neither did it drop from heaven. It was invented by a series of judges, and so grew up by force of custom, like some other of our institutions. The effect, as most of you will remember, is to allow the ownership of property to remain in suspense, in other words to belong to the settlor himself, for the lifetime of any number of living persons, and 21 years after the death of the survivor. It probably represented the prevailing views of the great landowners of the time, otherwise it would hardly have been promulgated, or, if promulgated, would have excited opposition. It ought not, therefore, much to surprise us if a law framed from two to three centuries ago to suit the people who had only recently been rid of perpetual entails, should be found now to be too restrictive of freedom. I, for one, think that it is so. In this case also I claim for each living generation the full dominion over the fruits of the earth, and the power of judging for itself what is most for its own good.

Now the effect of our law of perpetuity is this—that the settlor of property can take the dominion over it away from those whom he knows, to confer it on those whom he does not know, nay, on those who are unborn and may never come into existence. This power is very commonly exercised to its fullest extent, merely because it exists, and without the slightest reason beyond the pleasure of exercising power. A testator will not allow his son, though he may trust him and love him, to make arrangements for his own children at a time when he knows their number, their characters, or their needs, but insists on making those arrangements himself, some thirty or forty years beforehand, when nothing whatever is known of the circumstances to which they will apply. The result is that, among the richer classes of this country, a very large number of families have their property governed, not according to their own desires or necessities, but according to the guesses or the fancies of some one who died long ago, and who could not, even if he wished, make the best arrangements for them. If we were now proposing to enact such a law, this statement of it would probably be enough to ensure its rejection. What could be more irrational than to maintain that each generation shall be considered more competent to foresee the needs of the coming one than that one, when arrived, is to see them; and that the disposition of property shall never be brought abreast of the existing age, but shall always be subject to the views of the past age? Yet, such is the direct effect of our law of posthumous disposition; and according to my experience, the phenomena are much in accordance with the law. As the tree is, so is the fruit. The cold and numbing influence of the dead hand is constantly visible.

I am not going to discuss the more public side of this question, to which task, indeed, I am not equal. The law is both attacked and defended on grounds of general policy and of political economy.* Those I pass by now. Whether a curtailment of the power of settlement would tend to break up properties,† or, if it did so, what might be the political effect, I do not presume to say. Such inquiries seem to me of a very remote and conjectural character, even when conducted by competent persons. What I consider to be not conjectural, but proved by experience in all human affairs, is, that people are the best judges of their own concerns; or if they are not, it is better for them, on moral grounds, that they should manage their own concerns for themselves; and that it cannot be wrong continually to claim this liberty for every generation of moral men.

But there is another side of the question, with which my professional experience has made me familiar; and this is the department to which the law directly applies, and in which it produces its immediate effect. The interior of every family of any opulence is affected by the law of posthumous disposition, and the effect of the great power allowed to settlors is very prejudicial. I am not speaking at random, but with many instances present to my mind, in saying that a strict settlement is apt to place everyone concerned in a false and constrained position. Suppose that land is the subject of it. The father of the family, cut down to a tenancy for life, resents the restraint, disclaims responsibility for the inheritance, and declines to assist it by improving, or to spare it from charges by saving. If he has daughters only, the matter is worse. On his death, they and his widow will have to leave their home, of which some collateral, more or less distant, will take possession. Why should things be made comfortable for him? If he has a son, that son is secure of his succession; he owes his property to his grandfather, whom he never saw, and feels independent of all obligations. If unable to make satisfactory arrangements with his father about money, he will raise it by post-obits. If there is no issue, the relations between the life-holder and his collateral successors are much the same. This is the case, supposing him to be a man who does not exceed his income. But supposing him to be extravagant, then is seen a most melancholy sight. A family with wealth enough to provide for their wants and give them some start in the world, but with it all placed out of their reach during the father's life; the income goes to his creditors; the children may grow up in a state of ignorance and destitution; he is trying how far, by wheedling trustees or by the astute exercise of legal powers, he can encroach on their portions; they are expecting money in the future, and making no adequate exertion in consequence. It is probable that many men would be restrained from squandering their fortunes, if it were not for the delusive idea that the capital is placed beyond their reach, and will be saved from a wreck. But be this so or not, it is better, far better, even for the children themselves, to say nothing of the public at large, that they should, as regards inherited property, stand or fall by their parents' acts, and that they should not undergo the excessive trials which beset everyone who is poor now, but rich in expectancy.

* As for instance that on which Turgot principally insists, the impossibility of finding trustees who will enter zealously into the founder's views; expenses of management; temptations to peculation; inevitable quarrels between the various claimants of a legal right to share in the property—all direct consequences of the founder's continued ownership.

† A perpetuity is a perpetuity, whether the uses are public or private. This has always been sooner or later felt, though it is singular how separate the two classes have been kept. Legislation was aimed at gifts to religious bodies as early as Magna Charta, but secular corporations were not touched till the reign of Richard II. Licenses to make parks were subject to the same conditions as licenses to amortize land in 27 Edward I. Perpetual entails were not got rid of till the reign of Edward IV., and then by judicial process. But the dead hand was shaken off private property much more effectually than off public, though the efforts came later in our history.

‡ Lecture, &c., pp. 14 *et seq.*

* Usually under the name of the law of primogeniture, a name inaccurate and misleading. The important law which people really wish to discuss may be called the law of perpetuity or of settlement, or, as I have usually called it here, of posthumous disposition.

† As far as my own small experience goes, I have found that strict settlements do not foster, but retard, accumulation of land, a process which, I suspect, is due partly to moral causes, and chiefly to monetary ones, and not in any degree to the state of the law under consideration.

Strict settlements of money differ in some respects from those of land, but their effects on families are so alike that it is not worth while to pursue the differences here.

Of course I am not saying that the effects just described are in fact the usual result of strict settlements. Men are constantly better than their laws; and family affection, prudence, self-respect, and a sense of right and justice, are always operating, and in most cases with success, against the tendencies I have mentioned. All I say is, that these virtues would operate more freely and effectually if people were left with more freedom and more responsibility; that settlements have a tendency to blunt the sense of responsibility, by shackling freedom of action, and to impair the delicate interdependence of parent and child; that these tendencies come frequently into partial action, and not very infrequently into full-blown action. My belief, therefore, is, and has long been, that society at large would gain much, and lose nothing, if the power of posthumous disposition were confined to persons living at the date of the disposition.*

There is now another school of opinion on the subject of foundations, to which I must advert. Of this school Mr. Lowe is the most prominent teacher. He, it seems, would hardly admit of any endowments at all except, perhaps, in the shape of buildings, libraries, or such like things, producing no income.† To this I cannot assent. Mr. Lowe's late pamphlet insists on considerations of the greatest importance, perhaps of more importance than any other class of considerations. And if in any practical matter we lose sight of the maxims that we must offer to people the thing they want, and not the thing they don't want—that the users of an article are, in the long run (longer or shorter according to the simplicity of the article), the only available judges of its value—and that the exertions of the mass of mankind must be stimulated by their interest—we shall come to disaster. Moreover, his argument has the great merit—which ought not to be, though it is so singular—of being founded on experience, and affording solid grounds for assent or dissent. My reasons for dissenting from his conclusions are as follows.

In the first place, I think he has not borne in mind the cause of the failure of endowments. That failure is directly traceable to founder-worship, to our slavish and literal adherence to the directions of founders, instead of operating on the funds by public authority, and adjusting them from time to time, as change of circumstances requires. Having gone on the foolish principle of allowing the dead to govern the living, we cannot be said yet to have tried the effect of endowments. We are at least bound to try whether there is not wisdom enough and strength enough among us to convert endowments to really useful public objects. And I, for one, do not see why this should not be effectually done, if the nation becomes heartily in earnest about it.

Secondly, I think that Mr. Lowe has overrated both the ability and the will of people to provide themselves with those advantages, (a sound middle-class education is the subject he discusses) which it is designed to give them by means of endowments. It may be that, in progress of time, they may become able and willing, as undoubtedly they are more so now than they were fifty years ago. But that happy time has not arrived yet, and a judicious use of endowments may tend to hasten its arrival.

Thirdly, I think he underrates the effect of a good school supported by endowment. He says that the parents are the ultimate judges of the work of schools, and he adds that "the whole and sole use of endowments is to influence, in other words to bribe, that judgment." That the parents must be judges in the long run I agree, but in such a matter as education the run may be a very long one, and the judgment of parents may be, not bribed, but legitimately influenced by the spectacle of a school unpopular for a time, but justifying itself by success. Now, the temporary unpopularity would ruin and destroy a private school, but the endowed school can bear up against it, and, if sound, will win its way. The private school may be sound, but must be showy. The endowed school can afford to dispense with show till such time as its principles have been fairly tried. And this power, valuable at all times, seems to me peculiarly valuable in a time of change, when the old staple subjects of instruction are very largely encroached on, and other subjects are claiming admission on equal terms, or asserting, as Professor Huxley asserts on behalf of physical science, a paramount right over all rivals.

Having now reviewed the principal doctrines and arguments on this subject, I am in a position to state the two simple principles which should be established with respect to foundations.

The first is, that the public should not be compelled to take whatever is offered to it, but should here, as in other countries, have the right of considering whether that particular use which the founder has fancied shall take effect, or whether the property shall be turned to some other public use, or given back to private uses. In short, that if the public is chosen as a legatee, the legacy shall be, as it ought to be, an unconditional one. Of course, the public would speak through some tribunal constituted for the purpose, which would probably act on principles not rigidly defined, but not difficult to understand. A certain deference should be paid to the donor's wishes, so that they, or something akin to them, should have priority among claims of equal, or nearly equal, urgency, but they should never be allowed to interfere with the public welfare. As this principle would operate on the future, I do not see why, if accepted, it should not be applied with great freedom.

Some who recognise the absurdity of compelling the nation to take whatever terms are offered to it, have thought that there should simply be a power of rejection, leaving the property to go as in case of intestacy. I think, however, that there would be much more likelihood of justice being done, or rather of reasonable expectations not being disappointed, if it were left in the hands of a public office, to dispose of the property in all cases. The same generous consideration which the Crown now exercises in certain cases of intestacy, would be exercised when, as in the cases of Jarvis and Tancred, a man had disappointed just expectations for the gratification of base passions.

The second principle is, that the grasp of the dead hand shall be shaken off absolutely and finally; in other words, that there shall always be a living and reasonable owner of property, to manage it according to the wants of mankind. This, again, must be a public tribunal, charged with the duty of adjusting to new objects all foundations which have become pernicious or useless. This principle, though in my judgment the very salt and savour of foundations, and absolutely essential to preserve them from corruption, would, as affecting the past, require to be applied with great reserve, delicacy, and tenderness. Local interests and feelings must be carefully ascertained and consulted, and occasionally even efficiency postponed for the sake of conciliation. There would, however, be strong ground to hope that, if steadily pursued for a length of time, the living principle of using property so as to benefit mankind would, with the assent of the great majority, prevail over the deadly superstition of blind obedience to the commands of the dead.

We are, indeed, told by way of objection to such proposals, that if people are to have their gifts interfered with by the public, they will not give to the public.

* The strongest reasons to be urged against strict settlement apply with less force to ordinary marriage settlements; and there are reasons in their favour. I believe, however, that they are not found necessary in any country but this; and I cannot help thinking that they may hold a different position in this country when we have got rid of our barbarous laws relating to married women, and have adopted some more civilised regulations. Still, as a rule, they are dictated by motives of prudence, and not by love of power, and their propriety is to be discussed on considerations foreign to my present purpose.

† "Endowment or Free Trade, by the Right Hon. R. Lowe, M.P." Bush, 32, Charing-cross. See also an admirably-written criticism on Mr. Lowe's Pamphlet in *Macmillan's Magazine* for April, 1869.

To this I answer, first, that it is a pure guess without proof or probability. In other countries, people are not deterred from giving to the public by the knowledge that when they have given they cannot themselves remain owners of the gift. In this country, people do leave absolute legacies to private persons, though the legatee may divest himself of the property the next day, or use it in a way the testator would highly disapprove of. The objection assumes that the donors of property to public uses are the most suspicious, narrow, and unreasonable of men; that they will persist in thinking that they can foresee what is good for the future better than their successors can see what is good for the present; that they cannot bear to be fairly forewarned that each generation will insist on using property for its own good. But if we are to guess on this subject, I prefer to guess on grounds which are at once more probable and more creditable to human nature. It is more likely that the spectacle of large charitable funds, creating no scandal, but thoroughly well administered by each generation for its own best interests, would induce noble and reasonable minds to give more freely than at present.

But there is another answer, more important and conclusive. If people will not give freely and generously; if they will not really give; if they insist on only pretending to give, while all the while they are stipulating to remain owners themselves selves, then say I, "Let their money perish with them!" It is such false gifts as these which have created the scandals and the demoralising character of so many of our charitable institutions, or at least have prevented their improvement. They are like the gifts of malignant spirits of which the old fairy tales tell us; they look like gold, but turn to something foul in the handling. They are fatal. Let us have no more of them. We have too many already.

Another objection touches on a subject on which very few can speak plainly without giving offence, and, though not intending any offence, it is unlikely that I should be among the happy few. It is asked, as though the question were unanswerable, whether a public tribunal shall interfere with foundations for the support of opinions? The opinions for which foundations are established are usually of a theological character, and it is thought that foundations for this purpose are more valuable and sacred than others. Now, as to their being more valuable, I will not hesitate to say that foundations attaching endowments to the holding and teaching of prescribed opinions are (if they are to be unalterable) the very worst kind of foundation that can be conceived; for experience shows that the opinions to which men have attached property change and become extinct, sooner or later according to their depth and force, and then you have a direct premium on profession without belief. But that which tends to corrupt the noblest part of man, the very eye of the soul, his perception of truth, is as evil a thing as can be imagined. Suppose, for instance, that a large estate had been settled in the 16th century for maintaining the geocentric theory of the universe. It was believed implicitly; it was supposed to rest on the clearest testimony of revelation; to doubt it was impious. One or two in the pride of their wayward hearts had dared to express an opposite opinion. What more pious than to found a college for teaching this vital truth, which lay at the bottom of so many other beliefs about man's relations to his Maker? Suppose, then, that this had been done, and that now, when every child at a national school knows the contrary, solemn lectures were delivered to show that, in some sense or other, astronomical, metaphorical, or mystical, the sun travelled round the earth. This would be something like the Walloon sermon at Norwich, which nobody understood. But is any public authority to interfere with so degrading a mockery? Sir F. Palgrave would say, "No, you cannot interfere with the authority of the founder." I venture to say, Yes you can, and you ought. As long as any man believes any opinion whatever, let him proclaim it without molestation from the housetops. But to allow that property shall be devoted for ever to bribing people into teaching what they do not believe is monstrous.

I have put an hypothetical case; let me refer to a real one, which has been mentioned before.* It is that of a gift to propagate the sacred writings of Joanna Southcote. In that case, if the property had not luckily all vanished, we should now have a chapel or a lecture-room, with a paid preacher proclaiming aloud as true what neither he nor anyone else believed, and there would be no power of interference unless by special Act of Parliament. For this trust is to propagate the writings; the act is, as it should be, a lawful one; and as long as it is done (whether by preaching or printing does not much signify) the trust is duly performed. But that there should be no legal means of putting an end to such a trust is a great defect of our law.

Now, the number of foundations made to maintain theological opinions in this country is enormous. Some of the trust-deeds are very minute as to the tenets to be believed. I quote from one which has been quite recently in my hands. Those who benefit by this foundation are to believe and teach:—"The one only living and true God, the Creator and Upholder of all things; the Scriptures of the Old and New Testament as the Word of God and the only rule of faith and practice; the doctrine of the Trinity, including the Deity and distinct personality of the Father, of the Son, and of the Holy Spirit; the doctrine of original sin, and the entire depravity of human nature; eternal and personal election; particular redemption; atonement for sin by the death and sacrifice of Jesus Christ; justification by his imputed righteousness through faith; the necessity of regeneration and sanctification of the Holy Spirit; of repentance towards God and faith in Jesus Christ in order to salvation, and the final perseverance of the saints. Also believing that baptism by immersion only, and the Lord's Supper are to be administered to such alone who profess faith in Christ, and whose conduct is consistent with such profession; that the law of God is a rule of moral conduct to believers; that there will be a resurrection of the dead, both of the just and the unjust, and a day of final judgment, and that the wicked 'shall go away into everlasting punishment, but the righteous into life eternal.'" This deed was framed in the year 1836. Here are contained a great number of abstruse doctrines, as to which it is quite certain that the people really interested in the foundation will change their minds. I suspect I could point out one as to which they have changed their minds already. Such changes have frequently occurred, and have led to severe litigation.

A rough though wise method of stopping a number of lawsuits was devised in the Dissenters' Chapels Act, which secured the possession of congregations who had drifted away from the original tenets of the founders, and whose expulsion was sought by orthodox representatives of those founders. But it seems to me that it would be more wise and statesmanlike to engraft into the law powers to adjust these deeds from time to time, according to the true needs and beliefs of the community among whom the foundation was intended to work, and had always been working, so that if they came saying "Here is a doctrine which has dropped out of our real creed, we say nothing about it, but we should feel easier if relieved from any legal obligation to hold and teach it," relief of that sort should be granted to them.

Where a foundation is acknowledged to be national, it is agreed that, on adequate cause being shown, the creeds and formularies shall be altered. Establishments co-extensive with the nation are indeed such vast and important machines, that it is right that no alteration should be effected in them by any power short of the direct action of Parliament. But that Parliament may make the alteration is

* Lecture, pp. 4, 5.

doubted by no lawyer or statesman, and by not many ecclesiastics. The right of Parliament (as distinct from its power) to vary the terms of private theological foundations would be seriously disputed. The Church of England has a code of doctrine much more extensive than the private one I quoted just now. But at this moment there is a strong and growing desire for revision of the Liturgy and Creeds; and I need not refer to their effective revision at former periods of our history.

I, therefore, can see no reason why foundations for the maintenance of opinions should not be placed on precisely the same footing as other foundations.* To the truth or falsehood of the opinions themselves no human tribunal ought to have anything to say. That must be left in the province of argument and persuasion. But a human tribunal can easily ascertain whether events have occurred which demand an alteration. These foundations are subject to precisely the same incidents as others. The community among which they work may disappear altogether, or may cease to have any regard for the opinions; and then the foundation is useless. It may be impossible to find even one teacher who really believes them; and then the foundation is corrupting and immoral. In all such cases there should be, as in the case of almshouses, schools or doles, a power of adjustment to the changing circumstances of the day.

And now I have performed the task which I undertook, viz., to point out the objects at which we ought to aim. While stating my reasons fully, and illustrating them by examples, I have dwelt only on general principles; I have only exhibited in another phase my maxim that property is not the property of the dead, but of the living. In my opinion the law should be altered to admit this maxim. Into the details of any such alteration I have not attempted to enter. Probably meetings of this kind are at all times better suited to ventilate and discuss large general principles than the actual machinery by which they are to operate; and certainly at this opening stage of the question, when I find my general principles simply ignored by the bulk of men, and denied by the great thinker whom I have endeavoured to controvert, it would be mere waste of time to enter upon the intricacies of a legal reform.

But things are not well with us in this matter of foundations. For some reason or other, they will not work. The machinery is attended with enormous friction in the shape of labour and cost, and then turns out evil work instead of good. It is like the princess in the fairy-tale on whom a curse lay, so that when she tried to speak there came forth only toads and asps. Go into any town where charities abound, and ask there what effect they have. You will be told that they do mischief; and the chances are that your informant will add that it is a pity they are so abused. But let us not lay that flattering unction to our souls. Abuse is not what we have to complain of; it is the system, or rather the anarchy and want of system which we permit, and which is rotten to the core. We have suffered ourselves to fall in bondage to the speechless clay. The time was,

"That when the brains were out, the man would die,
And so an end: but now they rise again,
And push us from our stools."

We must have recourse to simpler and healthier principles. Reflection and experience have brought my mind to the conclusion which common-sense would seem to dictate, that living men should be allowed to dispose of the fruits of the earth for their own good, according to the best of their own judgment. This is so simple that it seems like a truism. It is so simple that we might expect it to be accepted as soon as stated, if we did not know how hard it is to gain acceptance for any truth that conflicts with established custom. Other simple truths have only obtained recognition through struggles well-nigh desperate; they have encountered, in fiercer times than these, oppression and persecution; they have been called wicked, impious, revolutionary, atheistical; and if there be any other term of obloquy it has been lavished on them. Freedom of person, freedom of trade, freedom of speech, freedom of thought, have all gone through stages of adversity more or less cruel. But they have passed on to victory, and are now taken as the plainest axioms of common sense, and as the cardinal points of human prosperity and happiness. I will make bold to augur the same success for freedom of property; with what amount of struggle remains to be seen.

* It is an opinion which I have not discussed here, as not deeming it practical enough for the present occasion, but it is well worth considering whether the difficulties attending foundations for opinions are not such as make it more expedient to prohibit them altogether, except national ones so constituted as to be kept constantly in sympathy with the nation at large, and that they should dispense with doctrinal texts as far as possible. I have lately been told by a very eminent member of a dissenting body that, in his opinion, the attachment of property to opinions makes great mischief. It is remarkable that Ignatius Loyola should have been highly apprehensive of the effect of endowments. He forbade his followers not only to solicit gifts, but even to sue for them if made by a testator and refused by his executor. His object, says a follower of his, was that he wanted to keep the cleverest men in the body, and feared that endowments might be the means of depriving it of its brightest members. He had deeply pondered over the greatest contest that ever took place, between men bound by endowments to a set of opinions and others who were unfettered, and knew on which side the energy was, and why. See the evidence of Mr. Trappes, given to the Mortmain Committee of 1844.

DISCUSSION.

Lord Lyttelton regretted that other engagements would prevent his remaining throughout the discussion, but was anxious, before he left, to express his general agreement with the principles and doctrines laid down by Mr. Hobhouse, the more so on account of the peculiar position in which he and that gentleman stood with respect to one important branch of the subject under review—being two out of the three commissioners appointed to carry into effect (should it pass into law) the Endowed Schools' Bill, under which they would have very large powers indeed of carrying out the principles now affirmed by Mr. Hobhouse. Under these circumstances, he felt it incumbent upon him to state clearly and publicly the manner in which he should feel it his duty to use the power committed to him; while, at the same time, he could but repeat a doubt, which he had already expressed, whether the government would act wisely in entrusting such large powers to men who were already publicly committed to the manner in which they would exercise them. For this very reason he at first declined the Chief-Commissionership under the Act, and he still doubted whether the managers of endowed schools had not some cause of complaint in not being placed under the control of men of less pronounced views on this subject than himself (who had taken so prominent a part in the Schools Enquiry Commission) and Mr. Hobhouse. Be that as it might, it was certainly only fair that managers and governing bodies, and those who had more respect for founders' wills than either himself or the gentleman who had read the paper, should be fully aware that, if they were to be allowed to do what they certainly would feel it their duty to attempt, in very many cases the "pious founder" would go to the wall. Whilst saying this, however, he desired at the same time to guard himself from being supposed to go quite the full length to which he understood Mr. Hobhouse would carry them. He was quite prepared to say that, after the lapse of a certain time, the mere will of the founder ought to be entirely disregarded; but he did not agree that with regard to almost all bequests, both public and private (and not merely in extreme cases, in which the law would now intervene), if in the opinion of legal tribunals, or of those who immediately succeeded the deceased person, a better application of funds might be made, under certain conditions, the law should have power to do so. That, in his opinion, would have the effect of destroying bequests altogether, and seemed rather too chimerical for adoption. He was quite prepared to advocate such a

change in the law as would assimilate the conditions affecting bequests to public uses to those made to private uses. There might be good reasons for supposing that dispositions to private uses might in many cases be just as mischievous to the public as ill-arranged bequests to public uses, but yet the law would not interfere, and say, we shall do something better for your family than you would have done yourself. He was quite prepared to say that, whatever the law said with regard to bequests to private uses should also be said with regard to bequests to public uses, but he could not see his way to going further. He must say also that he thought Mr. Hobhouse had exaggerated the state of public opinion on this subject, and treated it as being more backward than it really was. He apprehended it was now many years since an attack had been made on the doctrine of the absolute sacredness of the very letter and spirit of ancient bequests. If he was not mistaken, in the Appendix to the Report of the First University Commission, there was a paper by Mr. Dampier, laying down almost the same principles as those upon which Mr. Hobhouse proceeded, and there had been no public inquiry since which had not assumed as possible a greater or less deviation from the founders' wishes. It had certainly been laid down, to his knowledge, in the evidence of very many able men, and papers had been read upon it by the present Lord Chancellor (before the Association for the Promotion of Social Science), by the late Mr. Senior, and by many others. He believed Mr. Mill was not so much in error as Mr. Hobhouse supposed, in saying that we were near the introduction of a sounder system.

Sir Charles Trevelyan, who regretted that he had not had the advantage of hearing the whole of the paper, said he feared that justice was hardly done to the ancient founder, of whom so much was said, and that when they were spoken of, as was often the case, as "pious founders," the expression only scantily covered the satire beneath. It seemed to him, however, that so far from having been behind their age, these men were really as a body in advance of it. Of course he did not allude to the founder of the endowment for propagating the doctrines of Joanna Southcote, nor was it necessary for his argument to refer to such men as William of Wykeham, or Chichele, or the other great men who adorned the list. As a body he believed they were in advance of their generation, being actuated by a more than ordinary public spirit, and that it was scant justice to judge of them by the enlightenment of the present age. The *cy-près* doctrine, properly interpreted, would, he believed, meet the case. The law ought to regard the old founders of Plantagenet and Tudor times, and even of the last century, as if they lived in the present day, and had been desirous of acting according to Christian charity as the best men of the present generation would. This was merely another form of putting Mr. Hobhouse's argument as he understood it, and although he had not heard the whole of the present paper, he had the advantage of hearing the first one, and, when published, he paid it the unusual compliment of reading it three times. He did not hesitate to say that in future Mr. Hobhouse would be regarded as a "great founder," in consequence of his development of a new principle in the treatment of endowments in a series of treatises, which probably would be considered as the great authority upon the subject.

Mr. J. G. Fitch desired to corroborate, from his own limited experience, some of the observations of Mr. Hobhouse, particularly with regard to educational endowments. In the memorable paper by Mr. Mill, to which reference had been made, there was one argument, the fallacy of which had been curiously illustrated within his own knowledge. Mr. Mill seemed to think that a certain amount of independence and originality was absolutely necessary in teaching; and that educational endowments were, in a certain sense, a guarantee for greater variety and liberty of teaching than would otherwise be found. That was an exceedingly plausible argument; and, if the fact were so, he should feel it to be the strongest possible reason for the maintenance of endowments. As one of the assistant-commissioners on the recent inquiry, however, it had fallen to his lot to see above 120 endowed grammar schools, and he could only say that, out of the whole number, he did not find one single instance in which a new, original, or valuable system of education was tried, in obedience to the founder's will. If he had seen such a thing, he admitted it would have been a strong argument against many of those put forward in Mr. Hobhouse's valuable paper; but the truth was that the schools were, as a rule, all of one type, and that a bad one. The only influence of the founders upon the organisation of the schools, their aims, methods, and purposes, was purely negative and restrictive, saying—"You shall not teach this, you shall not charge certain sums, you shall not elect masters unless they possess this and that special qualification." The influence of founders upon education had been rather to repress and forbid originality of method than to encourage it. In Yorkshire, Durham, and Westmoreland, that proposition might, he believed, be stated without fear of contradiction, and he had found that educational endowments were often quite as mischievous where the intentions of the founders were honestly and carefully carried out as where they were abused and violated. He could mention one little village in Yorkshire, which he had recently visited, containing not more than 800 inhabitants in the three townships of which it consisted. There was an endowment which now realised nearly £2,000 a-year, which was most honestly administered in exact obedience to the will of the founder. The first provision was that there should be an almshouse for six old people, who were all to be chosen from the village. Then there was to be a boarding school, in which twelve children from any of the townships were to be boarded and educated, and there were also to be three dames' schools, one in each township. In all these the children were to be educated gratuitously, and there was an apprentice fund for the boys who left the principal school. The trustees had been extremely anxious to get as good a school as they could; but how had they succeeded? The education was entirely free, and in other villages, where there was no educational endowment, where the schools were inspected, and where the children paid ordinary fees, the state of education was much superior. None of these masters or mistresses were certificated, and they were not, of course, responsible to anybody but the trustees, whose only wish was to carry out the founder's will. The children were far less regular in their attendance than where they paid for their education, and yet there was no room for any other school in the village, because this one had provided so abundantly for it. The six old people in the almshouse and the twelve boys went about with a large R embroidered on their shoulders, the founder's name being Read, and one of the conditions of his will being that, to the end of time, all the recipients of his bounty should have his initial conspicuously embroidered upon their shoulders. He would ask how long that sort of thing ought to go on, and whether Mr. Read had not by this time had a sufficient return for his investment; and whether he was to be permitted to go on demoralising people, lowering the standard of education in the village, and wasting £2,000 a-year much longer? In truth, no one could be more sensible than those who inspected schools of the importance of encouraging liberty, independence, and variety of teaching; if there was one thing which was feared more than another in connection with Mr. Forster's new Bill, it was that there might possibly be some central authority which would impose a cast-iron system of instruction upon all schools alike. He did not think there was much reason to fear even this, but it was a danger to be most sedulously guarded against. The more of original thought, love, and enthusiasm they could enlist in the business of teaching the better, but they must not fall into the error of supposing that any

of that enthusiasm or ability had been encouraged by endowments. He had not the least hesitation in saying, in spite even of the high authority of Mr. Mill to the contrary, that it would be difficult to find a single instance in which the principle of endowments had done anything to promote new, or original, or improved methods of education.

The Chairman said that, as he had important duties to attend to elsewhere, he would ask to be allowed briefly to make a few comments upon the paper which had been read, before vacating the chair in favour of some other gentleman. He should entirely agree with Mr. Hobhouse that there had been, and probably would continue to be, a great deal of abuse in the administration of public charities, and that it was desirable to have, he would not say greater power over them—because theoretically the power existed—but to have better means of applying that power which they possessed. He should also admit that, in many cases, they had been unduly and even superstitiously scrupulous in endeavouring to enforce the exact conditions imposed by founders long ago, under circumstances and in times when those conditions had become obsolete and useless. Looking at the matter in that point of view, he fully admitted the value of discussions such as the present, as being likely to call attention to a subject which undoubtedly had not received as much notice as it deserved. But at the same time he was sure Mr. Hobhouse would excuse him for saying that he thought he had had his attention chiefly directed to the abuses which existed in connection with charities, and that those endowments which called for interference would be naturally those which would come most prominently under his notice, thus leading him to take some rather extreme cases, fairly enough if taken as extreme cases, but scarcely so if taken as a sample of the whole. He also thought that he had, to some extent, combated opinions which were no longer prevalent; for instance, he had quoted the evidence given by Sir Francis Palgrave six-and-twenty years ago, which seemed to go the length of saying that, however absurd and useless an endowment might be, the state had no right to interfere with it. He did not know whether Sir Francis Palgrave would have accepted that construction of his evidence, but even although that might be the view taken by a learned and able man, whose tastes had led him mainly to antiquarian pursuits, still that was not the view generally taken, or one which needed refutation at present. No one could contend, with any show of reason, that there was not a right inherent in the State to interfere in the case of a charity which was abused. In point of fact, by one machinery or by another, that power had constantly been exercised, and the only question was, to what extent was it desirable to exercise that right, and what were the cases in which interference should take place? There was, however, a wide difference between admitting that right in cases of abuse, and asserting the doctrine that if a man left money to the public at all, he must either hand it over entirely to the disposal of the State, to be spent in any way the State might think fit, or to the equally uncontrolled disposal of some possessor who might do with it that which the testator did not at all intend. Such a theory would, he believed, if acted upon, inevitably have the effect of preventing all endowments for the future. A man did not, as a rule, give his money to the State or to the public at large. The good he aimed at doing was generally local good, and the reward to which he looked was that of being locally remembered as a benefactor in the place in which he had lived, and where he hoped that his descendants would continue to reside. On the whole, that was not an objectionable feeling; if there were some better motives, there were many worse. It was easy to dwell upon cases in which persons left their money away from their families or relations from motives of ill-will; but that was not an argument against leaving money for public uses, because if a man were actuated by such motives he had always the option of leaving his property to some friend or casual acquaintance; and to counterbalance these cases, bad as they were, undoubtedly, they must consider the instances in which large bequests had been made by individuals who were childless, and upon whom there were no strong personal claims. Probably, most persons who had given any attention to this subject had known some cases of this kind; he had one or two present to his mind, and it was not easy to see what better disposition of property could be made in such circumstances, than leaving it for some well-considered scheme of public utility. Even taking examples adduced in the paper, it was evident that no very extreme remedy was required. The first, and probably the worst, was the Jarvis endowment. That was said, and no doubt with truth, to have demoralised the population of three parishes. But why? Because the sum to be given away was utterly disproportionate to the reasonable requirements of charity within that area. It seemed to him that a liberal application of the *cy-près* doctrine would perfectly meet the case, by extending the area over which the fund was to be distributed, and limiting the mode of its application to purposes of undisputed utility, such as the establishment of village hospitals or schools of a better class than those which the population of a rural district could provide for themselves. In this way, the bequest would, in the main, retain its local character, and be applied in furtherance of what seemed the reasonable wishes of the founder. With regard to the Abbott endowment, no doubt the endowment for the resuscitation of trade in his native place was money thrown away, but it was worth notice that the mistake made in that case was, under the actual existing law, discovered, and to a certain extent remedied, if he rightly understood, within a few years.

Mr. Hobhouse said there was an alteration made in twenty years, but owing to the *cy-près* doctrine the new plan was as bad as the old one, and it went on for 200 years.

The Chairman said that only showed that the application of the money was not so irrevocably fixed by law as it seemed to be contended. It was quite possible that those who diverted the fund from its original purposes did not make a good choice, but at any rate it showed that a power of control existed. With regard to the third case, that of the founder who left his money to the bell-ringers under very peculiar conditions, he did not think there was much doubt that, if it had been considered worth while, a bequest of that kind could have been set aside on the ground of insanity. With regard to the fourth case, that of the school where reading might be taught but not writing and arithmetic, no very great deviation from the founder's will would be required in order to say that the school should be retained, that absurd and fantastical rule being abolished. Generally, he would put it in this way, that the State might and ought to have power to absolutely sweep away any charity which, by lapse of time or change of circumstances, had become positively mischievous, and it might also, he thought, fairly use its own discretion in diverting to other purposes endowments the object of which, although not mischievous, had ceased to exist. For instance, at this moment he believed there was a fund in existence, and constantly accumulating, for the ransom of prisoners from the Algerine pirates. In such a case the State might fairly step in and say what was to be done with the money. In one respect he would go even further, and tell founders plainly that they could not, in matters of detail, make perpetual regulations, and therefore they should not attempt to do so. It was absurd to suppose that a man in founding a school should regulate to all time what should be the dress and food of the scholars, and the pay of the masters and teachers. Yet such things had been attempted continually. Subject, however, to such restrictions, he thought they ought, as far as possible, to carry out the desires of the founders. If they

wanted to have endowments in future—and he must say he considered them a sign of public spirit—they must recognise the will of the founder as finding the main design, leaving to the State, or to any authority appointed by the State, the power of modifying details where necessary. He did not desire to say anything on the difficult question of endowments in support of special opinions, but he apprehended that in general the theoretical difficulty of dealing with such cases would be greater than the practical one. All would agree that it was absurd to maintain in perpetuity an endowment for the support of some opinion which might not perhaps have a single adherent, but in such a case the evil would remedy itself, because if the sect died the funds would lapse, there being no one to claim them; whereas, as long as it lived there would be persons entitled to the money; while in the more usual course of a split into several divisions, the question would probably be decided in a court of law. There was one other point of some importance which had not been touched upon. All agreed that, as a general rule, it was not desirable that landed estates should be perpetually tied up in the hands of public trustees or for public purposes, and it was a matter, at least worth consideration, whether it would not be well in future to impose upon all founders beforehand some particular manner in which the endowment should be invested. If they continued to allow any individual to dispose in perpetuity of a sum of money, as at present, it did not seem any unreasonable limitation to insist that the capital should only be invested in one way, namely, in the public funds. Of course, it would be a difficult thing to apply such a rule to charities or endowments already existing; but, with regard to future endowments, he saw no hardship in such a proposal. In conclusion, he would say that, whether or not all his auditors agreed in the principles laid down by Mr. Hobhouse, there could be only one opinion as to the thoroughness with which he had investigated the subject, and the clearness with which he had brought forward his conclusions.

Mr. Edwin Chadwick suggested that, as there were many gentlemen anxious to speak upon the subject, the discussion should be adjourned. He moved that the discussion be adjourned to Friday morning next, the 9th inst., at 11 a.m.

The Rev. William Rogers seconded the motion, which was carried unanimously.

The adjourned discussion was resumed on Friday morning, July 9th, at 11 a.m., the chair being taken, in the absence of Lord Stanley, by Mr. Hyde Clarke, D.C.L., Treasurer of the Society of Arts.

Mr. Edwin Chadwick, C.B., said—The proceedings at the last meeting appear to me to have an importance as a precedent, *dehors* the matter of the important paper we are met to discuss. Great powers for the public service are to be charged upon a new commission—a new triumvirate. Anxiety was expressed in Parliament to know into what hands the powers are to be entrusted. The wish was a natural one, though it might be strongest on the part of persons whose anxieties would be mitigated if they perceived that those new powers of reform fell into hands that were feeble or torpid for their execution. Disregard of the need of special aptitudes, recklessness of the existence of positive inaptitudes for the exercise of new and important functions, is a too common political vice. The public have yet to be told of the extent of mischief and of waste occasioned in the administration of the new poor-law, in the new health laws, and in the administration of the funds for the advancement of elementary education, by public duties being entrusted to persons who are uninformed, or half informed, as to the principles of the measures with which they have been entrusted, or who were apathetic, or positively antipathetic to them, or to anything but the official salary or position, and who have cloaked the imposture and evasion of principle by the guise of superior judgment and moderation. It is, therefore, highly refreshing to have a precedent set of commissioners-designate coming forward before their appointments are confirmed, and expounding clearly, and in a manly way, the principles and views upon which they are prepared to act, and courting discussion upon them. I believe that those who are interested in the subject, and have heard the elaborate expositions that have been read to us, and the frank declaration of the noble Lord (Lyttleton), will be of accord with me in the impression that the government, and Lord de Grey, and Mr. Forster are to be congratulated on the sound and honest appointments made for the new service. The slow progress of opinion against sinister interests in respect to charitable endowments is melancholy to contemplate. To what he has said from observation of them in his office, I may add more from observation of them in administration on the spot. In 1833, under the Poor-law Commission of Inquiry, in the investigations of the modes of relief prevalent throughout the country, we met with charitable foundations everywhere in old urban districts, and everywhere found their operation and tendency to be to create the misery they were intended to relieve, and that they did not relieve all the misery they created. Of this opinion was our chairman, the late Bishop of London (Blomfield), and also our colleague the late Archbishop of Canterbury (Sumner, then Bishop of Chester), whose opinions on "charities" may be seen in an article on them which he wrote for the "Encyclopedia Britannica." In my own report of the administration of relief in the metropolis will be found a graphic description, which I got the Rev. W. Stone, the then Rector of Spitalfields (now Canon of Canterbury) to give from practical observation, and which is now typical of the sort of population these endowments created in his parish, in the life of one of them, born in charity, nursed in charity, fed in charity his life long, doctored in charity, and, after a wretched life, buried in charity. If the principles settled in our report, with the concurrence of the eminent prelates, our colleagues, had had due support, these charities would not now have been in question, and a growth of heavily burthensome pauperised part of the population would have been prevented. For myself, I took occasion to endeavour to recal attention to the subject through the Law Amendment Society, and again in a paper written for the Newcastle Commission of Inquiry on Elementary Education. But my most efficient colleague of the Poor-law Commission of Inquiry, the late lamented Mr. Senior, availed himself of the knowledge he had acquired on that commission, and displayed the evils of these charitable endowments in a chapter of the Report of the Newcastle Commission, in which they recommended that those funds, now expended mischievously, should be applied. But the commissioners' conclusions were summarily set aside by the then Vice-President of the Committee of Council on Education, Mr. Lowe; and the state of feeling, or of opinion, or of interest—in the House of Commons—was manifested by the dealing with Mr. Gladstone's measure, which would have set aside the exemptions of charities from taxes—exemptions which make the State contributory to every kind of voluntary, and unauthorised, and irresponsible endowed mischief and absurdity. The evidence of the evil arising from absurd and maladministered endowments surges up again before the Schools Inquiry Commission, and they re-urge them, with the additional evidence of law lords as to the unfitness of the Court of Chancery to deal with them; and it is creditable to Lord de Grey and Mr. Forster that they have adopted and brought forward provisions for dealing with them. But, so far as it has gone, the Endowed Schools Bill furnishes, I am sorry to state, an illustration of the

statement I have had occasion to make as a matter of fact, that no large measure, partaking of a character of legislative, administrative, or economic science, ever goes through Parliament that does not come out worse than it went in—and this measure is already emasculated in respect to the provisions for dealing with endowed charities. It is not, however, so much to simple ignorance of economic science that this persistent opposition in Parliament is ascribable, as to the prevalence of sinister interests in the endowed funds, as means of local political bribery and corruption. Both sources of opposition will have to be confronted for the progress of technical and popular education, for unless these endowments—now worse than wasted, estimated as to charitable doles at more than a million of money (more than equivalent to the annual grant for elementary education) —are allowed to be applied to provide a national education, which would otherwise be unnecessary in most old districts, provision will have to be made by the dreaded additional rates and taxes—really dreaded means—in this instance of large economies. In so far as relates to the pure ignorance of economic science, I have observed it is as if we were going on with a perpetuity of foundations of hospitals for the alleviation of marsh diseases, with a perpetuity of disregard of the antecedents of the diseases, and neglect of the marshes whence the diseases originate. We have a moral stagnancy, or marsh condition, as well as a literal one, to remove by a better administration, by the removal of stagnant endowments, and by training and education. The more you examine this branch of administration, however, the more laborious is the circumspection it is found to need to conduct it with safety. Administration upon exceptional cases, or upon immediate impressions, is generally fatal. You must regard not merely the collateral as well as the direct, and the ultimate as well as the immediate results of what you do. Sir Charles Trevelyan gave way to an excess of founder-worship in the case of William of Wykeham, but that founder provided for his own kin. To a proposition of mine for the disendowment of all such by the general application of the principle of open competition, I had the hearty support of the late Archbishop of Dublin, Whately, who stated the fact that, at Oxford, to say that a man was of "founder's kin" was equivalent to saying that he was a numskull. William of Wykeham could not have foreseen these remote consequences, or he would have forborne to dispose of his property in such a way as to tend to make all his kinsmen numskulls to the end of time. Sir Charles Trevelyan, not having given special attention to the subject, is excusable for not being aware of the ultimate consequences of such a foundation, but a charity commissioner may be bound to see them, and would be inexcusable for not providing against them. The Court of Chancery is given up by good equity lawyers as unqualified, for want of qualification, to decide properly on schemes for the administration of charitable foundations. The stream of decisions of the courts of law upon poor-law cases involving points of administration are generally bad law, and are so for this reason—that to enable those courts to decide correctly on principle you must possess them with the information contained in several volumes of reports—which, in practice, cannot be done. For safe administration it is necessary then to constitute a special authority, with securities for the special aptitudes of the administrators for their giving their undivided attention to the subject—and to make such self-acting arrangements as shall bring constantly within their cognisance the experience of the whole field for their guidance. Such an authority would have been the Poor-law Board, had the original intention, with its assistant-commissioners, been duly executed, giving constant local examinations; and, indeed, as it is, it is now more fit than the superior law-courts for the decision of all questions arising on the means of relieving the indigent. Such an authority will be found in Paris, where the whole of that metropolis is placed under one administration, conducted by superior executive officers, presided over by M. Husson, of the Institut, and supervised by a *Conseil de Surveillance*, composed of high officers of state, representative men of long administrative experience. The results of this arrangement are notable. Here, if a wealthy lady were disposed to found a hospital, she would recoil from the idea of entrusting its administration to any local authority, such as a vestry or a board of guardians, from whom would be expected every variety of *nonfeasance*, *misfeasance*, or *malfeasance*, or waste. She would be driven to constitute a private special trust for the purpose, and we know how unfortunate the eventual administrations of such trusts commonly are. There, in Paris, she voluntarily and confidently confides it to the *Administration Générale de l'Assistance Publique*. I have had sent to me its administrative account for the year 1866, in which there are accounted for one hundred and thirty legacies and donations, amounting to upwards of a million and a-half of francs, besides sixty-three gifts, most of them with special objects, confided to the care and discretion of the administration. I have been assured on good authority in Paris, that the administration deserves public confidence, and the large streams of voluntary donations confided to it are decisive of the fact that it possesses it. In my own observation of charitable foundations, though the motives of some of the founders are obviously base, though the means selected of doing good are too commonly foolish, I cannot but deeply respect the general motive—sympathy for human misery, and a desire to contribute to its relief. *Res est sacra miser.* Nevertheless, I say as a police commissioner of inquiry, that if you would prevent crime—if you would stop mendicity, which is the great seed-plot of juvenile delinquency and habitual adult crime, you must give authority positively to punish indiscriminate alms-giving. In other respects, competent authority should be given to guide and aid private beneficence, in respect to which I agree with Mr. Mill; and in answer to the request of Mr. Hobhouse for an instance where any endowment has been productive of any addition to science or human knowledge, I have to say that, in the nature of things, such examples are not likely to be found in the fields most in question, the fields with which he is officially the most conversant, of parish or borough foundations; but I believe it may be said that, but for the foundation of the professor's chair filled by Adam Smith, which gave him the leisure and the inducement, we should not have had "The Wealth of Nations." But for the professor's chair of jurisprudence at University College, which gave to Professor Austin the stimulus, from my knowledge of him, as a student under him, I do not believe we should have had "The Province of Jurisprudence Defined," the best contribution of our time to the science of jurisprudence. But for what was practically a foundation, the professor's chair at the Royal Institution, which gave to Faraday the means and motive, his great chemical discoveries might have been prevented by the necessities of occupation in gaining a livelihood in some inferior position. It may not be said that all the advances rewarded by medals and prizes in this institution —the Society of Arts—were the results of the medals, though some of them were; but from my observations of the proceedings of the transactions of the Academy of Moral and Political Sciences, of the Institute of France (of which I have the honour to be a member), it may be stated that very important treatises have been produced by the large prizes and endowments bequeathed to the Academy for its administration. When Mr. Mill said that the superstition in respect to founders' wills is gone, he is, I conceive, to be fairly understood as assuming it to be gone from the minds of the educated people, the readers of the publication in which he wrote. Incidental observations of his, which admit of qualifications, have, I may object, been presented at the expense of his main proposition, which is passed over without due notice. On the approach of a demand for compulsory education, with powers of rating for the better technical education

of the wage-classes and the lower middle-classes—wealthy men who have themselves received an education in which they glory largely from charitable foundations intended for "poor scholars" in colleges and universities, these men, most of them educated in foundations stolen from the poor, men whose rentals, without any labour of their own, are augmented by the advance of education and the skilled technical industry of the wage-classes, began to talk of the dignity of independence of rates or of anything of the nature of endowments for popular education; as if there were any public education of any amount anywhere in Europe that is not endowed in respect to buildings, professors' chairs, or otherwise. In this feeling of opposition Mr. Lowe chimed in, and it has been proved as pernicious in action as well as in writing. To him and to them, on the national elementary education question, Mr. Mill answers, as respects what he proposed as free-trade in education, that it is necessary that, "first, the consumer must have the means of paying for it; secondly, he must care sufficiently for it; thirdly, he must be a sufficient judge of it." "All the three conditions are signally wanting in the case of national education;" and who here can gainsay one of these propositions? To Mr. Lowe's declaration of "the incurable and inherent defects of endowments," Mr. Mill answers—"The abuses of endowments are flagrant, monstrous, and wholly inexcusable. But what funds, private or public, would not be a prey to malversation if the law took no notice of it, or if, though the law was what it ought to be, there was no individual whose interest, and no public officer whose duty it was to put the law in force?" To the objection to endowments as a bounty on idleness, Mr. Mill answers—"What is feared is, that the teacher's duty will be idly and inefficiently performed if his remuneration is certain and not dependent on pupils. The apprehension is well grounded. But where is the necessity that the teacher's pay should bear no relation to the number and proficiency of his pupils? In the case of an ordinary teacher, the fees would always be a part, and should generally be the greatest part of his remuneration." These are Mr. Mill's main propositions, and I venture to say that they are complete and conclusive. In respect to payments for results, I believe that I, long ago, first put forth that expression, in urging the need in education of making interest coincident with duty, for which purpose I proposed in respect to destitute children, that the teachers and trainers' emoluments should be made chiefly dependent on the outcome, that is to say, on the number who got into good places for productive employment, and who kept them. The general adoption of this principle in administration would work larger reforms than may really be imagined. I must observe that the Schools Inquiry Commissioners would have performed their task more satisfactorily in respect to the endowed grammar schools, if, instead of confining themselves to scholastic examinations within the four walls of schools, they had extended their inquiries to the outcome of them, as experienced by employers of the same in the counting-house or the manufactory. If they had taken that course, which is a comparatively short and decisive one, they would have found in respect to large and munificently endowed schools, of which the governors at public dinners boast the success to be so high and great as to set them above all question or inquiry, that the pupils would generally have been benefited by their entire suppression—if that were the only alternative; they would have found, if they had inquired in the merchant's or the banker's counting-house, or in the engineering establishment, that the arithmetic taught in those great old schools is commonly so wretched that it has to be unlearned and re-taught—that the useful modern languages are so taught as not to enable them to do what is required in writing a foreign letter; and that the pupil's time has been worse than wasted in learning badly dead languages, that might have been profitably occupied in acquiring the elements of living and profitable science. Such an inquiry into the outcome would have shown how much the grammar schools and our education are yet infected by that which deserves no better name than mediæval monkery and barbarism. Of this, an example was presented by Mr. Hobhouse, in the provision of Bishop Pursglove's foundation, in the time of Philip and Mary, who laid down as a condition that school-teachers, and, by consequence, the scholars, should be at work at their desks in the school eight hours daily during one part of the year, and ten hours daily during another. Those benighted monks or priests, not knowing that which was to be acted upon—the human mind—and especially the infantile mind, imagined that they had only to place the body before them under constraint, and that they might go on and on, as long as they could stand, pouring forth upon it whatsoever they listed, and that all that could be poured forth is imbibed and retained. It is only now beginning to be perceived that there are laws of the human mind—that the capacity of attention in young children has definite limits which cannot be transgressed without evil. The art of school examination is a new and recent art, by which you ascertain how much attempted to put in is really retained in the mind; and by the exercise of that art it is proved that, in the infantile stages, the capacity of profitable attention or of mental labour is exhausted in less than three hours daily. What monkish barbarism is it not then to go on as we are doing even now in the national and other schools throughout the country, keeping little children under six hours of daily sedentary constraint! Professor Bain, of Aberdeen, a leading psychologist, speaking of the grown youth at the University there, declares to me that he believes that they have there the hardest heads and the hardest workers in the kingdom, and that four hours of daily mental work is as much as is good for them. Ignorant of the law that a sound mind can only be maintained in a sound body, these benighted men of the cloister were reckless of the bodily as well as the mental injury done by so much sedentary constraint. This is a topic which appears to me to have been neglected by the School Commissioners, and that makes their report on the grammar and endowment schools to a serious extent one-sided. Neither do they seem to have been aware of what is termed a recent discovery of educational principle and administration, that the power of school teaching, in time, in economy, and in efficiency, is very much as the numbers. The consequence of this will be found to be to necessitate a common teaching in the elementary stages of the children of the middle classes, except in very populous districts, with the children of the wage classes, as in Scotland, else the children of the middle classes must be put to greater disadvantage or greater expense than they appear to be aware of. The persistence in the mediæval provisions of the subject-matters taught in most of the grammar foundation schools is as barbarous as the modes of teaching. We are wont to hear their founders praised as men in advance of the times in which they lived, and desirous of extending liberal education amongst the great body of the people. But when the conditions of the foundations are examined, it will be perceived that they were, for the most part, the work of the priesthood, and were instituted not for the people, but rather to sustain the clerical order, which could not be maintained from the surrounding savagery. The early introduction of music as part of the education in these schools is presented as an anticipation of a modern refinement, but it served to raise singers for the cathedral and church services. In the earliest times the extent of occupation with the dead languages was objected to. I concur with Professor Scott, late of Owens College, Manchester, who, in a lecture on the literature of the Middle Ages, quotes a letter written by our Anglo-Saxon King Alfred, and sent round to all the bishops and heads of monasteries. "Let us," wrote the king, "have learning with all speed put into English; let that be the first object of education; then let those that have leisure pursue their study of Greek and Latin." But it did not

suit the clergy to put that learning into English. Now, however, that there is more learning in the vernacular than was possessed in the classic periods—far more than there is time in any school or collegiate stages to master—now that the English itself, according to the impartial testimony of the great philologist Grimm and others, is the foremost language of all for cultivation as a mental exercise, are we, out of founder-worship, to continue these barbarous courses of education, not for the leisure classes, but for the industrial classes? In respect to the preparation of new and more fitting schemes, the Schools' Enquiry Commissioners evinced inexperience and a lack of administrative knowledge when they proposed that provincial authorities were the proper authorities to draw up schemes for education—that is to say, the authorities with the narrowest means of information? The commissioners might have seen the quality of such initiation in the common inferior quality of the educational schemes of amendment commonly presented to the Court of Chancery. Such a plan reduces the central authority to a judiciary, which, even if it be that of a special judiciary, will have only inferior means and responsibilities for the amendment of what is brought before it. No; the initiative, to be effective for what is required, must not be on the narrowest but on the widest information and experience in organisation. A properly constituted central authority is not the arbitrary, unreasoning, dogmatic, and irresponsible master the advocates for vestralisation assume, but is the servant of every locality as well as of the public at large, bound to collect the widest experience and professional knowledge and skill of the whole field, and apply it responsibly for the service of every locality. Without excluding local lights, and, indeed, carefully collecting them, they should send down men skilled in the organisation of educational means to produce the best results, to prepare schemes upon the widest experience, and report upon them for local as well as superior consideration and discussion. When an authority on correct principles is instituted, and has proved its competency by its reorganisation, then I consider that measure for which he contends may properly be instituted, and that bequests may, when the public is the legatee, be required to be unconditional, as Mr. Hobhouse proposes, and applied at the superior discretion of the authority. It is to be hoped that he and his colleagues may be allowed sufficient powers and means for the application of these principles, and may lead to the permanent institution of such an authority.

Mr. E. Webster inquired if the municipal authority in Paris, to which Mr. Chadwick referred, recognised in any way the right of private endowment. For example, if a person by will left property to a particular charity, would it be so appropriated? He would also like to know what was the practice in the French provinces in this matter.

Mr. Chadwick said his information only applied to Paris, and even to that extent he was not able to go into the detail Mr. Webster desired.

Mr. H. W. Freeland said he could not follow Mr. Chadwick through all the points upon which he had touched, but if he had rightly understood him to recommend that the municipal authorities throughout the country should have the control of the charitable trusts, he must beg leave to dissent from such a proposition. Municipal bodies were, in many cases, centres of jobbery and corruption, and were elected in a manner that was anything but pure. He did not know how the plan worked in Paris, and should be very glad if further information could be obtained. Probably on this point Mr. Hobhouse would be better able to speak, and he should like to hear from him if he could tell the meeting what was the result at Bedford of the municipal body being mixed up with the administration of charitable trusts. He thought it most desirable that this subject should be fully discussed, for there could be no question that, whether they took Mr. Mill's view, that of Mr. Hobhouse, or what appeared the intermediate one of Lord Lyttelton, all must agree that it was very desirable that public opinion should be fixed and formed upon this important subject, to which nothing could contribute more than such admirable papers as those of Mr. Hobhouse. The extent to which the State should interfere with the right of testamentary distribution was unquestionably a most delicate problem. All agreed that there should be some controlling authority, and he, for one, was of opinion that such authority would be best entrusted to some such body as the Charity Commissioners, subject as they were, by the reports they made, to the control of public opinion and of Parliament. All agreed that abuses must be checked, and in his opinion some such controlling power would be the best means of bringing the eccentric and absurd dispositions of founders into harmony with the wants and spirit of the age. No one would desire to check the rational flow of public charitable benevolence. The habit of giving, kept alive and restrained by principles of sound practical wisdom, was one of the best antidotes to the poison of those selfish tendencies from which, in his opinion, society had as much to dread as from the misdirected efforts of unwise testators. The subject alluded to by the noble Chairman at the close of the previous sitting was one in which he had long taken an interest, for he had expressed the opinion some years ago, that it was undesirable that large quantities of land or houses should be locked up permanently in the hands of the trustees of charities. In a country like England, where land was scarce, it was exceeding desirable that it should be made as available as possible for all the reasonable requirements of a great commercial community. He was therefore much pleased to find Lord Stanley substantially endorsing that opinion, because, from the position occupied by that nobleman in the legislature, and from the extreme care with which it was known he examined all subjects which he touched, such a statement coming from him must have great weight. "All agreed," said Lord Stanley, "that, as a general rule, it was not desirable that landed estates should be perpetually tied up in the hands of public trustees, or for public purposes, and it was a matter, at least worth consideration, whether it would not be well in future to impose upon all founders beforehand some particular manner in which the endowment should be invested. If they continued to allow any individual to dispose in perpetuity of a sum of money as at present, it did not seem any unreasonable limitation to insist that the capital should only be invested in one way, namely, in the public funds. Of course, it would be a difficult thing to apply such a rule to charities or endowments already existing, but with regard to future endowments he saw no hardship in such a proposal." As far back as 1860, he (Mr. Freeland) had, in the House of Commons, called the attention of Mr. Lowe to this subject, and had stated that, according to the last returns, which did not, however, come down later than 1839, there were between 400,000 and 500,000 acres of land tied up in the hands of trustees of charities. If any later information on this head could be given by Mr. Hobhouse it would be valuable. In 1862, when sitting in a Committee on the Ecclesiastical Commission, he put to Mr. Dyott, a gentleman who had paid great attention to these matters, this question—"Does, in fact, the land locked under charities and under the church impede the progress of the town of Lichfield?" and the answer was, "Enormously; I use the word enormously as the only word which I can bring to bear upon it." This, at all events, showed that the mode in which moneys given for charitable purposes were invested, had an extensive and important practical bearing, and he was very glad to find Lord Stanley expressing himself so strongly on this part of the question.

Mr. J. G. Fitch rose to say, for the information of

Mr. Webster and Mr. Chadwick, that a very clear exposition of the present state of the law of France, and of several of the German states, on the subject of charitable bequests, would be found in Mr. Matthew Arnold's report to the Schools Inquiry Commission, on the "State of Middle-class Education in Foreign Countries." He there gave some very striking extracts from the Code Napoleon and the law of Prussia, in relation to the liberty permitted to testators. He had certainly gathered, from the very clear summary of the law of both countries there given that such a thing as nomination by a testator of a body of trustees, with power of perpetually appointing successors, was absolutely impossible.

The Rev. William J. Irons, D.D., commenced by saying that, while he admitted Mr. Hobhouse's principles almost entirely, he almost as entirely differed from his conclusions. Conclusions ought to be implied in premises, but in the present case he did not think they were so. Mr. Mill appeared to him to be much nearer the truth than Mr. Hobhouse, when he said that men were really agreed upon the plain fact that the State had a right to deal with the disposition of all property after the death of the present owner, and even had a right to regulate property to a certain extent during the lifetime of the owner. He was surprised to find that Mr. Hobhouse thought it a discovery of the present generation that wills, however fairly signed and witnessed in the lifetime of the testators, cannot always be maintained as in the darkest ages. He (Dr. Irons) did not believe that the opposite opinion existed amongst educated persons; indeed, they all knew that the power of disposing of property by a piece of writing must exist and continue only by the permission of the legislature of the country. There were times when there was no such power. The right to make such a will was unknown to ancient Greece and Rome. There was no such thing as making a written will in Rome before the Law of the Twelve Tables, nor in Greece before the time of Solon, nor was there any provision for the making of wills in the laws of the Jews. Even in England the power of making a will was but a common law right, and the earliest statute was passed about the time of the Reformation, the 28th Henry VIII. He thought it was a wrong thing to impute to anyone opinions which he did not hold, and then to argue against them. It was, in truth, only fighting a man of straw. No doubt there had been a degree of interest thrown into this somewhat dry subject, which at first sight was rather surprising, but the reason was, that in all men's minds at the present day the question of endowments raised certain collateral ideas. The little allusion to "pious founders" which had been made, at all events awakened the suspicion that something else was thought of besides an interference with endowments for doles and other purposes. The stress laid upon the word "pious," and the manner in which Mr. Chadwick had thought fit to introduce the idea that priests in former ages had had some sort of interest in not acting fairly and honestly by the people, but, on the contrary, in keeping up a defective state of education for some purpose of their own, tended to the same conclusion, and he did not think such a way of referring to a sacred subject was calculated to promote the purposes of the present conference. They ought in such a meeting to reason calmly, not sneer at their neighbours, and, for his own part, whenever he found anything like a sneer, or even a smile, was introduced into a syllogism, he thought the syllogism itself was probably faulty. With regard to the subject itself, he would come at once to what he supposed to be that which gave it so much interest, viz., the fact that they were now beginning to deal not only with charitable but also religious endowments throughout the country. As honest men let them look honestly at what they were doing, and the principle on which they were to proceed. For himself, he did not insist that the disposition of money to sacred uses was any more to be protected than the disposition of money to charitable uses. He was quite prepared, and he was quite certain that every capable ecclesiastic of his acquaintance was prepared, to make a much larger concession on that point than even Mr. Hobhouse himself, perhaps. He was prepared to say that the continuance of endowments for church purposes should depend politically on the same broad principles as any other endowments for any purpose whatever. They could not conceive that a man who lived 500 years ago, and gave a tenth of his property or land to certain religious objects, could in all things bind them. If the act was right originally, let men do the same now. If the payment of tithes was a sacred obligation then, let men act upon the same principle now. He supposed that no one would contend that tithe—which he was convinced was the real subject in all their minds—was an absolute law of nature, so that one-tenth of the whole soil of the globe ought to be set apart to purposes of religion. If, however, any one maintained the obligation to give a tenth of his own property to religious or charitable purposes, he could only say, let him act upon it by all means, and let him, as far as he could, persuade others to do the same. If he could persuade the whole nation, then, no doubt, it would for the time become the law; but it would not necessarily be the law for the next generation; the next generation might act upon it if they thought the same. But what would be the result? If one-tenth of the property were now given by the present owners to religious and charitable purposes, in the next generation a tenth of the remaining nine-tenths must be given, and in the next generation a tenth of the remainder, and so on, until, in the course of a few generations, very nearly the whole soil of the country would thus be given. It was evident, therefore, that this sort of sacredness of tithe could not be defended. Then it came to this, he maintained the sacredness of endowments whenever it was found that in their administration they were right and useful, not otherwise. And in his opinion they should make a distinction, not between personal property and corporate property, but, what he believed a much more correct and proper distinction, between endowments for abstract purposes and endowments for personal purposes. He wished to call particular attention to this, because he believed that hereafter the whole matter would be guided by that principle, as it was now being guided by it with regard to the Church in Ireland. By an endowment for an abstract object, he meant an endowment to carry out a general intention on the part of the donor, to execute, say, some charitable end not necessarily connected with persons. By a personal endowment he meant a totally different thing, which he would illustrate in this way. Suppose a trade-union having no fixed body, but constantly adding to and losing its members. Such a body could acquire property, as probably many such bodies had, and the law protected, or ought to protect, a trade union in the possession of that property. Certain members died, other members joined, but there was no change in the ownership of the property, which still remained in the hands of a living body of men, who although in a state of flux were still the same body. This was really an endowment; the more property they acquired, the greater was their endowment. Any club or institution of a similar kind which had the power of adding to and lessening its members, might acquire property which would become, in the course of a generation, an endowment to be protected by law. True, in some cases it might be interfered with by the members themselves, but in others there might be regulations made by the members prohibiting such dealings; in some cases there might be very stringent rules, which could not be altered except by the authority of the legislature. At all events, they would hold the property as a club, as property not held for any abstract purpose, but property which was as much the property of the living generation as that of any individual, and it would certainly be right for the law to maintain the existence of such an endowment so long

as the persons existed capable of using it, according to its general intention. Further, he would say that they ought not to be charged with improper motives when they maintained that ecclesiastical property was of this kind. It was not property left for an abstract purpose, or, as it was expressed the other day, property intended for the endowment of opinions. It was property belonging to individuals who were combined, not exactly as a corporation, but still in a manner that the law recognised. Ecclesiastical property in this country did not belong, perhaps, strictly speaking, to a corporation—every individual of it was a corporation, but the church at large was not a legal corporation, and he did not conceive how it could be. He held that the property, while it answered its purposes, and while it was administered by a living body, and inherited by a living generation, ought to be protected by law. If in any place, or under any circumstances, the property became entirely alienated from all useful purposes, and no longer answered its end, whether it were tithe or any other kind of endowment, he should not hesitate to say that it ought to be applied in some other way, and dealt with rigidly by law. But there ought to be and would be more care exercised in dealing with personal property of that kind, whether vested only in one person or in a *quasi* corporation, than with that merely abstract kind of endowment which he had first referred to. He would now shortly state how it was he differed from Mr. Hobhouse. He thought the paper laid down sound principles; that it was only right that the law should keep a tight hand over all these doings, and deal with every question on its own merits very carefully; but he differed from him in supposing that there ought not to be any real endowments, whether of opinions or of persons, when they continued from generation to generation. It was absolutely said in one part of the paper that Mr. Hobhouse doubted the wisdom of any endowments at all, and, as far as he understood him, he would thus have one generation cut clean off from the next, and that the living generation at any time should have the power of dealing *de novo* with all the property then in existence. There he differed entirely from Mr. Hobhouse; all civilisation would become disintegrated if they were to act upon such a principle.

Mr. Hobhouse remarked that what he objected to was simply unalterable endowments.

Dr. Irons said no one doubted that, as far as he knew. He never met an educated man who maintained the proposition, that endowments should be absolutely unalterable.

Mr. Hobhouse said he met with such men every day of his life.

Dr. Irons said he had never met with such men, nor had he found such a proposition in print. The simple origin of the right of making a will was quite sufficient to put an end to such an idea. When a man, died he had nothing more to do with this world; if the State gave him power to make a will, then he might make it; but the State might lay down what regulations it thought fit with regard to such wills. What he maintained was that there might, beyond that, be a perpetual succession of individuals who could exercise this power of which he had been speaking. That was the case even in Greece and Rome, where there were institutions similar to the burial clubs of the present day, and which, no doubt, formed the models upon which were partly formed the *agapæ* of the Primitive Christians. These clubs existed throughout the Roman empire, and were recognised by the law of the land; their property was protected, and was allowed to descend from one generation to another. Each club did not come to an end by the death of its members, but held on a continuous life; and he claimed the same reasonable conditions for ecclesiastical property. For this reason he disagreed with what appeared to him to be Mr. Hobhouse's conclusions; but if he had mistaken him, he should be glad to be set right. Such a course as he suggested would turn back the tide of civilisation, instead of urging it forwards, which latter, he believed, would be in accordance with Mr. Hobhouse's earnest aspirations. If they were to cut themselves off, and say they had nothing to do with the past, and nothing to do with posterity, they would only intensify the selfishness of the present generation, and threaten the progress of all civilisation. It should never be forgotten that they owed all they had to their forefathers, and were morally bound to transmit all the advantages they could to those who came after them. They were bound to examine what was best at any given time, and if they found things were going wrong, the law was bound to interfere. But he must again say that he deprecated in these discussions the tendency of some to sneer at the priesthood, who had certainly been the leaders of civilisation.

Mr. W. R. Grove, Q.C., said, if the question before the meeting was as to what detailed measures were best in relation to existing charities, it could hardly be dealt with in a verbal discussion of that character; but if, on the other hand, the question was, how far endowments were beneficial to civilisation, or how far they were the reverse, it was his duty to express his opinion. He gathered from the last speaker that, in his view, the law might interfere with endowments when those endowments were injudiciously administered, but that was an admission which he did not consider of any great value, because the law must interfere if the endowments became absolutely pernicious; this was absolutely necessary to the carrying on of the social system. The question before them, as he understood it (not having heard the paper, but having heard Mr. Hobhouse's former paper on the same subject), was whether it was desirable that there should be unalterable endowments; in other words, endowments which, except under extraordinary and revolutionary circumstances, were allowed to perpetuate the intentions of particular individuals when those individuals were alive. These endowments might be divided into two, or perhaps three classes—mortuary or testamentary endowments, endowments by will, to take effect after the death of the testator; secondly, gifts during the lifetime of the testator, controlled by his wishes, gifts by deed; and, thirdly, there was a class of property which might be included under the term endowment, though he should not have so treated it—corporate property, gathered together under certain circumstances, and becoming in that way brought into perpetuity. The latter formed part of a very large question, with which he did not think they were now dealing, and he should therefore confine his observations to the former classes, viz., mortuary endowments and gifts by living men. With regard to the first, he was absolutely and entirely opposed to them. There had been a time when he thought as others had thought, and as many still thought, that there was a degree of sacredness attached to what was called the intention of the testator. He remembered very well that, at the time he left the University, he should have thought it almost a wicked thing to doubt that, unless some positive evil were prescribed by the testator, his intentions ought to be carried into effect. But the thought of many years, and the study of these things, had satisfied his mind that that was a fallacy. In the West-end of London, there were masses of houses inhabited by wealthy men—there might be hundreds, if not thousands—to whose opinion not one man in that room would attach the slightest weight whatever. He would take one as a type of the class, and call him say John Smith. If the opinion of John Smith, who had £10,000 a year, were stated, or his opinions expressed in that room, every one would say that he did not care a straw what Mr. John Smith's opinions were; he might be a very good man in his way, but he had not thought, and therefore his opinions or intentions were worth nothing at all, and would not be listened to or acted upon, they would have no influence whatever with mankind. But let Mr. John Smith leave his money for the purpose of some particular object which he had at heart, which might be sufficiently moral, or not im-

moral, so that it came within the statutable definition of a charity, and then, a century or two after Mr John Smith's death, his intentions would govern the world, and would be followed out in every respect. The man who was not worth listening to in his lifetime, who had but a moderate or no education—who had never shown by any struggles with mankind that he had any capabilities of thought or action—that very man, whose intentions during his lifetime were absolutely valueless, by the very fact of his decease might become exactly the contrary, and would have power to control the actions of mankind in perpetuity, because the law said that a man's wishes after his death, if connected with the distribution of property were sacred, and were not to be interfered with or departed from in any way. Many of these ideas grew up during monastic times, though he meant no reflection on anyone on that account. But was there any benefit in this? It was certain that the property of the country was not increased; if a man died intestate, or left his money to A, B, or C, the country would possess the same amount of property. Not a single acre of land, not a single pound of money, existed more than if it had not been left to charity. Moreover, how was this frequently done? Perhaps when a man found life ebbing away, when he had no relations, or had quarrelled with them, or conscientiously thinking that some particular set of opinions which he affected were of importance to the world, he tied up his money to that set of opinions, and so it remained for ever, although, very possibly, had the man himself lived a few years longer, he would have discarded them. Again, he generally made this disposition, not when his mind was in its best state, not when, by struggling with the world, he had his wits sharpened, but when enfeebled by illness, and influenced by those around him. Under these circumstances a thing was executed in a moment which would perhaps be repented of next day if he had not died, but it was binding for ever because he did die. Of course he was speaking here only of personal property; landed property was to a certain extent protected, but with a mere stroke of the pen, done in an instant, by a person at the point of death, personal property would be appropriated for centuries according to the mere—it might be passing—whim of the individual. There might be good mortuary bequests, but the question was, did more evil or more good result from them. On one subject, that of education, he thought they were peculiarly objectionable. Education was a matter which had changed, and must continue to change as long as the world lasted. The man born to-day did not start in the same position as the man born fifty years before; he had to start with the addition of all the knowledge that had been acquired during that fifty years, and which was unknown to his predecessor, yet if the opinion of that predecessor on education were to be acted upon, the man of to-day must not avail himself of the fifty years' improvements, but must go back fifty years, or a century or two centuries ago, and be bound in the trammels which had been prepared for him by the man who lived in that distant age. Could such a system as that be good? It was the same with regard to doles and charities of every description, with one possible exception, that of hospitals for the sick and infirm, which he excluded for this reason, that they required, generally speaking, a certain amount of living local assistance, and were mostly administered by gratuitous services, so that there was not so much opportunity, as in other cases, for the funds being abused, whilst they were applied in a great majority of cases to the relief of those who wanted it merely for temporary purposes. Even in the case of hospitals, however, he doubted whether they would not be better administered entirely by the subscriptions of living persons than by the aid of mortuary gifts. There would be the same ability to administer them, for there would be precisely the same amount of property existing, whether it was left to the charity or not, and there was no doubt that, in many cases, subscriptions were withheld from hospitals in consequence of mortuary gifts. For instance, a man whose father had left a large sum of money to an hospital would feel that he was exempt, and need not subscribe, his father having already done his part. He, therefore, with his interest and controlling influence, would be withdrawn from the charity. If this were the case with hospitals, *à fortiori* in other matters; there was much inevitable evil connected with these mortuary gifts. If persons subscribed to a society or any other institution they would watch its progress, and if they saw any abuse could interfere, or, if they were not disposed to take an active part, they could at least withdraw their subscriptions. But when there was this fund given by a dead hand, who was to interfere? It was immediately said—"You are a meddling person, what business is it of yours to come here and make a fuss; you did not give us the money, but the testator, a hundred years ago or more; what business have you to come and say it is squandered or misapplied?" Nobody had a right to withhold subscriptions from, and thus exercise a controlling influence over the affairs of such a charity. There were an immense number of other evils of a similar character, if there were time to go through them. Mr. Hobhouse had given some instances, but he might have given a much larger number of still stronger ones. It was admitted that there was no question of right in the matter at all; the whole question of wills altogether was a question of human policy. There was no abstract right in a man to prescribe how future generations should carry on the matter. It was only necessary to state such a question in order to answer it, and he did not hesitate to say, as regards these mortuary bequests, it would be better for the State if they did not exist at all. While saying that, however, he must guard himself from being supposed to say that existing endowments should all be swept away. They had been going on for many years, some of them doing good, and some doing harm, and some that were doing good did harm at the same time; they must take them as they were, and endeavour to do the best they could with them; but, for the future, it would be far better if there were no money left by will for charitable purposes. The second class of endowments, to which many of the same objections applied, but which had much more to recommend them, were gifts by living persons. In these cases the living person, at any rate, had to part with his property at a time when he was capable of enjoying it himself, and that alone was a tolerable check upon such gifts. There never would be in fact a large number of these charities. But, secondly, living persons would be likely to take an interest in the charity which they had founded, and to interfere if things went wrong, and thus there would be a powerful check which did not apply to the case of mortuary gifts. No doubt, however, many evils would remain, and in particular when the donor died all the evils that belonged necessarily to mortuary charities would come into full play. With regard to this class of charities, therefore, although he would not prohibit them altogether, still he would have them put under rigid supervision by the State, meaning by that term some authority chosen by the State, for of course no particular ministry for the time being could attend to the charities throughout the country. In his opinion, no charity should be supposed to be carried on perpetually for any special purpose, except subject to such changes as the controlling authority might see fit from time to time to introduce. He believed that such a course of action would not deprive the country of one efficient charity, but they would get rid of the abuses which were now known to take place in many of them. The subscribers would become much larger, because the charities of the day would be thrown upon the energies of the living people of the day, who would feel that they had a duty to perform, a large portion of their property not having been already taken away from them, and given by will to charities. Every thinking man would, he believed, feel it his duty to subscribe

to and help forward the deserving charities of the day, and they would thus be not only equally well supported, but much better looked after. Before sitting down he must refer briefly to a matter which was in every one's mind, and which was, no doubt, a very difficult and delicate point to deal with, viz., the large and ancient educational establishments, such as the Universities and public schools and their endowments. He was not for suddenly and violently interfering with these bodies, although he had already taken part in endeavouring to introduce some new branches of education into them. He might here mention a little of his own personal history, which would illustrate the effect upon the Universities of the gifts of past founders. In consequence of his father having a very intimate friend, a clergyman, who was a member of Brazenose, that was the college selected when he went to Oxford; but when he had been there a short time, he found that although there were a number of very good scholarships and fellowships attached to the college, there was not one which he could by any possibility hold. They were all tied up strictly, either to the founder's kin, or to persons born in a particular locality; and his parents not having happened to select one of these localities as their domicile, he was excluded from any participation in these benefits. But there was one other remarkable thing, and that was, that all the men in the college who distinguished themselves, as a general rule—he did not say there were no exceptions—were not scholars or exhibitioners. And the reason was obvious; the scholars and exhibitioners came up there, not to distinguish themselves, but because they were provided for; they had so much a-year as scholars, and were pretty sure of a living or a fellowship afterwards. Taking them as a general body, therefore, the scholars were the least scholarlike of the whole University; he himself had no chance of any preferment at the University, except in competition with the whole University, for the very few University scholarships which were open to that college.

Dr. Irons asked if Mr. Grove meant to assert that the scholars were the worst men at the University.

Mr. Grove said that was his recollection of his own college. Whilst he was there, no scholar took either a first or second class. He merely mentioned the facts which had occurred within his own knowledge. He gave no reason for these facts, but still he must say it was a probable result. He made no reflection at all upon the moral character of these gentlemen, or anything of that sort, but coming up already provided for, they had not the same motive for exertion as other men; they came up to receive so much a year, and attached to these scholarships there were generally livings or fellowships for those who could manage to pass even decently. He believed the experience of other colleges was much the same, and, indeed, the result seemed almost inevitable. If the rule of any school were that one-third of the pupils, provided they could just decently go through the ordinary studies, should have £100 a-year and £200 a-year when they left school, and that the other two-thirds should have nothing but what they could get by competing with the world at large, which would be the most likely to be energetic and persevering? There might be men who would struggle in spite of their indulgences, but as a general rule they would not be so likely to do so as those not so favoured. He had heard the same thing often asserted with regard to smaller establishments, asylums, and such like, except in cases where the foundation was so poor that it only afforded the pupil an opportunity of learning, and gave him nothing afterwards. In such cases it might, *pro tanto*, be beneficial, but anything which was given, to support persons utterly irrespective of merit—because he did not recognise it as any merit that a man was born in a particular county—must do harm, because it rewarded the non-meritorious as against the meritorious, and it deprived the person to whom the reward was important of a very great incentive to exertion. Still, he would repeat, he was not for slashing down the Universities, or introducing sudden and violent changes. His own views on the question of education had often been given; he thought it should partake of the history of past progress and present knowledge, and was not for cutting off all association with the higher-class minds of times gone by. Although he was a strong advocate for the introduction of physical science into education, he by no means wished it to monopolise attention; but one great reason why they could not get even so much as three hours a week for instruction in physical science was that all these endowments were connected with the past—with what was then a good education, the best that could be given; but even those who considered it of the greatest value would hardly contend that a knowledge of the dead languages was sufficient for all purposes of modern education, without an admixture at least of historical learning and physical science. These things, however, could not be taught, because of the dead weight which they had to contend against. In reference to Mr. Chadwick's remarks on the beneficial effect of endowments, he would say that the Royal Institution was principally supported by the subscriptions of its members, and it did not happen as a fact that any endowment which belonged to it had much to do with the making of Faraday.

Mr. G. W. Hastings said it was frequently assumed, indeed almost always, by persons who spoke on this subject, that the absurdities which had been so well exposed by Mr. Hobhouse and others, related only to the older endowments, but such was not the case. He had been much struck with the absurd conditions attached to an endowment in connection with the Society of Arts, which was certainly made within his own life-time, and with the administration of which, some few years ago, he had something to do. He referred to the Swiney bequest. Dr. Swiney left by his will a considerable sum, the interest of which was to be given away in a prize for an essay on jurisprudence, the judges being the members of the Society of Arts and their wives, and the members of the College of Physicians and their wives. He directed that when the prize was given away the whole body of adjudicators were to meet together in the hall of the Society of Arts, and determine by show of hands to whom it should be awarded, the competition being open to the whole of the civilised world. That will was still in force, and the bequest came to the Society in the way he had described; but, chiefly through the wisdom of the present Lord Chancellor, some kind of private arrangement was made, under which something like common sense was introduced into the matter; the plan adopted being that the prize was given alternately by the Society of Arts and by the College of Physicians, in the one case for a work on general jurisprudence, in the other for one on medical jurisprudence.

The Chairman, in reference to the remarks of Mr. Fitch, said that no doubt there was a great deal of useful information on the subject of testamentary dispositions in France in Mr. Matthew Arnold's report, and the French law governed a great part of Western Europe; but still it must always be borne in mind that the letter of the law was not always an exact guide to its actual administration. With regard to the provincial administration, generally speaking, charities in Western Europe were administered by the municipality of the town, or by the authorities of the commune, but they could do nothing without the consent of the Minister of the Interior, so that at every step the control of the State was operative. With regard to this subject, he thought the laws of Mohammedan countries were worth consideration, being, for the most part, derived from the Roman law, and they presented many instances both of use and abuse. A consideration of the subject on a broad basis would, he believed, relieve them from a difficulty which one remark of Mr. Grove's had introduced. He said that whether a testator left money in one way or another—whether by mortuary bequest or

otherwise—the property of the country was neither diminished nor increased. He almost regretted to have heard that, because it was a sentiment which, in one way or another, affected the community, as he believed, very perniciously in the result. It was perfectly true, of course, that not one blade of grass more was grown, or one pound added to the capital of the country, but it made a very great difference to the community whether the fund distributable for public as apart from private purposes was enlarged or not, and that was a portion of the subject which had received very little attention during the discussion, except from Mr. Chadwick. With reference to the question of endowed schools, he had pointed out that it would make a very material difference whether the portion of these funds available for education could be applied to the general purposes of education, or whether it was applied solely or mainly on some such basis as endowed schools. The administration of endowed schools might present many cases of abuse in the higher middle class, but when they came to the lower middle class it would make a great difference indeed whether or not there were funds available for the support of the schoolmaster. According to Mr. Chadwick, it was very desirable that these funds should be increased, but applied under the direction of the State. All experience shewed the great advantage that was derived from applying continuous criticism to these institutions, and it was because they had neglected to do so that they found the present defects and abuses. Dr. Irons had thought that Mr. Chadwick had sneered at sacred subjects and monastic institutions, but it certainly did not appear to him (the Chairman) that there was any such intention, although he differed from Mr. Chadwick as to the effects of what was done by the monks. It was, no doubt, the opinion of many, that the schools established by the monks were simply for ecclesiastical purposes, and had no reference to the objects of the day; but a little investigation as to what took place during the Middle Ages would show that there was a wholesome competition between the great schools; and he believed there was a passage in Fitz Stephen—at any rate there were many such in mediæval histories—which showed there was great competition between the great schools, and that it was the object of the monks and the schoolmasters to introduce not merely various branches of literature, but the various practical subjects which were demanded by the mercantile classes, according to the wants of the day. The subject of the Swiney bequest had been very well explained by Mr. Hastings, and he might add that it was still under the consideration of the Council, who were not without hopes that some means might be found for making that bequest available to its proper object, instead of being applied, as at present very often, to a subject which, under the name of medical jurisprudence, had hardly anything to do with jurisprudence at all. He would conclude by what was really almost a matter of form on his part, since it had had already been mentioned by almost every speaker, viz., moving a vote of thanks to Mr. Hobhouse for the very able manner in which he had discharged his self-imposed task.

The vote of thanks having been carried unanimously,

Mr. Hobhouse, in reply to the observations which had been made, said, though it was convenient to sum up the discussion, it was hardly necessary, inasmuch as any remarks which had been made adverse to his positions, had been thoroughly answered by others. In the first place he might be excused for saying a word or two on a personal matter, which he should not have done but for the remarks of Lord Lyttelton at the previous meeting. Lord Lyttelton made several observations with regard to the official position which he (Mr. Hobhouse) now held, and to that which he and that nobleman were about to hold in common, and seemed to infer that there was some delicacy in a person holding an official position, or about to hold one, discussing, in an abstract way, topics on which he had to administer the law. He, on the other hand, always considered that when he embarked on any abstract discussion, he left his official position behind him, and that it was open to any one, whatever his calling might be, to enter upon any discussion on any part of the law of the land, if only he was sufficiently interested in it, and knew enough about it. Such a person, he thought, was bound to qualify himself for the discussion, but he did not think that having to administer the law in any capacity ought to put any restriction upon him. He had often heard judges on the bench, while administering the law, express their disapproval of it, and state that they had endeavoured to get it altered. But, while it remained as it was, they were strictly guided by it. It was the same with him in his humbler position; he endeavoured to administer the law of the land, as he understood it, to the best of his ability. It would be exactly the same under the Endowed Schools Act, if it became law. As he read that Act, there were certain limits laid down as distinctly and definitely as at present, though more widely, and a Court of Appeal would be always sitting above them to set them right if they went wrong. He had no doubt, when the Commission got to work, they would, to the best of their ability, apply the principles of that Act, and not indulge any individual crotchets of their own. With respect to the expression that "the pious founder would go to the wall," he had intimated on former occasions, as well as in the present paper, his excessive dislike to any sudden or violent changes, and his thorough conviction that they could not force people into them, but must use argument and persuasion, and endeavour to get the bulk of rational people on their side, before they could hope to introduce any effective reform. He said that in the most emphatic language he could use in his first address, and had repeated it in the paper which had just been under discussion, so that whatever argument, persuasion, and reasoning could do towards putting the law on a sound footing he, in his individual capacity, would do. Doubtless Lord Lyttelton meant the same thing. But, as for the notion of overpowering by any central authority that which was the prevailing opinion of those who had the local administration of all these various funds throughout the country, that was quite contrary to the whole spirit of English legislation. Lord Lyttelton also said that he considered the same limitations of power should apply, whether a person gave property to private or to public uses, and seemed to think that the law of settlement to private uses was not to be interfered with. He had been contending for precisely the same thing, only he declined to look upon the law of disposition to private uses as a sacred thing, not to be examined or criticised. It was a mere piece of hap-hazard legislation, not of the legislature, but of the judges, such as had happened again and again in England. If that was pressed upon him as a reason why they should give a definite term of years to everybody to play his fantastic tricks upon the public, according to any caprice that might take him upon his death-bed, then they must examine into the law of gifts to private uses, and see on what reason it rested. He contended for the same principle in both cases, as a piece of abstract reasoning, viz., that the persons to take property should always be living persons—that there never should be one moment of time at which it should be possible to say that the existing generation of men on the face of the earth could not deal with the whole of the property on the face of the earth. It did not often happen that one had the chance of replying to the Chairman, but Lord Stanley, having generously come forward to speak, had given him this opportunity, and he was only sorry that that nobleman was not present to hear him, because he was quite certain that his candid mind would at once admit that there were considerations which had not occurred to him before, which were well deserving of consideration. In the first place, Lord Stanley dwelt very much on the *cy-près* doctrine, and contended that all that was wanted was some better machinery for using the

power which he said theoretically existed. He admitted that there were some abuses, but he thought all that was required was to bring the existing power to bear upon these abuses. Now his (Mr. Hobhouse's) doctrine was this, and it could not be repeated too often, that abuses were not the thing they had to complain of. The abuses were comparative trifles. In the legal sense of the term, an abuse was a departure from the founders' directions, which would be rectified by the Court of Chancery, and very often such a thing was the salvation of a charity instead of its ruin. The mischiefs, which all acknowledged did exist, resulted from the system of the law, and there was no power of remedying them, not even in theory. When Lord Stanley and Sir Charles Trevelyan talked of the *cy-près* doctrine, he must be allowed to remind them that they were not lawyers, and it was no discredit to them to suppose that they had not mastered the *cy-près* doctrine of which they spoke. They evidently were under the impression that there existed somewhere a power of remodelling foundations whenever they were found to be inconvenient or mischievous, but in truth there was no such power whatever. The *cy-près* doctrine was simply this, that where the objects of a charity had ceased to exist, the Court of Chancery would not allow the funds to be wasted, or to be put by the trustees into their own pockets, but would apply them to some use as nearly as possible the same as that designed by the founder; that was all. Lord Stanley, in commenting on the several instances mentioned in the paper, said that all that was required was to apply the *cy-près* doctrine, for instance, in Jarvis's case. But the very mischiefs arising in that case took place under a decree of the Court of Chancery. Lord Eldon had this matter pressed upon him by Sir Samuel Romilly, and what he said was this—"I have nothing to do with arguments of policy. If the legislature thinks proper to give the power of leaving property to charitable purposes recognised by law, as such, however prejudicial, the Court must administer it. If it is right to put bequests of property to charity under fetters, that is for the legislature, and courts of justice must act without regard to the impolicy of the law." So much for the *cy-près* doctrine in that case. It was just the same in Abbott's case; there it happened that the first complaint arose in the time of the Commonwealth. If it had come in later times before Lord Eldon, no doubt he would have said he could not interfere, but the commissioners appointed in the time of the Commonwealth dealt rather more boldly with these matters, but, through their adherence to the *cy-près* doctrine, they made a scheme which was just as bad as the original one. That lasted for a hundred years, and then, on application to the Court of Chancery, another scheme was framed on the same principle, which, after seventy years' trial, was found to be as bad as the preceding. They then went to the court again, and a fresh decree had just been made which would apply the funds to new uses, the result of which remained to be seen. But, even in this case, the court would hardly have acted as it had, but for the ground having been so much cleared by the action of the Commissioners in 1656. The original objects having ceased to exist for more than 200 years, the property was now made over to a school. Take again the case of the Leeds school, which was an old foundation for teaching Latin and Greek. Leeds having become a great manufacturing place, it was found that no one wanted to learn Greek and Latin, and the school was empty; but on application being made to Lord Eldon for leave to establish an English system of education, he said, No, he must be bound by the wishes of the founder. It might be good for Leeds to have an English school, but he had nothing to do with that; it could not be good for the charity, because the law of the charity was what the founder had said. In passing from this subject, he felt sure that if Lord Stanley would turn his attention to what the *cy-près* doctrine really was, and how it had been applied, he would at once be convinced that something more was necessary, namely, that there should be an authority constantly at work to adjust these foundations to the wants of the age. Another remark made by the same noble lord was, that the instances he had cited were extreme cases, and that it so happened that persons who had to administer to these institutions saw the bad cases, but did not see the good ones. That remark he had himself made use of to judges on the bench, that they saw the pathology of the subject they were dealing with, but not the physiology. In the case of the Charity Commissioners, however, it was different. They did not sit merely to hear complaints and settle disputes, but they received accounts of all the charities, and saw the working of them, more or less; he, therefore, saw the physiology as well as the pathology of the case. But, even if it were otherwise, he might take leave to add that his experience did not date merely from the time of his entering the Charity Commission, but from a much earlier period, since which he had turned his attention particularly to the working of the various charitable institutions throughout the country. He therefore said now as he had said before, that the instances selected were not extreme, but were typical cases in the strictest sense of the term. They were doubtless selected either from the magnitude of the funds involved, from some picturesque or striking incident connected with them, from being pretty widely known, or for some similar reason. But there was not one which did not fairly represent a large class of similar cases. And to those who made this objection he would say, bring forward your cases on the other side. Indeed, it so happened that one of his examples, that of Abbott's Charity at Guildford, had been selected by Sir Francis Palgrave, and put forward as an admirable specimen of a foundation, and as a reason why founders should have even greater power given them than at present. Jarvis's foundation might be exceptional in the amount of the funds, but certainly not in the motives of the testator. Every attorney in London could tell of one or more instances in his own office, of persons leaving property to charities from spite, and every town and nearly every large village in the country could supply instances of demoralisation produced by money given in doles. He had before challenged any one to produce an instance of a foundation on a large scale working well, but it had not been answered, unless his friend Mr. Chadwick's observations with relation to professional chairs were an answer. In his first lecture he had used this language:—"Of the greater foundations, will anybody confidently assert that they produce more good than evil? I will not dwell on the great almshouses, such as St. Cross, which has been a stone of offence perhaps from its founder's days, certainly from those of William of Wykeham, until now. Take the foundations for objects we should all approve—for learning, and for the tending of the sick. Has the state of the great endowed hospitals of London been always satisfactory? Has, for instance, that of Bethlehem? We all know the contrary. Turgot cites the hospitals of the sick as among the most striking instances of the deadness of foundations. Will any contemporary of mine at Eton assert that the then state of of the college was useful or edifying? Will any contemporary of mine at Oxford say that the foundations of Merton, or Waynflete, or Chichele, were then playing their part in the world? There may be times of awakened conscience and active exertion, but the question is whether rich foundations derived from private origin do not invariably gravitate towards sloth and indolence. It is difficult to point to one instance of a private endowment for learning achieving great results by itself alone. Where such results have been achieved, whether on a small scale or on a great, whether in a rural school or in Eton or Trinity Colleges, it has been by superadding a voluntary or unendowed department, rising and falling with public estimation, and lying open to all the influences which excite hope or fear, which animate the zealous or rouse the apathetic." Mr. Lowe, in his late pamphlet, threw out the same challenge, and

Mr. Grove's college experience was an apt illustration of the same thing. Dr. Irons seemed to think such a result was exceptional, but he (Mr. Hobhouse) believed it was a sample of the other close colleges when he was at Oxford. Where the endowments were open to a large number of competitors they did good, but where they were operated on entirely by the dead hand, as in Mr. Grove's case, there they produced only evil. Take the case of Balliol College, which had, not without grave suspicion of illegality, had the courage to throw open its fellowships and scholarships; the result was that, although a very poor endowment, a Balliol scholarship became one of the greatest prizes in the University, and it had amongst its scholars men who not only distinguished themselves then, but had since played no inconsiderable part in the world. Dr. Irons had objected that he (Mr. Hobhouse) had been combating opinions which were obsolete. In reply to that, he would say that it was an almost invariable rule that, when anyone attacked an untenable position, they were met by two classes of opponents; one, those who held the position and who told him he was a revolutionary, a burglar, and so on; and the other class consisted of persons like his friend Dr. Irons, men with strong heads and well-disciplined minds, who said that he was merely telling them what they had known all their lives, that he was beating the air, and knocking down a house of cards which he himself had set up. They entirely agreed with him in principle, only somehow or other, when they came to apply the principle, they entirely disagreed. Of course, he who led the attack against an untenable position must deal with both classes of opponents. Dr. Irons said he never met anyone who disagreed with the principles now advocated, but he (Mr. Hobhouse) did every day of his life, and when they came to deal with these mischievous endowments, the disagreement assumed a very formidable shape, and almost always resulted in the defeat of those who desired to introduce any improvement. He was very glad to hear from Lord Stanley and Dr. Irons, and to read in Mr. Mill's essay, that public opinion was as they said it was, not because he thought so, but because it showed that these bold thinkers were so far upon his side. But Dr. Irons went on to say that, agreeing with him almost entirely on general principles, he disagreed with him almost as entirely in his conclusions. He had listened very carefully, but could not make out in what Dr. Irons did disagree with him, seeing that he admitted the absurdity of allowing the dead to have anything whatever to do with the regulation of property when their wishes conflicted with the welfare of the living. He (Mr. Hobhouse) contended for no more than that.

Dr. Irons said he was under the impression that Mr. Hobhouse objected to endowments altogether, and the ground on which he disagreed with him was that such a principle would cut off the present generation entirely from all duty to posterity, and so tend to destroy civilisation.

Mr. Hobhouse said it was an open question whether charitable endowments were desirable, but so far from his saying there should be no endowments, he had given several reasons why he differed from Mr. Lowe on that point, and stated that in some cases it might be very useful to have certain endowments, operated on by State authority from time to time as necessity arose. It might be very useful to have a public fund always available for objects for which it might be difficult to raise taxes. All he contended for was, that there should be no unalterable endowments, that they should not be considered a sacred thing, never to be touched. He could not see anything in his way of putting it which could lead anyone to the conclusion that persons were to live entirely for the present, having no reverence for the past, and no regard for futurity.

Dr. Irons said he thought the paper went a little farther than that, and although it tolerated the principle of endowments on a limited scale, it only seemed a temporary concession to human infirmity, which might at some future time be abolished. It also led to the conclusion that endowments might properly be dealt with much more roughly than he for one should think. Mr. Hobhouse had also omitted to notice the distinction he had drawn between personal endowments and endowments of an abstraction.

Mr. Hobhouse said he should be much obliged to any one who corrected him if he in any way misrepresented his own paper, but he was quite confident that he had never laid down the proposition that there should be no endowments at all, and if he had said any thing at all like it he should be much surprised, having certainly said the exact contrary, and that in considerable detail. He could not follow Dr. Irons into his classification of endowments, but he would say this, that those who dealt according to the best of their judgment with property of any kind, private or public, for the greatest benefit of the human race, showed the greatest reverence for everything in this world or in the next, in the past, present, or future. He could not see how his present argument trenched on that question at all, and he thought it was over-sensitiveness on Dr. Irons's part to suppose that there was any irreverence for the past, or any want of care for the future, in those that contended that the property should be used according to the best judgment of the living for the time being. Some might call it irreverence to arraign the motives or the wisdom of dead men, but he did not. The worshipper of idols might call it irreverence in any one who told him it was only a stock or a stone, but he contended they were bound to examine carefully what the past had done and taught, and that gratitude to those who had done good work in the times gone by was best shown by adjusting their machinery to the needs of the present, by the aid of their experience, *plus* that of succeeding generations. Living men alone could have a knowledge of the present wants of society, and therefore it was not only a right, but a duty cast upon them, to administer charitable bequests according to their best wisdom for the time being; and in the same way our posterity would best show reverence for us by doing the same thing in their turn. He was sorry that Dr. Irons should have thought that there was any side-long glance at tithes, or any desire to cast contempt on the clerical body intended; he could assure him that nothing of the sort was in his own mind, nor had he heard any remark in the course of the discussion which gave him such an idea. He was quite confident that there was no talk of dealing differently with tithes from any other class of property, and there certainly was no desire to reflect in any way upon the clerical profession. So long as members of that profession would take the same pains as Dr. Irons did to inform themselves on all the questions of the day, and would speak with the same freedom from prejudice and the same amount of learning, no one would wish to attack them, or would dare if they did wish. In conclusion, he might say he took it to be the duty of every man who had a clear idea in his own mind that there was a department of human affairs which was not in a healthy state, and who believed that he could point out the cause of the mischief and suggest a remedy, to come forward and speak what was in his mind. This he had done. He believed the present system of charitable endowments worked ill for such and such reasons, and he had suggested such and such remedies. If any one thought it worked well let him step forward and say so. If anyone thought he had mistaken the causes of the mischief let him say so; or if anyone could suggest a better remedy, by all means let him come forward and propound it. He only hoped that the members of the two societies whom he had the honour of addressing would not turn a deaf ear to the matter, but that some younger man, with more leisure and ability, would turn his attention to the subject, and do that which it was necessary to do in all such cases, persevere until he had forced the attention of the public to that which it required some labour to under-

stand, and some courage to attack, on account of the personal interest and feeling concerned.

DISTRICT SCHOOLS FOR PAUPER CHILDREN.

By George C. T. Bartley, Esq.

IV.—SOUTH-EAST SHROPSHIRE SCHOOL DISTRICT.

This is a smaller school than either of the three which have been considered in the previous numbers of the *Journal*. It provides for the unions of Bridgnorth, Cleobury Mortimer, Madeley, and Seisdon; and, in addition, receives children from the two foreign unions of Newport and Shiffnal. During the year ending Michaelmas, 1868, it provided for an average of 173 children. The half-yearly sheet of accounts is drawn out with great care, and gives a great deal of information which that of the larger schools does not touch upon. The various details are as follows:—

I.—Cost of Officers and Servants.

Description of officer.	Salary.	Estimated cost of rations.	Total.	Cost per head for each child at the school.
	£ s. d.	£ s. d.	£ s. d.	£
1.—*General Staff.*				
Superintendent	40 0 0			
Chaplain	25 0 0			
Clerk	35 0 0			
Matron	35 0 0			
Servants' wages	36 0 0			
	171 0 0			
2.—*Nurses.*	...			
3.—*Medical.*				
Medical officer	35 0 0			
4.—*Teachers.*				
Schoolmaster	60 0 0			
Assistant	35 0 0			
Schoolmistress	32 0 0			
	127 0 0			
5.—*Industrial and other Teachers.*				
Female trainer	15 0 0			
,, ,,	15 0 0			
Male trainer	7 0 0			
,, ,,	9 0 0			
	46 0 0			
Total	379 0 0	*170 0 0	549 0 0	3·173

II.—The Cost of Maintenance.

The details of this item in the institution before us, as given in the report, are very full and interesting. The contract prices are given for each half-year, and are valuable in comparing the relative cost of articles in this with other neighbourhoods. The total cost of the children's provisions, including firing and necessaries, comes to £1,199 9s., or at the rate of £6·93 per head per annum.

III.—The Cost of Clothing.

This amounts to an average of 7½d. per head per child. In the list of contract prices, it appears that the girls' boots cost from 2s. 4d. to 4s. 9d. per pair, and those for the boys, 3s. to 6s. 6d. The total amount expended is £243 12s., or at the rate of £1·41 per head per annum.

IV.—Miscellaneous Expenses.

These charges amount, as nearly as possible, to £250, or at the rate of £1·44 per head per annum. Among the items it appears that the hair-cutting of the establishment amounts to four-pence per head per annum.

V.—Farm Expenses.

This item appears to vanish altogether in the account; in fact, a profit of £70 was made during the year ending Michaelmas, 1868. The produce is used in the schools, and paid for into the farm account as to an ordinary tradesman.

VI.—Rent and Re-payment of Cost of Building.

The amount expended on altering the building for the purposes of the school was only about £700, and, hence, this item is but small, amounting to £171 2s., or at the rate of £·99 per head. This charge will shortly disappear altogether.

The general summary of this school, which, although small in comparison with the three already considered, is still of fair proportions, shows it to be below them all in cost:—

1. Staff	£3·17
2. Maintenance	6·93
3. Clothing	1·41
4. Miscellaneous	1·44
5. Farm	Nil
6. Rent, &c.	·99
Total	£13·94

Somewhat under £14 per head per annum.

* The accounts do not state precisely which officers receive rations, but the whole amount expended on this item is given at £170, which s, therefore, entered in the total in one sum.

Colonies.

The Labour Market in Sydney.—A Sydney paper says that the labour market continues well supplied with manual labour. The rates of wages now current are, with board, lodging or hut room, and rations, per annum, carpenters and blacksmiths, £50 to £70; rough carpenters, £35 to £40; grooms, coachmen, and gardeners, £35 to £50; farm and garden labourers, £26 to £30; surveyor's men and bushmen, £30 to £35; ploughmen and stockmen, £30 to £35; boys for farms and stations, £16 to £20.

Queensland Wheat.—It has been found, when a comparison is made between all the Australian colonies, that Queensland has reason to be satisfied with her position as a wheat producer. The average yield is over 15 bushels to the acre, which places Queensland second, Victoria holding the first place for yield per acre. The quality also is very fair, and the weight, often over 60 lbs. to the bushel, not to be slighted, when the poor tilth given and total absence of manure are taken into consideration.

The Legal Profession in Sydney.—The Law Institute continues to work well, although quietly. Nothing further has been done to realise the idea of incorporating this body, which was strongly entertained some time since. Two other movements which have been started, one for the incorporation of the bar, and the other for the amalgamation of both branches of the legal profession, appear also to have died out, at least for the present. The ranks of both branches of the profession have been largely recruited during the past year. But for the increased and increasing demand for the country districts, it would be absolutely impossible for so many new practitioners as are from time to time admitted to hope for anything like remunerative practice. As it is, the competition must be very great. "For European practitioners," says the *Sydney Empire*, "there is, as a general rule, little hope of professional success in this colony, and we would not advise them to seek our shores with any such hope. The young Australians who are called to the bar, or placed on the roll of attorneys, and whose educational and professional training is of a very high standard, are quite numerous enough to meet the demand, and they will generally have an influence in obtaining practice with which the professional man of Europe cannot hope to compete."

Publications Issued.

A Progressive Drawing Book for Beginners. By Philip H. Delamotte *(Macmillan)*. — This work, the author states, is intended to give such instruction to beginners, and to place before them examples so easy, that they may find no obstacle in making the first step. The work is largely illustrated with wood-cuts, engraved by a process which, by means of varying depth of tone, gives the distinguishing characteristics of pencil drawing.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb. *Delivered on 6th July*, 1869.

172. Bill—Criminal Lunatics.
180. ,, Insolvent Debtors and Bankruptcy Repeal (amended).
188. ,, Land Tax Law Amendment, &c.
191. ,, Turnpike Acts Continuance.
264. Liverpool Local Marine Board—Correspondence.
291. Railway Accidents—Return.

Forced Loans and Compulsory Military Service—Declaration for the Exemption of British Subjects in Denmark, &c.

Delivered on 7th July, 1869.

195. Bill—High Constables' Office Abolition, &c. (as amended in Committee, and on Re-commitment.)

Session 1868.

344. (c.) Poor Rates and Pauperism—Return (C).

Delivered on 8th July, 1869.

196. Bill—Public Offices Concentration (amended).
198. ,, Annuity Tax (Edinburgh) (amended).
216. (I.) Fisheries (Ireland)—Further Return.

Sandwich Islands—Declaration.
China (No. 11, 1869)—Abstract.

Delivered on 9th July, 1869.

194. Bill—Petroleum (amended).
302. Fisheries—Return.

Courts Martial and Military Punishments—Second Report of the Commissioners.

Delivered on 10th July, 1869.

200. Bill—Jamaica Loans.
304. Inclosure Act—Report from the Select Committee.

Public Petitions—Twenty-eighth Report.

Delivered on 12th July, 1869.

183. Bill—Titles to Land Consolidation (Scotland) Act, 1868, Amendment (as amended).
199. ,, Savings Banks and Post-office Savings Banks.
204. ,, Heritable Rights.
205. ,, Sunday and Ragged Schools (amended in Committee, and on Consideration, as amended).
296. Public Offices Concentration Bill—Report.
297. Dagenham (Thames) Dock Company—Correspondence.
300. Army Prize Money—Account.

Patents.

From Commissioners of Patents' Journal, July 9.

Grants of Provisional Protection.

Animal and vegetable substances, preserving—1976—J. Robinson.
Bands for ladies' wear—1982—T. Atwater.
Beetroot, extracting the juices of—1915—W. Spence.
Benches, desks, &c., supports for—1961—W. Blackburn.
Boilers—1874—H. and F. C. Cockey.
Carding engines—1935—J. Heys, J. Duckworth, and G. Barnes.
Carpet looms, bobbin frames for—1937—J. Lamb.
Cartridges, filling—1984—J. D. Dougall and W. Bartram.
Cartridges, filling and closing—1963—W. Bartram.
Catamenial sacks or uterine supports—1938—A. B. Childs.
Cinder sifters—1680—J. King.
Colouring matters, preparing—1936—H. Caro, C. Graebe, and C. Liebermann.
Cotton, self-acting mules for spinning—1951—W. P. Wilding.
Counterpanes, &c., weaving—1906—T. and R. Nuttall.
Cutting and slicing machinery—1974—W. H. Bailey.
Electric telegraph apparatus—1920—A. M. Clark.
Embroidering machines—1940—W. Madders.
Fencing, &c.—1924—W. W. Neame.
Fire-arms—1945—F. Wohlgemuth.
Fire engines, &c., water directors for—1958—G. C. Haswell.
Floor cloths, tarpaulins, &c.—1955—G. T. Smith and C. Challenger.
Flour discharged from millstones, arresting and depositing—1943—J. Lomax.
Gas—1941—A. H. Still and D. Lane.
Hats or bonnets, machinery for felting or planking the bodies of—1861—J. Kirk, S. Shelmerdine, and C. Froggatt.
Hats, ventilating—1952—C. D. Abel.
Horse rakes—1956—J. Howard.
Iron—1968—R. Brown.
Iron ores, preparing for smelting—1939—C. Cochrane.
Jewellery boxes, &c.—1934—W. F. Williams.
Lard, tallow, &c., refining—1957—W. R. Lake.
Locomotive engines—1960—W. Cowan.
Matches, fusees, &c.—775—J. B. Palmer.
Millstones, preventing the deleterious effects of "back lash" in driving—1944—J. Lomax.
Motive-power engines—1986—A. Barclay.
Musical boxes—1941—F. C. Lecoultre.
Nails, &c., manufacturing—1988—A. V. Newton.
Paddings—1928—J. Brooke and J. Hirst.
Rag machines, &c., removing the dust from—1926—S. Joy.
Railway breaks—1978—W. E. Gedge.
Railway chairs, key fastenings for—1933—W. Palliser.
Railways, permanent way and rolling stock of—1946—A. Clark.
Reflectors for artificial light—1925—R. N. Williams.
Shirt collars—1950—A. Bowring.
Smoke burners—1949—G. Fielding.
Slates, &c., damping and cleaning—1966—B. Templar.
Sodium and potassium, producing—1990—H. Larkin and W. White.
Sugar, manufacturing—1962—E. T. Hughes.
Velocipedes—1932—W. Bracelin.
Weighing scales—1953—M. Kennedy.
Woven and felted fabrics, combined—1954—J. W. Burton and R. W. Morrell.
Woven fabrics, finishing—1942—J. Donald.

Inventions with Complete Specifications Filed.

Extract of meat, incorporating with sweetmeats, &c.—1970—W. E. Gedge.
Fibrous materials, weighting motions used in machinery for preparing, &c.—1995—E. Scott.
Water, &c., regulating the flow of—1996—S. Smithson, G. Senior, and J. Inman.
Water meters—2024—W. R. Lake.

Patents Sealed.

88. A. Henry.
95. G. V. Osborne and A. J. Peerless.
99. P. M. Barnett.
100. J. Steel.
103. L. Hannart.
107. G. D. Kittoe & P. Brotherhood.
109. R. Watson & B. Dangerfield.
116. J. H. Kitson and J. Kirby.
117. T. Cook and J. Watson.
122. J. Steel.
131. T. Howcroft & A. McGregor.
166. W. T. Eley.
174. N. D. Spartali.
194. A. M. Clark.
202. B. Craig.
208. T. Cook and J. Watson.
223. W. M. Welling.
249. T. Reeder.
257. R. Girdwood.
264. R. M. Marchant.
336. J. R. Johnson.
435. W. J. Horton.
547. J. and T. Leach and J. Goodyear.
651. W. E. Newton.
658. T. Howcroft & A. McGregor.
938. G. Bloem and E. Scheidt.
1040. A. V. Newton.

From Commissioners of Patents' Journal, July 13.

Patents Sealed.

113. H. Vavasseur and C. M. Wade.
126. D. P. Wright.
130. P. Spence.
132. E. Craddock.
140. J. G. Johnson.
142. H. A. Silver.
144. J. Loader and W. H. Child.
151. M. Henry.
160. J. W. Price.
182. E. Burton.
239. J. Wilson, J. Wilson, jun., and G. Cryer.
245. H. Law.
274. J. Easterbrook, J. H. Allcard, and A. M. Wild.
282. G. Hawksley.
305. C. D. Abel.
318. W. I. Palmer and W. P. Goulding.
384. J. H. Johnson.
387. W. R. Lake.
419. P. Taysen.
444. F. C. Hills.
519. H. T. and T. Jennings.
566. H. Bessemer.
587. E. D. Barker.
652. R. Wright.
662. T. Forster and R. Taylor.
684. R. R. Bevis.
727. G. Spencer and J. Barker.
799. O. Whittaker and H. and I. Wallwork.
809. B. Latham.
964. F. W. Follows and J. Bate.
1341. T. Greenwood.
1348. G. Ritchie.
1429. J. Withers.
1459. J. H. Johnson.
1488. G. T. Bousfield.
1512. W. R. Lake.
1568. G. Johnston.
1586. G. T. Bousfield.
1625. R. P. Williams.

Patents on which the Stamp Duty of £50 has been paid.

1782. H. G. Fairburn.
1789. J. A. Salmon.
1796. A. Clark.
1813. G. W. Hawksley, M. Wild, and J. Astbury.
1820. C. E. Austin.
1809. J. S. Cuthbert.
1814. W. Walker.
1816. G. Haseltine.
2184. E. Green.
1845. P. Ellis.

Patents on which the Stamp Duty of £100 has been paid.

2007. T. Hill.
1975. J. Rhodes.
2077. T. Meriton.

Journal of the Society of Arts.

FRIDAY, JULY 23, 1869.

Announcements by the Council.

Examinations, 1870.

The Council have this year decided to remove from the Programme those subjects in which the Science and Art Department holds examinations, which, it appears, are now largely taken advantage of by the same class of persons (and very often by the same individuals) as those who sit at the Society's examinations. The following subjects will therefore not appear in the programme for 1870 :—

Algebra.	Light and Heat.
Geometry.	Chemistry.
Trigonometry.	Mining and Metallurgy.
Conic Sections.	Botany.
Navigation, &c.	Animal Physiology.
Principles of Mechanics.	Free-hand Drawing.
Practical Mechanics.	Practical Geometry.
Magnetism, Electricity, &c.	Mechanical Drawing.

The Metrical System will also be omitted.

The programme is now in preparation, and will include some further modifications in the system, but the above, being by far the most important, are announced at the earliest opportunity.

National Elementary Training and Education.

At the instance of the Council of the Society of Arts, His Royal Highness Prince Arthur has graciously consented to review, at the Crystal Palace, Sydenham, on Friday, the 30th inst., at 4 p.m., the boys of the several district and other schools, in or near the metropolis, who are sytematically taught drilling as part of their education.

Invitations to take part in the proceedings have been forwarded to the School of the Royal Military Asylum, Chelsea (Duke of York's School), the Royal Naval School, Greenwich, and the principal district and other schools.

A programme of the proceedings will be duly advertised in the daily papers.

The attendance of Members of the Society is invited.

Improved Cabs.

The Council of the Society of Arts offer the following medals for improved hackney carriages specially suited to the metropolis :—

The Society's Gold Medal for the best and most convenient open hackney carriage for two persons.

The Society's Silver Medal for the second-best ditto.

The Society's Gold Medal for the best and most convenient closed hackney carriage for two persons.

The Society's Silver Medal for the second-best ditto.

The Society's Gold Medal for the best and most convenient hackney carriage for four persons, either open or closed, or both.

The Society's Silver Medal for the second-best ditto.

Lightness of construction, combined with adequate strength and durability, will be especially considered in making the awards.

The awards will be made after actual trials of the carriages extending over a certain period.

Communications describing the carriages must be sent to the Secretary of the Society of Arts before the 1st January, 1870, the carriages to be sent to a place hereafter to be appointed.

The Council also offer the Society's Silver Medal for the best instrument, to be affixed to a cab or other hackney carriage, for indicating the fare as between the passenger and the driver, whether by registering the distance travelled or otherwise, and which instrument shall also indicate, for the convenience of the cab-owner and of the driver, the total distance travelled during the day and the total amount earned. The instruments competing, with full descriptions of their construction, to be sent to the Society's House before the 1st January, 1870.

Competitors may, at their option, sign their communications, or may forward with them sealed letters containing the name and address of the writer.

The Council reserve to themselves the right of withholding all or any of the medals, in case none of the carriages or instruments possess, in their opinion, sufficient merit.

Subscriptions.

The Midsummer subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Musical Pitch.

In the month of January last, the following letter was addressed to the Earl of Clarendon :—

21st January, 1869.

My Lord,—The Council of the Society of Arts have had under their consideration the question of a standard musical pitch for this country, and how far it may be possible to arrive at unformity in this matter with Continental nations.

The Council are desirous of ascertaining how far unanimity does exist abroad, and of obtaining information in reference to the pitch in use in the various countries named below, and I am directed to ask if her Majesty's government would aid the Council in their inquiry by procuring, through her Majesty's representatives abroad, from the several governments and

other accredited sources, replies to the queries appended to this letter.

I have the honour to be, My Lord,
Your Lordship's most obedient Servant,
P. Le Neve Foster, *Secretary.*

The Right Hon. the Earl of Clarendon,
Her Majesty's Secretary of State for Foreign Affairs.

Queries.

1. Is there any standard musical pitch officially prescribed and in use, and if so, what is it, and by what number of vibrations for C is it represented? (It would be very desirable that a tuning-fork or other instrument showing the pitch should be procured and sent. The expenses of this the Society will pay.)

2. By what authority is it adopted, and how enforced?

3. Is it compulsory on any and what class of musicians, and whether or not in military bands, conservatoires, operas, royal chapels, &c.? Name these if any.

List of Places where it is desired to obtain the Information.

Berlin.	Naples.
Munich.	Milan.
Stuttgart.	Turin.
Vienna.	Bologna.
Leipsic.	Venice.
Cologne.	St. Petersburg.
Dresden.	Moscow.
Brussels.	Stockholm.
Florence.	Copenhagen.

Copies in French and German were prepared for distribution by the Foreign Office, who kindly undertook to make the inquiries.

The following replies have been received:—

Copenhagen.

Although the questions of the Society of Arts might almost be answered by a simple negative, I shall perhaps do well to state the Copenhagen practice as to musical pitch.

1. The band of the Royal Theatre (opera-house) tunes, in the beginning of the performance only, from a pianoforte in the orchestra. This piano is kept at pitch from two old forks (date not precisely known), which happen nearly to agree with the new French normal diapason, giving probably three or four more vibrations per second.

2. The A of the military bands is at least $\frac{1}{4}$ tone higher than that of the theatre. Their forks are (or are supposed to be) of uniform pitch.

3. The brass of the chief orchestral societies, local concerts, and small theatres, being supplied from the military bands, the pitch of the latter is the standard for such institutions.

4. The School of Music has the pitch of the Royal Theatre.

5. The above statements as to height of pitch rest on the authority of the tuner of the Royal Theatre.

G. Strachey.

Copenhagen, February 24th, 1869.

Leipsic.

1. There is no standard musical pitch officially prescribed or in use at Leipsic, but the pitch in common use is very high—that of the Gewand-haus concerts being represented by 920 to 940 vibrations for A (La).

2. The above-named pitch at Leipsic is in use at the Gewand-haus and Euterpe (concerts), and in the town theatre. The authority for its use is merely custom.

3. The pitch compulsory for military bands at Leipsic is that which has been made compulsory at Dresden.

At a conference of professional men, held in September, 1862, at Dresden, it was resolved that the French *diapason normal*, of 870 vibrations for A (La), as contradistinguished from the Vienna pitch of 932 vibrations for A, should be adopted. But it was found on subsequent trials and comparison between the *diapason normal* of the Académie Française and the Dresden pitch, that the latter was so very little higher (A = 892) that it was not worth while to alter it, the alteration involving a renewal of the then supply of brass instruments. Military bands, therefore, here, as in other parts of Saxony, use the Dresden pitch.

It is necessary to bear in mind that, though the pitch of 892 at Dresden has been compulsory at the court theatre and concerts, and in all Saxon military bands since 1866, it is not otherwise enforced—indeed, there is no authority to enforce it. In the Catholic church at Dresden the old pitch of A = 855, which is very like that of Mozart (A = 850), is still in use, and at the court theatre when certain operas of Gluck and Mozart are played the Mozart pitch is taken, there being a supply of brass instruments of that pitch.

J. A. Crowe, *Consul-General.*

P.S.—Inclosed are two forks—the Leipsic pitch and the Dresden pitch.

Leipsic, March 27th, 1869.

Munich.

(Translation.)

In answer to the note from Sir H. Haward, of February 19th of the present year, the undersigned has the honour to communicate the following information to Her Britannic Majesty's Chargé d'Affaires, Mr. Fenton, respecting the standard musical pitch prescribed in Bavaria.

There is in Bavaria an officially established pitch for music and musical instruments, which has been universally adopted since the month of January 1868. This is the same as the French pitch, based on the principle of the "Diapason Uniforme," which was introduced into France by a decree dated February 16th, 1859. The French diapason (tuning-fork) sounds the note A, the sixth tone of the French scale (*gamme*), which consists of seven tones, and the note A is represented by 870 vibrations per second. This tone, A (French "La"), is the note adopted as the standard tone for the tuning of instruments, the tone C (French "Ut"), the first tone of the French scale, not being used for this purpose. The standard pitch in Bavaria is prescribed by authority of the Royal Musical Intendance (Kœniglich Hofmusik Intendanz), and its general use has been thereby secured, so that only such tuningforks are allowed to be used in Bavaria as have been approved and stamped by the above-mentioned Intendance. All establishments for instruction and education in Bavaria, in which musical studies are pursued, have been apprised thereof by means of an ordinance of the Ministry under whose authority they are placed, and the directors of these establishments are made specially responsible for the exact observance of that ordinance.

The undersigned takes the opportunity of calling Mr. Fenton's attention to the "Official Gazette for Church and School Affairs," of January 14th of last year, herewith enclosed, which contains the ordinance (above referred to) for "The Introduction of the French Orchestral Pitch." The use of the standard pitch is obligatory on all classes of professional musicians in Bavaria who are in connection with the Ministry of the Interior for church and school affairs, and in accordance with a communication made in due time to the chief ecclesiastical authorities of both confessions, with reference to the above-named decision, it was decided that the French orchestral pitch should also be used in the celebration of Divine service and for church music.

No objection whatever having hitherto been raised against the regulation in question, it may be assumed that the French pitch, which is especially calculated to prevent the overtaxing of the human voice, is at the present time universally in use in Bavaria.

The undersigned, believing that he has afforded the information requested in the note of February 19th of this year, avails himself, &c.,

(Signed) Prince Hohenlohe.

Munich, April 16th, 1869.

A tuning-fork accompanies this reply.

Dresden.

(Translation.)

1. In Germany there is no officially prescribed musical pitch.

2. In a number of chapels and orchestras the new French pitch has been introduced; still, it may be assumed that they only comprise about one-sixth of all the chapels and orchestras of Germany, as very considerable expense would attend the acquisition of new wind instruments, were the French pitch generally adopted.

3. There was another reason, however not a financial one, for not introducing the French pitch. It appeared that the pitch adopted in Dresden was so slightly higher than the French pitch, that the difference would not warrant the outlay of something like 6,000 thalers (£900) for new wind instruments.

4. The new French pitch (diapason normal), fixed by the French Academy, is represented for A (La) by 870 vibrations; the pitch in the Royal Chapel at Dresden for A by 892 vibrations.

5. In the Roman Catholic Court Church of Dresden, the old so-called *chorus-tone* still exists, representing for A 855 vibrations. As a matter of course, different instruments are throughout used at the musical performances in the church. These are again sometimes made use of in the theatre for the production of Glück's music, and for some of Mozart's works, as in the time of Glück the vibrations for A were only 818, in the time of Mozart 850, and, by adopting the pitch of that period, the task is much easier for the singers, and does not injure the music.

Dr. Julius Reitz,
Royal Saxon Chapelmaster.

A tuning-fork accompanies these replies.

Stuttgart.

Stuttgart, March 18, 1869.

My Lord,—I have the honour to transmit herewith, in original and translation, the reply which I have received to the queries which your Lordship's instructions of February 12, in your Lordship's despatch No. 3, desire me to procure with reference to the standard musical pitch here, together with a tuning fork, showing the pitch usually adopted in Wurtemberg.

By the paper enclosed it will be perceived that there is no officially prescribed musical pitch in this country, although the new French pitch is that which is now commonly in use; and I have, therefore, so answered the question paper, also returned herewith, transmitted in your Lordship's despatch.

I have, &c.,
G. W. Gordon.

The Earl of Clarendon, K.G.

(Translation.)

Extract of Report from the Ministry of the Church and School Department regarding the Musical Pitch in Wurtemburg.

There is no special officially fixed pitch in Wurtemburg, nor, indeed, any particular one in use. But for the last few years, at the Royal Chapel and Opera, as also at all the German theatres and concerts of the first-class, the new French pitch, with 870 vibrations to A, has been introduced. This pitch may consequently be given as the usual one; it is in force in the Conservatorium and Stift's Church (the organ of which has been tuned thereto), and is used by piano, organ, and other musical instrument makers. A tuning fork can consequently be purchased from any of the first-class instrument makers, and, if necessary, can be compared with that of the Royal Chapel.

I am not aware that this pitch is introduced for military music, which is unnecessary, as there is no vocal music, and it would not be worth the cost of providing new instruments.

Private theatres and private concerts, as well as the town and church orchestras in Wurtemburg, still continue the old high pitch, either on account of the expense or of the difficulty of retuning the church organs.

The new French pitch can, therefore, be regarded as the one in general use in Wurtemburg, or even in Germany.

Stuttgart, March 6th, 1869.

1. There is no officially prescribed standard musical pitch in Wurtemburg. But the new French pitch, with 870 single vibrations to A, has been introduced, and may be given as the usual one, being adopted in the Conservatoire, collegiate church, and used by pianoforte, organ, and other instrument makers.

A tuning-fork of this pitch is forwarded.

Vienna.

(Translation.)

The Ministry for Foreign Affairs having made inquiries at the Ministry for Worship and Public Education, with regard to the questions put by Lord Bloomfield, &c., &c., on the 19th ultimo, on behalf of the Society for the Encouragement of Arts, Manufactures, and Commerce, concerning the musical pitch in Austria, has now the honour to make the following answers:—

1. In Austria there exists "an officially prescribed" pitch, only in so far that one has been introduced (and that the French standard pitch) in both the Imperial theatres, in the Court band, and in the more important concert societies in Vienna.

The French standard musical pitch is not based upon C (Ut), as the circular of the Society for the Encouragement of Arts presumes, but upon A, the altitude of which is fixed at 870 vibrations per second, and all the other notes are tuned up to this pitch.

In order to keep the real Paris pitch, tuning forks from Paris are procured for Vienna. It would be well if the above-named Society were to pursue the same course.

2. No "authority" in Austria has dictated a compulsory standard pitch, in the manner in which this was done in France when it became law that a standard musical pitch must be universally adopted in Paris, from 1st July, 1859; in the departments, at latest from the 1st of December, 1859.

The Lord High Chamberlain's office introduced the pitch of the Imperial theatres, and the Grand Master of the Ceremonies' office that for the Court music. The French standard pitch was introduced in these two establishments in 1862.

The Society of Friends of Music in the Austrian empire followed this example on their own account for their "conservatorium," as also did the Society of Philharmonic Concerts.

3. The standard pitch is only obligatory for the two Imperial theatres and the Imperial band of music. The remaining theatres in Vienna, and all the theatres in the provinces, are not Court or State establishments, neither is the "conservatorium" of the Society of Friends of Music. Therefore a measure of this sort, connected as it is with pecuniary sacrifices, could not be dictated to these establishments. Nevertheless the adoption of the French standard pitch by such establishments, is becoming every year more general.

The French standard pitch has not yet been introduced into the Austrian military band.

The undersigned avails himself, &c.,

(Signed) Biegeleben.

Grand Duchy of Baden.

Carlsruhe, 30th April, 1869.

Sir,—Mr. Baillie, under date of the 20th of February last, desired information respecting the musical pitch in use in the Grand Duchy, and, for this purpose, forwarded to me a list of questions from the Society for the Encouragement of Arts, Manufactures, and Commerce.

I have now the honour of enclosing to you the answers to these questions, accompanied by a tuning-fork. I likewise enclose a report of the Court leader, Levi, assuming that his experience may be of service to the above-named Society. I may, likewise, remark that the Ministry of War informs me the Paris pitch is used by all the bands of the Baden troops, so that the blowing of the high instruments is lightened, and the tone of the music has gained in softness. It has, however, been noticed that the tuning-forks received from Paris do not agree in tone, and, therefore, they are compared to and kept in accordance with the pitch of the Grand Ducal Court orchestra.

I have, &c.,

(Signed) Freydorf.

T. C. Cobbold, Esq.

(Copy.)

In returning the questions, I have the honour to remark as follows:—

1. The pitch officially used in France, and in most of the larger musical institutions of Germany, is the so-called "Paris;" the normal tone is A, with 870 vibrations in the second. I enclose herewith a carefully pitched tuning fork.

2. The normal pitch was introduced by an Imperial order from the French Ministry of the Interior, of February 16th, 1869, in all musical institutions, Imperial and other theatres in Paris and the departments, in schools, and musical conservatoires, on the opinion of a commission composed of the most scientific men in France, of composers, leaders of orchestras, and directors of theatres. The chief motive which guided the commission was the fact that the pitch had, in the course of time, reached an unnatural height, which threatened by a further increase to render the performance of older works impossible. In 1859, in the opera at Paris, A had 896 vibrations; in the Kärtner Thor Theatre at Vienna, 932, a height which fatigued the power to such an extent that it was soon used up, and necessitated a change and transposition of older musical works, thus prejudicing the intentions of the composers. An unofficial pitch has in itself a tendency in the course of time to rise; in Vienna, where the Paris pitch was introduced in 1862, it is said to have considerably risen. This is to be prevented, as is the case in the Baden Court theatres, by a comparison of the A of the instruments with the A of the normal tuning-fork.

3. The introduction of the normal pitch necessitates the purchasing of new wind instruments, and becomes, therefore, a question of money. Private orchestras, especially where the instruments belong to individuals and not to the company, have as yet avoided this expense; as, for instance, the Heidelberg, Freiburg, and Pforzheim choirs. The Paris pitch is, therefore, only obligatory when ordered by authority. As far as I know, it only exists in the Grand Duchy, at the Court theatres of Carlsruhe and Mannheim, and in the military bands. There are no longer any Royal choirs in the country. The pianos in the schools here are tuned to the normal A, as is also the case with pianos in private houses. The pianoforte makers (with the exception of those of Berlin, who, astonishing to say, are a tone higher) tune their instruments after the normal A.

(Signed) Hermann Levi.

Carlsruhe, 30th March, 1869.

Berlin.

(Translation.)

1. There is neither an official normal pitch—that is to say, a pitch universally fixed—nor yet a pitch in common use, as the new Parisian orchestral pitch, which makes A with $437\frac{1}{2}$* beats in the second, is only employed, up to the present time, at a few of the principal theatres and orchestras.

2. A congress of Parisian artistes—of which, indeed, Meyerbeer was a member—fixed it and introduced it. Any stage director or orchestra conductor could adopt this pitch if he thought proper, and was prepared to grant the expenses of procuring new instruments and altering the old ones.

3. This pitch is not obligatory, as, for instance, in Berlin, besides the new Parisian pitch, most of the chapels have still the former higher pitch. It has only been introduced at Berlin in the Royal opera-house, by the special command of the Intendant-General of the Royal Theatres. It is, however, to be expected that, by degrees, the Parisian pitch will become universal, as it offers special advantages to singers.

Cologne.

1. The Concert Society (*Conzertgesellschaft*) of Cologne adopted the French normal pitch several years since, and has procured the necessary instruments for the musicians. This pitch gives for the C $1{,}034\frac{74}{125}$* beats in a second.

2. The same as the previous answer.

3. The new pitch is only obligatory for the representations of the Concert Society.

The Intendant-General of the Royal Theatres places at the service of the Society for the Encouragement of Arts, Manufactures, and Commerce, the accompanying tuning-fork, which gives A of the new pitch.

Baron von Hubner,
Intendant-General of Theatres.

Berlin, April, 1869.

National School for Music.

The following petition, after special notice, was presented by the Right Hon. Sir J. Pakington, Bart., M.P., to the House of Commons, on Tuesday last, 20th July:—

To the Right Honourable the Commons in Parliament Assembled.

The Humble Petition of the Society for the Encouragement of Arts, Manufactures, and Commerce, London. Incorporated by Royal Charter,

Sheweth—

That the Society appointed in the years 1866-7 a Committee, consisting of the following noblemen and gentlemen, to report on the Musical Education of the United Kingdom, namely:—Lord Gerald Fitzgerald; the Right Hon. Sir G. Clerk, Bart., Chairman of the Committee of Management of the Royal Academy; Sir J. E. Harington, Bart.; Sir J. P. Boileau, Bart.; Sir Francis Sandford; Messrs. W. Hawes, Robert K. Bowley, E. A. Bowring, C.B., Harry Chester, Henry Cole, C.B.; Capt. J. F. D. Donnelly, R.E.; J. Puttick, Samuel Redgrave; Lieut.-Col. Henry Scott, R.E.

That such Committee obtained full information of the constitution, present state, and working of the Royal Academy of Music, as well as evidence on the National College of Music, the London Academy of Music, and the London Vocal Academy. They received a report on the Military School of Music, Kneller Hall. On the subject

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* Both these figures differ slightly from those usually given.—Ed. *J. S. A.*

of Church Music the Committee entered into correspondence with the Deans and Chapters of the several Cathedral Churches. Through the Secretary of State for Foreign Affairs they obtained reports of the regulations of the several Musical Academies at Paris, Munich, Vienna, Prague, Leipsic, Milan, Naples, and Berlin.

That the Secretary of the Society of Arts was despatched to Brussels and Liège in order to report on the Musical Institutions there.

That in respect of the Royal Academy of Music, Sir George Clerk, Bart., Chairman of the Committee of Management, and Mr. Lucas, Principal of the Academy, gave complete evidence.

That the views of the musical profession were stated by the following gentlemen, who either appeared personally before the Committee or sent written observations:—Professor Sterndale Bennett, Mr. Benedict, Mr. Costa, M. Garcia, Mr. A. F. Godfrey, Mr. J. Hullah, Mr. Henry Leslie, Mr. C. Lucas, Mr. G. A. Macfarren, Sir F. Gore Ouseley, Mr. Ernst Pauer, Mr. Otto Goldschmidt, Mr. Turle, and Dr. Wylde.

That the Committee also received evidence and suggestions from Messrs. Capes, Harry Chester, H. F. Chorley, H. Cole, C.B., P. Le Neve Foster, and B. St. John B. Joule.

That the wide cultivation and use of music in this country, from the earliest period, especially before the dissolution of the Monasteries, appeared to the Committee to render it surperfluous for them to dwell on the importance and value of this important branch of the fine arts. They did not consider it within their province to enter upon the subject of the various systems of teaching music; but their inquiries were rather directed to ascertaining the principles and the nature of the administration by which the general musical education of the people of this country might be systematically conducted on a scale and with results at least equal to those of the Academies which flourish on the Continent of Europe.

That it appeared from the evidence that the Royal Academies of Music of Paris, Brussels, and Naples furnished instances of highly successful institutions, on an extensive scale, and presented especially useful suggestions. At Paris above six hundred out-door students, selected from all parts of France, are educated, and at Naples between two and three hundred students are trained. In both cases the education is gratuitous to the students, the expenses being paid by the State; at Brussels there are above 500 students, whose expenses are defrayed partly by the State, and partly by the municipalities.

That your petitioners submit that a national academy or musical training school, in connection with the education of the people, for the United Kingdom, its colonies and dependencies, is a public necessity, and, when created, should provide for the instruction of a certain number of students, supported by public funds, and a certain other number paying adequate fees. That certain students should receive gratuitous training, and that they should be selected by public competition.

That your petitioners respectfully submit to your Honourable House that a national musical training school can never be maintained by private enterprise, but only be established by the State, and be supported by public funds, disbursed under Parliamentary and ministerial authority.

That your petitioners are of opinion that as our colonies and India send many young persons to this country for general education, it might reasonably be expected that they would be induced to send persons having musical gifts for musical education if the facilities for training were as efficient as they might be.

That so far as your petitioners are enabled to judge from the evidence, they consider that at least two hundred free students should be trained, that they should receive grants for maintenance, at varying rates, in accordance with the system which is found to work so successfully in the Art Training Schools at South Kensington. That should Parliament see fit to create a proper and responsible musical training school in connection with public education, your petitioners have reason to believe that private individuals will come forward and endow scholarships.

That your petitioners consider that the only organisation which would appear to give hopes of adequate and permanent success is one which should be under proper ministerial responsibility and control. This the present constitution of the Royal Academy of Music does not provide. In support of this view your petitioners would refer to an "Appeal to Government and the Royal Commissioners of the Art Exhibitions in favour of a Government School of Music," signed by a very large number of the most eminent professional musicians of the day, and which has been printed and laid before Parliament.*

Your petitioners therefore pray that your Honourable House, as soon as circumstances appear favourable, will take the necessary measures for affording Musical Education to all classes of her Majesty's subjects in the United Kingdom, not less complete and efficient than is afforded by France, Germany, Italy, and other countries of Europe.

And your petitioners, as in duty bound, will ever pray, &c.

An Appeal to Government and the Royal Commissioners of the Art Exhibitions, in favour of a Government School of Music and National Opera.

Understanding that the Government and the Royal Commissioners of the Art Exhibitions are being petitioned to contribute still further to the maintenance of the institution called the Royal Academy of Music, we, the undersigned professional musicians residing in England, realising the fact that the Royal Academy of Music has failed to promote the highest interests of musical art, that the late Government grant has simply prolonged its existence but not extended its usefulness, and feeling, moreover, assured that any further repetition of such an attempt can only end in a similar failure, and prove equally discreditable to the country and wasteful of its funds, do hereby respectfully advise the establishment of a new school of music, in which every advantage may be offered to musical students, to be presided over by competent professors appointed by the State, and responsible to it for the efficiency of the institution. Connected with such an academy, we would further advise, if possible, the establishment of an English National Opera, believing by such agencies a genuine and useful impulse might be given to the development of musical genius in this country, ultimately redeeming it from the disgrace of being the only European nation that fails to cultivate its own national music.

Respectfully soliciting your consideration of our appeal, we remain, with great respect and consideration, &c.,

Therese Tietjens.	H. Wylde, Mus. Doc.
H. Lemmens-Sherrington.	Alfred Mellon.
J. Sims Reeves.	Ludwig Straus.
C. Santley.	Tom Hohler.
W. Harrison.	J. F. Barnett.
Rokitansky.	J. Pittman.
W. Ganz.	A. M. R. Barret.
G. Paque.	Rene Favarger.
F. Lablache.	W. Beavan.
R. Sidney Pratten.	H. Holmes.
T. H. Wright.	J. B. Ciabatta.
H. Handel Gear.	W. H. Hann.
E. Schubert.	F. Griesbach.
J. W. Thirlwall.	C. Harper.
V. Collins.	J. T. Carrodus.

And about 100 others.

* A copy of this Appeal is appended.

Free Public Libraries and Museums Committee.

CIRCULATION OF UNEXHIBITED SPECIMENS.

During the debate in the House of Commons on Monday, the 19th inst., on the Education Votes, Lord Henry Lennox, again referring to the above subject, observed that it had been said that the Society of Arts, of which he was Chairman of Council, interfered with everybody's business; but they only did so in matters in which they thought they could promote the moral and material welfare of the community. With regard to technical education, he thought there was nothing which tended so much to its development as national museums; and upon their good government, and being rendered accessible, depended in a great measure their success. Some weeks ago he wished to put a question to the government, having reference to the propriety of circulating works of art; he did not know to which minister to address himself, as there were four or five collections belonging to the Crown under as many different authorities, and accordingly he was obliged to put his question to the first Lord of the Treasury, fixing upon him the collective responsibility of the government. In putting that question he had been careful to intimate that he wished those objects of art to be circulated not only in Edinburgh and Dublin, but in Manchester and the other great hives of industry; and the right hon. gentleman, in answer, said that the government were anxious to do everything they could; that two collections of Turner drawings had been chosen, and would be established in Dublin and in Edinburgh. Establishment, however, was different from circulation; and, in his opinion, the great want of the present day was that the superfluities of the London collections should be circulated among the populous towns in the provinces. It was, therefore, with great regret that he perceived a reduction in one item connected with the very principle of circulation which he desired to see carried out; a vote which last year stood at £4,000 was this year reduced by £500. It was certain that the trustees of the British Museum were buying water-colours of Turner's, and storing them away in portfolios, while the trustees of the National Gallery were making up parcels to be sent to Dublin and Edinburgh; and what he wanted the Vice-President of the Council for Education to explain was, why there had been a decrease instead of an increase, in the manner contemplated by the member for Manchester. He trusted that some explanation would be given of the reason for the reduction of this vote, and that every facility would be afforded for the circulation throughout the provinces of duplicate works of art.

Mr. W. E. Forster, the Vice-President of the Committee of Council, in his reply, said he regretted that only £3,500 was to be spent in circulating articles from South Kensington. His right hon. friend the Chancellor of the Exchequer had felt obliged to request him to go carefully through all the votes of his Department, with the view of making them as economical as possible; but he believed that more would be done with the £3,500 than hon. gentlemen might expect.

Proceedings of Institutions.

EXAMINATION PAPERS, 1869.

The following are the Examination Papers set in the various subjects at the Final Examination held in April last:—

ARITHMETIC.

THREE HOURS ALLOWED.

1. How many casks, one of them holding $2\frac{1}{4}$ cwt., and the others each 7 cwt. 13 lbs., are required for 30 tons?

2. If 25 gross of pens are bought at 1s. 10d. a gross, and sold at 1s. 6d. a hundred, what profit is made?

3. A watch and chain are together worth £14 6s., the watch being worth £8 16s. more than the chain; find the worth of each.

4. Bought 3 cwt. of sugar at 36s. 6d. per cwt., and reserving some for private use, sold the rest at $4\frac{1}{2}$d. per lb. for the amount which the whole cost; how much was reserved for private use?

5. A sets out from a certain place, and walks at the rate of $3\frac{3}{4}$ miles an hour; B follows on horseback 20 minutes later, at the rate of $8\frac{1}{2}$ miles an hour; how soon will he overtake A?

6. What is the value of 18 gallons, 3 quarts, $1\frac{1}{2}$ pint, at 17s. $10\frac{1}{2}$d. per gallon?

7. Divide £6 1s. 11d. into three shares, so that the second share may be $\frac{4}{9}$ of the first, and the third $\frac{3}{5}$ of the second.

8. If $1\frac{3}{4}$ oz. of gold, 18 carats fine, be worth £5 11s. 5d., of what fineness must gold be in order that $6\frac{3}{4}$ dwts. of it may be worth £1 3s. $10\frac{1}{2}$d.

9. Suppose when 13 apples weigh 4 lbs., the cost of 5 dozen apples is 7s. 4d., what should 33 apples weigh when the cost of $4\frac{1}{2}$ dozen at the same price per lb. is 6s. 6d.

10. Express £1 4s. $10\frac{3}{4}$d. as the decimal of £3 19s. 8d.

11. Convert £246 13s. 10d. to francs, the course of exchange being 25 francs 18 cents per £.

12. If $8\frac{3}{4}$ lbs. of coffee, at 7 cents 2 mils. per lb., be equal in value to $4\frac{1}{2}$ lbs. of tea, what in decimal currency is the price of the tea per lb?

13. If the mercantile discount on a bill due in 5 months, at 4 per cent. per annum, be £1, for what sum was the bill drawn?

14. Express £195 6s. 3d. decimally in pounds, and then calculate on the result the difference between its simple and compound interest for 3 years at 4 per cent. per annum.

15. Which is the heavier, a pound of gold or a pound of feathers, an ounce of gold or an ounce of feathers; by how much in each case?

16. A certain number of apples were bought at four a penny, and an equal number at three a penny. The whole were sold at 7 for twopence. Required the gain or loss per cent.

17. What change of income is made by transferring £4,275 from the 4 per cents. at 80 to the $5\frac{1}{2}$ per cents. at 99?

18. If sugar can be bought at £3 14s. per cwt., how must it be sold to gain $12\frac{1}{2}$ per cent, after allowing a discount of $7\frac{1}{2}$ per cent.?

19. Four men can do a work in 1 hour, which two women can do in 3 hours, or six children in 2 hours. How long would 1 man, 1 woman, and 1 child take to do the work?

20. A piece of work can be done by A alone in 6 hours, by B alone in 5 hours, and by C alone in $4\frac{1}{2}$ hours. They all begin it together, but A only continues to work until it is finished, B leaving off 2 hours 10 minutes, and C $1\frac{1}{2}$ hour before its completion. In what time is the work accomplished?

THE METRIC SYSTEM.

THREE HOURS ALLOWED.

N.B.—Only six questions to be attempted.

Candidates may select their questions from either paper: the value of correct answers in the second paper being higher than that in the first.

First or Easy Paper.

1. What is the fundamental unit in this system? Whence and why was it chosen?

2. Name the units of weight and capacity, and show how larger and smaller measures are obtained.

3. Give the English equivalents of a kilometre, kilogramme, and kilolitre.

4. Express the value of a mile, a ton, and a gallon in kilometres, kilogrammes, and litres.

5. How many cubic centimetres are contained in a cubic metre?

6. A vessel measures 2 feet square and 1 foot deep, how many litres will it contain?

Second or more Difficult Paper.

7. Name those countries where the metric system is in general use, and urge any reasons for the general adoption of this system.

8. A room measures 10 metres each way and 4 metres high: what weight of air will it contain, in grammes?

9. A cistern is 2 metres long, 5 decimetres broad, and 8 centimetres deep. What is the exact quantity and weight of water it will contain?

10. A cubical block of ice measures 3 decimetres along its edge: what will be its weight, the specific gravity of ice being 0·94?

11. A cylindrical gasometer is 10 metres in diameter, and 15 metres high: what is its capacity expressed in litres and cbc? The volume of a cylinder $=\pi r^2 h$.

12. Explain how the units of weight, capacity, and surface have been obtained from the metre.

BOOK-KEEPING BY DOUBLE ENTRY.

THREE HOURS ALLOWED.

1. Journalise and post, in proper technical form and language, the following imaginary transactions, and make out from the ledger a trial balance, a profit and loss account, and a balance-sheet.

On 1st January, 1869, Grant and Ross have assets and liabilities as follows:—

Assets.

	£	s.	d.
Business premises, valued at	300	0	0
Cash at bankers	942	3	6
Petty cash	8	1	0
Acceptance of W. Thom, due 8th January	371	10	0
Due by A. Down	148	0	0
Goods on hand, viz.:—			
10 tons of tin	800	0	0
Wool	1,500	0	0

Liabilities.

T. Vane, balance of account	369	14	6
Our acceptance to J. Brook, due 18th Jan.	500	0	0

N.B.—The surplus assets over liabilities, being the capital of the business, belong to the partners in the following proportions, viz., to H. Grant, £2,400, to J. Ross, £800. The capital and drawings of the partners are subject to interest at 5 per cent. Ross, as manager, receives £25 a month. The remaining balance of profit and loss is divisible as follows:—To H. Grant, three-fourths; to J. Ross, one-fourth.

1869.		£	s.	d.
Jan. 1.	Discounted W. Thom's acceptance, and received in cash £371, and allowed for discount 10s.	371	10	0
„ 4.	Bought of T. Vane 5 tons of tin	400	0	0
„ „	Accepted T. Vane's draft at two months	769	14	6
„ 6.	Bought wool for cash	500	0	0
„ 8.	Sold wool to W. Thom	1,000	0	0
„ „	Received from W. Thom his acceptance for £500 at a month, and Harris and Co.'s acceptance to him for £500, due 31st January	1,000	0	0
„ 12.	Received from R. Green consignment of indigo, invoiced at	1,200	0	0
„ „	Accepted R. Green's draft at two months for	800	0	0
„ 14.	Received cash of A. Down for balance of his account	145	0	0
„ „	And allowed to him for discount	3	0	0
„ 15.	H. Grant drew out for private expenses	50	0	0
„ 16.	Sold for cash the whole of R. Green's consignment of indigo for	1,300	0	0
„ „	Commission gained by us on the above consignment	33	0	0
„ 18.	Renewed our acceptance, due this day, for £500 for two months, in favour of J. Brook (including interest)	508	12	0
„ 20.	Cheque drawn for petty cash	20	0	0
„ 26.	Sold 15 tons of tin to A. Down for	1,500	0	0
„ „	Received from A. Down, cash	800	0	0
„ „	„ „ his acceptance at one month for	700	0	0
„ 31.	Received cash for Harris and Co.'s acceptance, due this day	500	0	0
„ „	Paid J. Ross his salary as manager	25	0	0
„ „	Paid salary of clerk	8	0	0
	Payment out of petty cash for trade charge in the month	15	1	0
	Interest on H. Grant's capital	10	0	0
	„ J. Ross's „	3	6	8
	„ H. Grant's drawing	0	2	4
	„ allowed to us by bankers on our balances during the month	4	0	6
	Interest due by us to R. Green	2	1	0
	Wear and tear of premises, estimated at	5	0	0
	Wool on hand, valued at	1,000	0	0

2. On examining the books it is discovered that the following transaction—"Interest allowed to us by bankers in the month, £4 6s."—has been posted as if it had been "Interest charged by bankers in the month, £4 6s." Give the journal entry or entries necessary to correct the error.

(*To be continued.*)

ECKHOLD'S OMNIMETER.

A new instrument, under this title, the invention* of a German engineer, M. Eckhold, has been brought out to aid in surveying operations, such as measuring the bases of triangulation, measuring distances either inclined or horizontal, measuring altitudes, and measuring angles. The omnimeter is calculated to effect an important improvement, combining, in one instrument, the theodolite and the level; doing away with the necessity for tedious chain measurements, and requiring in its operation no complicated calculations.

The instrument consists of the following parts:—1st, of a graduated circle, to read off each ten seconds in the measurement of horizontal angles; 2nd, of a powerful telescope, revolving in a plane perpendicular to the graduated circle; 3rd, of a microscope of high power, connected with the telescope and moving with it; 4th, of a highly sensitive level lying upon it; 5th, of a rule, or plane, having a fixed length (of twenty centimètres for example); 6th, of a scale fixed vertically at the extremity of the said rule, at a distance coincident with the optical axis of the microscope, which scale is divided into half millimètres (the millimètres are indicated by the numbers between 1 and 100); 7th, of a micrometrical screw movement connected with the base of the scale and giving the $\frac{2}{10000}$ of a millimètre of the scale, legible on the graduated circle beneath; 8th, of a second extremely sensitive level, capable of being applied to the telescope and of determining, in case of need, its horizontality; further, of all the necessary screws, keys, and other matters required to secure the efficient working of the instrument.

As the necessary complement of the omnimeter, there

* This description was furnished by the inventor.—Ed. *J. S. A.*

is a levelling staff, not divided, but of an invariable length (as, for example, three metres), which length is defined by two white lines on a ground of black, one at the upper extremity and the other at the lower extremity of the staff.

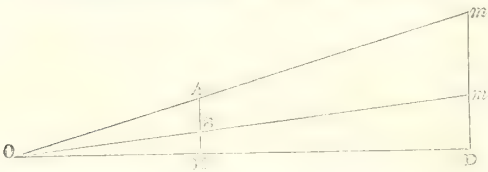
Before going into more ample details regarding the instrument, it may be as well, in order to show the way of working with it and the advantages to be obtained by its use, to take an example.

Supposing, then, that we require to ascertain the distance between any two points, the first thing is to place the levelling staff at one of the points (in this, as in all geodesical operations, the staff must of course be held in a true vertical position). We then take the omnimeter to the other point and set it up. By means of the level and its screw adjustment we place the instrument in a horizontal plane; then, directing the telescope upon the upper white line of the staff, we fix the telescope with the screw for that purpose; we read off on the scale, by means of the microscope, the inclination of the telescope. On account of the figures being magnified by the microscope, we shall be able to see only one number at a time of the 100 integrals of the scale; suppose we find the number 67 (millimètres) plus the unascertained fraction comprised between that number and the horizontal thread of the microscope. We ascertain the fraction exactly by means of the micrometer; say, in our example, that it reads as 2035 on the circle of the micrometer.

This we note down in our book to the right of the number 67 already obtained, thus..	672035
We repeat this operation in every particular for the lower line of the staff, and we obtain, say	609400
The operation with the instrument is now complete, as we are in possession of the data required for calculating the distances; let us take the difference between these two quantities.....	62635

And divide 6000000—a constant number for all cases—by the difference we have thus obtained and we shall have 95·79 m. as the horizontal distance in question. In fact, suppose the levelling staff in position at mm', let O be the point round which the telescope revolves, AB representing the difference as found = 62635.

From the point O let us draw a horizontal line; let us



produce the line AB to H, and the line mm' to D. We have then AB and mm' perpendicular to OD. In the similar triangles OAH and OmD we have the following proportion:—

$$\frac{OH}{AB} = \frac{OD}{mm'}, \text{ there } OD = \frac{OH \times mm'}{AB}$$

But

OH = 0·20m. (by the construction of the instrument).
mm' = 3·00m. (the invariable length of the staff).
AB = 62635 (the quantity obtained in our example by the scale).

The last quantity in fractions of the mètre is 0·002635m.; if we substitute for the letters their respective values, we have—

$$OD = \frac{0{\cdot}20\text{m.} \times 3}{0{\cdot}0062635\text{m.}} = \frac{0{\cdot}60\text{m.}}{0{\cdot}0062635\text{m.}} = \frac{6000000}{62635} = 95{\cdot}79\text{m.}$$

In the preceding example we have supposed the staff to be placed at one point and the omnimeter at the other. This manner of operating is not, however, the only one; there are two others, one by placing the omnimeter in line with the two points, the other by fixing it at some point outside. In either case, a staff must be set up at each of the points. In the first instance the total distance is obtained directly by adding together the back and fore sights. In the second instance we obtain the distance by measuring the horizontal angle, which we read off on the great circle, and by calculating the triangle (trigonometrically) by means of the angle thus obtained and the two sides.

For the establishment of a base of triangulation, the latter mode is that which we should recommend for adoption; for, if we proceed thus by small distances from 10 to 20 mètres on each side, or thereabouts, we may easily measure a base line of 1,000 mètres within an approximation of 0·004m.; a result which is quite satisfactory. In fact, if for a distance of 10 mètres, the scale gives us the difference 0·06m., it will give us for a distance equal to 9·99996m. the difference 0·0600002m., a quantity appreciable on the circle of the micrometer. The nature of this operation requiring extreme exactness, a staff of special construction should be employed. This staff would have the two faces similar to those already described; would be provided with supports to ensure its verticality, and, at its base, would be armed with a steel point and iron tressels. As regards the measurement of the slope or the inclined distance, the operation requires, further, the reading off of the horizontal line on the scale. We have then a new proportion:—

$$\frac{AB}{BH} = \frac{mm'}{m'D}, \text{ and } m'D = \frac{mm' \times BH}{AB},$$

Consequently,

$$Om' = \sqrt[2]{(m'D^2 + OD^2)}$$

General Observations.—The practice of the omnimeter has proved to us that in the measurement of lengths requiring extreme accuracy it is not prudent to make the points more than 200 mètres apart. At that distance we are within an approximation of 0·04m.; at 500 mètres, by making use of a staff 4 mètres high, the approximation will be within 0·17m.; a sufficiently satisfactory result, as, by one forward and one back sight, we can determine a kilomètre within 0·34m. With the chain we know, as a fact, that it is hardly possible to come nearer than within a mean of $\frac{1}{700}$ of difference.

In levelling, the operation is identical with that we have described for the measurement of inclined distances. The quantity is given by the formula—

$$m'D = \frac{mm' \times BH}{AB}$$

that is, three (mètres) multiplied by the difference of the sights, divided by the difference with the horizontal line.

The readings are obtained with the greatest precision. For distances not exceeding 100 mètres, they are obtained within a fraction of a millimètre; and for greater distances (at which the instruments at present in use are inoperative) the measurement can be obtained within a millimètre. This degree of precision is attained, because:

1. In placing the instrument, we have not to pay attention to centralising the optical axis.

2. Because the operator has always to point his telescope on the same lines of the staff, which lines denote an invariable length, viz., 3 mètres.

3. Because there can be no hesitation in reading the staff as with the ordinary levelling staves, with which we have an element of guess-work not found here.

In difficult and hilly ground, levelling with the ordinary level becomes a very long and very expensive operation, because the sights are necessarily short, and because the number of them is multiplied in proportion to the rapidity of the incline. The omnimeter, as may be perceived at once from the nature of the instrument, allows of levelling points placed at great distances apart, and which make considerable angles with the horizon.

Fine Arts.

Ordinary Expenditure in France on account of Fine Arts.—The budget of the Minister of Beaux Arts, for the year 1870, amounts to the sum of £486,064, being the same as that of the present year. The sum is made up of the following items:—Material expenses of the central administration, including heating, lighting, repairs of buildings, and furniture, £1,620; Imperial archives, £1,440; school of fine arts, £1,016. Cost of free schools of design:—Paris, £2,488; Lyons, £400; Dijon, £608; other localities, £480. Decoration of public monuments and establishments, and of religious edifices, £26,000. Purchase of works of art, and cost of casts, £7,200. Purchase and transport of marble for works of art, £2,600. Expenses of the annual exhibition of works of art in Paris (the whole of the receipts being devoted to the purchase of works exhibited in the salon, £12,200. Preservation of ancient historic monuments, £44,000. General council of public buildings:—Salaries and expenses, £4,132; maintenance of public buildings, £34,000; construction and repairs of public buildings, £56,000. The expenditure of the city of Paris for architectural and other works, schools, &c., is entirely independent of, and in addition to the above, which relates to the State alone.

Manufactures.

Heating Wine.—The *Journal des Fabricants de Sucre*, quoted in the *Produce Markets' Review*, says:—M. Pasteur's plan of heating wine puts an end to the causes of disease or of change, by destroying in the wine the ferments, or the cryptogamic plants which produce them. For this, all that is necessary is to warm the liquid to a temperature of about 55° centigrade. The wine receives by this operation fixity and solidity of character, and it no longer contains the elements of change, which are completely eradicated by the heat. From these facts a new industry, that of warming wines, has sprung, and, indeed, has caused the question of the vinage, with which it has a certain analogy, to be rather overlooked. Several apparatus are in use for the heating process, which is carried on, on a large scale, and with great success, at Orleans, Béziers, and Narbonne. Steam or hot-water worms are used, but it is necessary to avoid exceeding a heat of 80° centigrade, and this condition is not easy of fulfilment either with steam or with boiling water. The apparatus employed hitherto have therefore a defective side—the difficulty of not passing the point at which the heating would become hurtful. It appears that wood spirit boils at 68°, and alcohol at 78°. Starting from these facts, M. Lallouel de Sourdeval has invented a wine-heating apparatus, composed of a small steam generator and alcohol evaporator, with a steam worm and an exhaust into the same boiler; and of a wine heater, containing a worm for the circulation of the alcohol, with a vessel above for the wine. The process is simple. The wine, introduced from below, runs into the heater, and runs off at the desired temperature by a waste pipe placed at the higher part of the receiver. The condensed alcoholic vapour runs back to the evaporator by means of a syphon placed at the bottom of the wine heater, which forms a reservoir, and is in communication with the evaporator. The apparatus is continuous and self-working; no steam of water or of alcohol is seen; the whole is in constant circulation without any loss, and without the least chance of accident or of getting out of order, and above all, with the impossibility of the heat exceeding 78°. This very ingenious apparatus is constructed to warm 100 hectolitres of wine in ten hours, at a very trifling expense.

Colonies.

Revenue of Victoria.—The following statement shows the estimated revenue for the colony for 1869:—

Customs	£1,335,000
Territorial	863,500
Income from public works	697,600
Postage	120,000
Fees	78,350
Excise	75,200
Miscellaneous	49,000
Ports and harbours	17,500
Fines and forfeitures	5,350
	£3,241,500

Telegraphs in Victoria.—A return relative to the electric telegraph offices has been laid upon the table of the House of Assembly. There are seventy-three offices throughout the colony, of which only four yielded a profit during last year; the remainder are carried on at an annual loss amounting from £3 4s. 4d., in the case of Coleraine, to £524 11s. 9d., in that of Inglewood. The stations which yield a profit are Ballarat, which paid £2,856 8s. 9d.; Belfast, £7 18s. 4d.; Geelong, £127 8s.; and Warrambool, £158 4s. Two stations were closed at the end of last year, and it is proposed to close those at Buningong, Carisbrook, Moonambell, Mornington, Newstead, and Seymour. The government have received guarantees for the payment of whatever loss may accrue in future at Coleraine, Penshurst, Walhalla, Serpentine, and Mansfield.

Correspondence.

ARTIFICIAL REFRIGERATION.

Sir,—My friend and agent in London, Mr. James, has been so obliging as to translate for me the lecture read by Dr. Paul, at the meeting of the Society of Arts, on the 16th December, 1868, as well as the remarks by which it was followed. I take the liberty of reviewing that essay, and of making some observations relative to my apparatus, and the relations which those of other inventors bear to it, whilst adding, as my contribution to the historical disquisition above-mentioned, some new facts.

I may be allowed, first of all, to make some remarks on the analogy which was pointed out between my latest inventions and Harrison's machine, which has subsequently been improved by Messrs. Siebe.

It is difficult, when various apparatus are intended to produce a similar result, to avoid finding in them some resemblances, but the differences must be taken note of at the same time. So far as I am concerned in this case, the latter exist as well in the refrigerating material as in the means employed, and also in the application and results. I should have been better able to admit the propriety of the comparison had Harrison been the discoverer of any principle; but he was no more than one of the links of the chain of inventors who have applied themselves to the problem of the production of cold. His machine, which has been recently improved in England by Messrs. Siebe, and previously had been improved in France by Mr. Reece and M. Carré, is the reproduction of a previous patent, omitted from mention in the interesting monogram of Dr. Paul, I mean that of the Englishman Shaw, who took out a patent in 1839, for the manufacture of ice by evaporation of sulphuric ether in a vacuum.

Now Shaw was not in any way the discoverer of a principle. The true discoverer was the illustrious Lesbie, whom I am always ready to recognise as a master, and to whom it is a gratification to be able to do homage. I render this homage with all the more pleasure, now that I am permitted to salute in his own country the

memory of a man who, by his genius, has become a fellow-citizen of every enlightened people.

I come now to the practical bearing of the question. I have remarked that, amongst the differences existing between my apparatus and those which have preceded it, the nature of the refrigerating material ought to be pointed out. I am the sole producer of that which I employ. Previous to my efforts it existed only as a curiosity in the laboratory. Discovered by M. Dumas, investigated by M. Peligot, it remained completely unused, and many chemists had never seen it, particularly in a liquified state. At this moment I can furnish it in quantities of more than 100 kilogrammes daily. I have delivered as much as 250 kilogrammes at once. I speak of methylic ether, an article which must henceforth take its place in the catalogue of refrigerating agents described by Dr. Paul. I think it will be interesting to point out some of its properties, which, for the most part, I have been the first to ascertain.

Methylic ether is gaseous at ordinary temperatures. It has an agreeable smell, like that of apples. It does not affect india-rubber joints, and has in general much less action on that substance than sulphuric ether. It does not perceptibly decompose oil; hence pistons continue properly lubricated, and friction is mild. It is very stable. Its manufacture is simple. In a gaseous state its specific gravity, taking air at 1, is 1·6; when liquified, its density, compared to that of water, is 0·714. Its expansion is as follows:—

Centigrades.	Fahrenheit.	Atmospheres.
—10°	(+ 14°)	2·25
— 5°	(+ 23°)	2·50
0°	(+ 32°)	2·75
+ 5°	(+ 41°)	3·25
10°	(+ 50°)	3·75
15°	(+ 59°)	4·25
20°	(+ 68°)	4·75
25°	(+ 77°)	5·
30°	(+ 86°)	5·25

An inspection of this table will show that these pressures are not extreme. The general properties of this body are so satisfactory, from the point of view with which we are at present occupied, that I do not hesitate to pronounce it the refrigerating material *par excellence*.

In certain cases, particularly in respect of navigation, where the term "ether" may be an obstacle to insurance, I substitute ammonia for methylic ether; but, on land, I have no hesitation in giving the preference to the latter substance, the manipulation of which is exceedingly easy. At this moment I am making an ice-machine, in which that substance will be employed to produce 2½ tons in twelve hours, a product truly remarkable, and without danger when the precautions necessary for all inflammable bodies are taken. It should be taken into consideration that, if methylic ether is inflammable, it is contained in metallic vessels of great resistance, prepared for and proved up to three times the pressure they are required to support. In such a state it not only presents no real danger, but is safer than most of the alcoholic matters which are moved about in barrels or bottles. The inflammability of methylic ether is, besides, so little to be apprehended that I use it as a test. When I wish to be assured of the tightness of an apparatus, I try all the joints with a lighted candle. If there is ever so slight an escape, a little flame appears, and a turn of a nut makes all safe.

This subject of pressure leads me to reply to some of the apprehensions expressed by Dr. Paul, as well as to establish the superiority of my apparatus over those which have preceded it. When five, six, or ten atmospheres are spoken of, the mind is appalled by the pressure thus indicated. An apprehension of this sort would be well-founded, if the diameters of the tubes in use were considerable; but the case is precisely the contrary, and thus, without giving any enormous thickness to them, I obtain considerable resistance. I am enabled, therefore, to test all the parts of ammonia machines at 40 atmospheres, and those where ether is used at 20 atmospheres. It will easily be seen that this arrangement is of the simplest, when it is known that in my small machines, which absorb 2,500 heat units per hour,* the cylinder of the compressing pump has a diameter of only five centimetres (two inches). In a still smaller size, which I am preparing for hospitals, country-houses, and sailing-ships, the cylinder, calculated to remove 500 heat units per hour, is only three centimetres in diameter (1½ inch). All the parts of my machines are established on these bases and proportions, and it will be admitted that there is absolutely no danger whatever in their use.

I now come to a more delicate point, the proof of the superiority of my machines over others. It is always unpleasant to me to be less courteous than I should desire to be towards my competitors and I lay it down as a rule that in competition the first duty of all is candour and respect. Not to transgress this line of conduct, I ask permission to treat the question generally, and without naming individuals.

In the front rank of the question lies that of refrigerating mixtures. The best, in my opinion, because there is no chemical change in the nature of the material employed, is the mixture of nitrate of ammonia and water, the combination of which produces considerable cold. But there is always a little nitrate lost in the process of reconstitution, whilst if a certain temperature (about 152° centig. = 305° Fahr.) is exceeded it is entirely decomposed. Ice made by this process costs, under the most economical conditions, 75 centimes (1s. 1½d.) the kilogramme. It is, therefore, impracticable.

The machinery acting by a vacuum comes next. It is precisely on account of the vacuum that the development of ice-making by this means is arrested. Nothing is so difficult to maintain as a vacuum; for confirmation of this statement I appeal to all natural philosophers. Nothing is less easily understood by workmen. Pressure is easily understood by them. If there is an escape it is seen at once; it yields to their efforts, they know how to obviate it. They cannot understand what a vacuum is. They do not perceive that the entrance of a little air should paralyse an apparatus. That is, however, so true, that unless the vacuum be completely maintained no progress is possible, and no ice obtained. I have been informed by one of the most intelligent manufacturers in France, who is a proprietor of a machine of this kind, that he has occasionally spent one week in the vain endeavour to discover the spot where a defect existed.

Leaving *terra firma*, let us for a moment proceed to sea. To speak of navigation in England is to treat the subject where it is best understood. Up to the present moment there has been hardly anything done in refrigeration as applied to the marine, and yet there are immense advantages to be obtained in that department —advantages which I have long applied myself to study, to work out in theory, and to make practicable. There is concerned, first of all, the transport of animal matters preserved by cold without any preparation. I think it useful here to recite the particulars given by Mr. Shand.

I preserved in September last (the experiments commenced about 15th of August) by cold alone, during nine weeks, fresh beef and mutton; during six weeks, game with entrails undrawn; during three and five weeks, fish not cleaned. I am convinced that more might have been done. First, because it was not any deterioration of the animal matters which led to a conclusion of the experiments, but because they lost their interest on the approach of cool weather. Secondly, because the apparatus was worked in an irregular manner, and because, under the conditions of continuity

* In England, the unit of heat is the quantity of heat required to raise the temperature of one pound of water one degree of Fahrenheit scale. In France, it is the quantity of heat which raises the temperature of one kilogramme of water one degree of centigrade scale.

presented by marine motive power, there is the means of having at all times the apparatus under command.

The particulars of the experiment are not uninteresting. On the two first Sundays of the period of the experiments the apparatus was not at work. There were then, on two occasions, 36 hours of cessation. The external temperature was, at the commencement, 28° centigrade (82° Fahr.). On the other Sundays there were only four hours during which the machine was worked, two in the morning and two in the evening. Every night, during nine weeks, the apparatus was at rest, and during the day there were only eight hours of movement. During some of the first nights, the temperature rose to 14° centigrade (25° Fahr.), in consequence of imperfect isolation. If we take account of numerous visits made to the apparatus, when the matters were taken out and handled, we can understand how much more efficient than the experiment should be a special undertaking, conducted under favourable circumstances.

At the present moment a steam-vessel, the *City of Rio de Janeiro*, has put to sea with the same apparatus which was at work in Paris. I am firmly convinced that this new experiment will lead to the result of bestowing on Europe the precious articles of consumption which are now lost on younger continents. It would be unjust not to mention here the name of the courageous man who has had the confidence to commence and continue this enterprise, M. Francisco Lecocq, of Monte Video.

M. Lecocq, without any knowledge of my process, took up the idea of applying cold to transoceanic movements. We were brought together by a common friend, and, by the aid of considerable capital (which I am bound to acknowledge M. Lecocq has not hesitated to employ in my processes), the result which I have just indicated is on the point of being attained. God grant that the experiment may succeed, by being preserved from the trifling accidents, which are nothing when an affair of this sort is reduced to practice, but which are everything when it is on trial. How many steps in the world's progress have been retarded by such causes. There is besides, however, every reason for entertaining such aspirations. This enterprise is of the nature of those which form the union of nationalities, giving wealth to some and abundance to others.

Such considerations will suffice, I trust, to secure the sympathies of the honourable Society of Arts, and I am sure they will accompany M. Lecocq in his bold and generous attempt.

I pass from the commercial question to another, that of the comfort of passengers during distant voyages. It is not possible to obtain ice everywhere; it is often expensive; it is always difficult to keep it. My apparatus remedy these inconveniences. With them, and a little power supplied, every steamer might not only keep its own provisions fresh, but supply its passengers with ice in abundance.

The Compagnie Générale Transatlantique has at present under consideration the adoption of my apparatus on board the steamers intended for their Pacific line. I hope that very soon my efforts will be appreciated in England, and that the steam navigation companies will comprehend the economy and other advantages which my processes afford. I am concerned not only with the comfort of the passengers and of the officers, but with the health and general welfare of the seamen who man our commercial fleets.

Ice, in case of sickness, becomes an energetic remedy. I expect to be able to furnish an apparatus which can be worked by hand. Such machines are now in progress, but that is not all. Ordinarily, and particularly on board steamers, distilled water is supplied to the crews. This water cannot, in warm latitudes, be sufficiently cooled. Its solvent properties are less than those of other water, it contains less air, and is consequently unwholesome. With my apparatus, for 10 to 15 centimes the hectolitre (4d. to 7d. the 100 gallons) in all latitudes, the temperature of water may be reduced from 40° to 15° centigrade (100° to 60° Fahr.), the latter being that best suited for deglutition.

Then there is still the ventilation by cooled air of holds, cabins, etc., etc., matters to which I have long given my attention, and which I hope soon to see in actual practice.

It is not by machines dependent upon the production of a vacuum that these results will be obtained. Besides being cumbrous, how could a defect be discovered in the midst of the noise of the engines, the shocks of the waves, the whistling of the wind, or the roar of the tempest? Neither will it be by compressed air that the results can be attained. To abandon the energetic absorption of caloric produced by evaporation for that which is effected by the dilatation of the air alone, can never be an economical procedure.

Nor will apparatus employing ammonia and water be efficient. That such apparatus is difficult to manage on land I know by my own experience, since I was the first inventor of it; and, according to reports I receive daily, it is impossible at sea, where the movements are opposed to every efficient separation of the products of the operation. In short, my apparatus alone remains applicable to such circumstances, and I confess it is this idea which has for long governed all my researches relative to the production of cold.

I have only to add, in completion of this part of my subject, some words in respect of Reece's apparatus, and of another mode, suggested, I believe, in Australia, the transport of liquified ammonia, and its utilisation in case of need.

The first of these methods, that of Mr. Reece, is only, it must be acknowledged, a simple improvement of the apparatus sold under the name of M. Carré. I am not aware whether Mr. Reece is a European, but if he is not, and has not come to an arrangement with Messrs. Carré and Co., I should recommend him strongly, before introducing his apparatus into Europe, to consult the documents relative to my lawsuit with Messrs. Carré and Co. I shall be happy to communicate them to him.

The second method has been proposed for, I believe, some twelve or eighteen months. It was described by me in one of my patents, dated five or six years back, and is detailed at length in my work on ammonia, entitled "L'Ammoniaque dans l'Industrie," Paris, 1866. I am bound to say at once that it is not applicable to maritime transport. A few figures will prove this. If we consider that the temperature of 0° centigrade (32° Fahr.) must always be maintained; that a very considerable quantity of heat passes through the walls whatever method of insulation may be used; if we remember, first, that the store ammonia metal vessels, heavy and cumbrous, weighing at least, for safety, four times the contents, must be provided; secondly, that to collect its vapour there is needed at least four times its weight of water, besides that of the recipient vessels, lighter indeed, but still heavy, we shall arrive at this conclusion, that one kilogramme of ammonia, giving five kilogrammes of ice, will require a dead weight of nine kilogrammes; that is to say, 1 kilogramme of ammonia + 9 kilogrammes dead weight, making 10 kilogrammes, for 5 kilogrammes of ice, or 2 kilogrammes dead weight for 1 kilogramme of ice, whilst, with my apparatus, 2 kilogrammes of coal give a minimum of 15 kilogrammes of ice.

The weight of my apparatus representing barely that of the water-tanks of ammoniacal water, which I have purposely neglected above, we arrive at this proportion, that with prepared ammonia, one kilo. of dead weight will give 0·500 grammes of ice, whilst with my apparatus 1 kilo. of dead weight will give 7 kilos. 500 grammes, that is to say, in the proportion of one to 15 in my favour, which places beyond discussion the superiority of my latest processes.

In respect of railway carriage and the preservation of fish on board fishing-boats, the situation is different. But I have long ago indicated this method. It is true, and I

say it with regret, I have long preached in the desert. I hope this state of things will not exist much longer, and I rejoice in the development given to this question of refrigeration by the Society of Arts. I am confident that the interest it has so warmly testified, and the intelligent appreciation of the bulk of its members, will aid in developing methods which our children will daily make use of without being able to comprehend how we have been so slow in adopting them.

The chairman of the meeting, on the 16th December, expressed his regret that positive information was not supplied as to the production of cold by these machines; I am able to inform him on that subject. The machine which I have furnished to the Compagnie des Salines du Midi withdraws 10,000 heat units (French heat units) per hour, as ascertained by dynamometer, its required $5\frac{1}{2}$ horse-power of 75 kilogramètres. This proportion is 1,810 heat units per horse-power.

I allow a mean of 100 heat units per kilogramme of ice. I obtain this estimate as follows:—I suppose the water at a mean temperature of 20·75° centigrade. I add to this, for latent heat, 79·25; and I obtain 100° in round numbers, which I take for the mean equivalent of ice in all countries. The machine can therefore furnish 18 kilos. 100 grs. of ice per horse-power per hour. I admit in practice only 15 kilogrammes, and I am ready to guarantee this figure whenever it may be necessary. Allowing two kilogrammes of coals to be expended per horse-power per hour, the same calculation will bring us to 11 kilos. for 10,000 heat units, equal to 1 kilo. 100 grs. of ice or $1\frac{1}{10}$ ton of coals per 10 tons of ice.

On a large scale, with machinery consuming $1\frac{1}{2}$ kilos. per hour, 10 tons of ice will require less than 1 ton of coals.

It is time to conclude. I have perhaps abused the attention given me, but I cannot conclude these observations without offering my thanks to the Society of Arts for the attention it has bestowed on my endeavours. I owe my best thanks also to Dr. Paul, for the favourable remarks he made on the same subject.

I feel flattered at having been, during some moments, the object of the attention of a meeting so eminent as that of the Society of Arts, and remain, &c.,

Ch. Tellier, C.E.

21, Rue Boulainvilliers, à Passy, Paris.

Patents.

From Commissioners of Patents' Journal, July 16.

Grants of Provisional Protection.

Agricultural implements—1977—A. Walker.
Anæsthesia, producing partial or complete—2046—A. P. Price.
Barges, &c.—2013—T. Grahame.
Bar iron, &c., manufacturing—2026—W. E. Newton.
Billiard and bagatelle room convenience—1993—H. A. Bonneville.
Biscuits—2015—G. Palmer.
Bobbin net or twist lace machinery, apparatus applicable to—1964—H. Yates.
Boilers, feeding—2019—J. Clark and A. Ewing.
Boots and shoes—2010—N. Mole.
Carding engines, &c., cards used in—2040—J. Shore.
Carding machinery—1997—S. Brooke.
Carriage springs—1969—W. E. Gedge.
Chairs for travellers—2030—J. Gedge.
Chandeliers—2052—A. V. Newton.
Colouring matters—1948—W. H. Perkin.
Corks—1999—C. D. Abel.
Croquet markers—1987—L. F. Banks.
Crushing machinery—2014—I. James.
Fabrics, looped or knitted—1991—E. Roe.
Fire-arms, breech-loading—1985—J. H. Johnson.
Fire-arms, breech-loading—2025—L. Falisse.
Furnaces—1981—R. Porter.
Galvanic batteries—2003—J. Smithers.
Glass, &c., ornamental articles in—2004—W. A. Biddell and J. Redgrave.
India-rubber, utilising waste strips of—1989—A. Turner.
Knives for reaping and pruning—1930—R. Olpherts.
Lace—2017—T. Butler and R. F. Carey.
Lifting apparatus—1183—P. Bogler and H. Kayser.
Liquid meters—2006—H. E. Newton.
Liquids, registering the flow of—2038—W. Q. East.
Lubricators—1919—O. Zabel.
Lubricators—2033—W. L. Wise.
Meat, preserving—2054—J. H. Johnson.
Metallic boxes, &c.—1967—M. Turnor.
Metallic lead, &c., producing—2034—C. Crockford.
Motive-power engines—1249—G. White.
Motive-power engines, &c.—2032—W. Walker.
Nail-drawing implements—2018—C. Churchill.
Oil, manufacturing from castor and other oleaginous seeds or berries—2012—A. H. A. Durant.
Photographs, transferring to wood and other surfaces—2022—F. W. Grüne.
Pianofortes—2007—J. Steward.
Pipes or tubes, jointing—1979—R. W. Whitehead.
Printing surfaces, producing—1965—R. H. Courtenay.
Puddling furnaces—2050—W. E. Newton.
Puddling furnaces, &c.—2001—W. Frazer.
Railroad cars, &c., springs for—2009—P. G. Gardiner.
Railway tickets, apparatus for regulating the delivery of—1185—P. Bogler and H. Kayser.
Refrigerators—2037—W. Bray.
Sewage, utilising, &c.—2016—J. Hart.
Stays, &c., busks for—2042—H. E. Knight.
Steam engines—1971—D. Hebson.
Steam engines—1998—G. White.
Stop-cocks or valves—1557—Z. E. Coffin.
Switches and signals—1975—R. Boyd.
Taps—2021—W. Duckworth, jun.
Taps—2036—L. and L. Clayton and J. Smith.
Telegraphic cables—2008—A. Foucaut.
Terry fabrics, weaving plain and elastic—2000—H. Turner, jun.
Travelling bag and chair combined—2002—W. R. Lake.
Type composing and distributing machines—2031—C. D. Abel.
Varnishes—1947—T. Gray.
Vehicles, &c., four-wheeled—2027—J. Knight.
Velocipedes—2023—T. Wilson.
Velocipedes, &c.—2044—J. B. Rogers.
Walking sticks, &c.—1888—J. B. Brooks and G. Picken.
Water-closets, &c.—1973—R. Heyworth.
Water-heating apparatus—2035—C. E. Brooman.
Waterproof varnishes and paints—1927—J. Macintosh.
Wood, machinery for cutting, &c.—2029—W. B. Haigh.

Inventions with Complete Specifications Filed.

Coal, &c., compressing and moulding small—2045—V. A. Deaubeuf.
Gas—2103—C. F. Dunderdale.
Steam engines, &c., slide valves of—2106—J. Piret.
Velocipedes—2048—F. Trappes.

Patents Sealed.

157. P. Oldfield.
165. H. and J. Parnall.
167. S. G. Archibald.
169. G. Lowry.
170. W. and J. Pain.
172. J. Armstrong.
178. J. Siddeley & F.N.Mackay.
179. F. A. Paget.
184. P. C. Evans and H. J. H. King.
199. W. R. Lake.
210. W. E. Gedge.
213. J. Beattie.
217. W. Huggins and H. Hornaill.
215. J. Ortton.
233. R. J. Green.
259. J. Silman.
277. W. MacLean.
287. F. Jay.
299. J. Tolson.
311. C. Hoult.
315. D. Joy.
372. J. C. Shaw.
462. C. W. Lancaster.
715. I. Hudson.
1214. M. Andrew.
1479. C. W. Lancaster.
1647. W. R. Lake.
1682. W. R. Lake.

From Commissioners of Patents' Journal, July 20.

Patents Sealed.

203. M. Tildesley.
219. H. H. Murdoch.
220. B. Mountain, T. Richmond, and G. Duffield.
232. H. D. Bowyer.
237. E. D. Ruston and W. W. Mills.
238. J. D. Ellis.
242. J. Pickering.
283. G. Price.
308. A. V. Newton.
329. A. S. and A. R. Stocker.
348. J. Vavasseur.
349. E. Morewood.
362. J. Halford.
383. R. W. Row.
401. G. F. G. Desvignes.
404. J. H. Johnson.
442. W. E. Newton.
582. B. P. Walker.
620. R. J. Goodbody and R. E. Donovan.
887. F. de Bowens.
942. E. Morewood.
988. J. B. Rowcliffe.
1119. J. Easton.
1292. W. Prowett.
1317. A. Meredith.
1369. T. Perkins.
1394. I. and G. Battinson and T. Whitehead.
1427. W. E. Newton.
1510. W. R. Lake.
1567. W. R. Lake.
1577. W. R. Lake.
1613. W. Palliser.
1649. T. Clarke.

Patents on which the Stamp Duty of £50 has been paid.

1979. W. Beaumont and Wm. McMaster.
2146. J. Whitworth.
1915. G. Mountford and G. L. Loversidge.
2325. E. Fitzhenry.
1861. W. Thompson.
1874. N. Salamon.
1936. G. B. Woodruff.
1868. G. Plant.

Patents on which the Stamp Duty of £100 has been Paid.

2027. R. Ridley and J. G. Jones.
2042. R. Dunn.
2088. T. King.
2096. A. Vignon.
2057. C. A. Day and T. Summers.
2060. R. Barrett.

Journal of the Society of Arts.

FRIDAY, JULY 30, 1869.

Announcements by the Council.

National Elementary Training and Education.

The Council announce with regret that the review by his Royal Highness Prince Arthur, at the Crystal Palace, of the boys of the several district and other schools, in or near the metropolis, who are sytematically taught drilling as part of their education, which was to have taken place this day (Friday), is unavoidably postponed.

Proceedings of the Society.

Cantor Lectures.

ON APPLIED MECHANICS.

By John Anderson, Esq., C.E.

Lecture I. — Delivered Monday, April 12th.

Applied Mechanics in Relation to Art and Science.

The following unpretending course of lectures will have reference to a portion of the subject of Applied Mechanics, or, as it is frequently termed, Practical Mechanics.

It is needless to make any apology, at the Society of Arts, for introducing such a subject. The important place which applied mechanics now occupies in all branches of manufacturing industry, both for peace and war, as well as in accelerating the conveyance of men and commodities, and in improving the means of communication between man and man all the world over—these combined advantages have given it such a high position in this age, that its value is self-evident and is acknowledged by all. The time has gone past when the introduction of machinery has to be defended. It is now an axiom that the man who can make two blades of grass to grow where but one grew before is a benefactor to his race; with equal truth it may be said that the man who can make two of any useful article where but one was made before is equally a benefactor. The general result of machinery is to increase the productions which supply man's necessities, and by means of which our existence is maintained. It thus provides a living for a greater number. Assuming applied mechanics to be the application of mechanical philosophy by mechanical art, or rather the subjugation of the powers and materials of nature which have been placed at man's disposal in the world, and that man being gifted with an inventive and contriving mind, he turns and applies them all, as far as his knowledge extends, to the furtherance of his own purposes, it will be convenient for the present purpose to consider applied mechanics as an art for giving to materials certain definite mathematical forms or shapes; then, the arranging of these shapes or forms under such combinations, that, on the application of any natural force, from whatever source derived, that force will produce certain and definite results by the combination. It thus embraces the subject of automatic working, and producing by the aid of machinery the various kinds of mechanism and movements which men have contrived for the application of first principles. With the aid of mathematics, it aims at the adaptation and harmonising of the best forms to be given to materials, consistent with their several chemical and physical properties and characteristics, so that they may severally afford the maximum of strength with the minimum of quantity, and at the lowest cost. From this short definition, it will be seen that applied mechanics is a large subject, which at every step is crossing the paths of chemistry, mathematics, natural philosophy, and physics. Although it is thus entwined with and depending on so many other sciences, still it has a distinguishing character of its own, and the unchanging laws which govern the material universe, and, so far as we know, the whole firmament of heaven, regulates matter it all its varied applications in the workshop; and when the practical science of the workshop or manufactory is carefully analysed, when man's mechanism and contrivances are eliminated, it is the true science of nature that remains, and which is the great leading feature, and man's province is merely to take advantage of and apply nature, and which he does apply under so many thousand different ways. From the circumstance that man's doings are so intimately incorporated with all workshop arrangements, our minds are naturally prone to over-estimate man's share, and to under-estimate the effect due to the simple obedience of natural laws as the grand agency for achieving such results.

The science of applied mechanics, like all true science, is founded upon a long-continued accumulation of practical facts, many, indeed the greater number, of these facts having emanated from some obscure workshop, so that their history is unrecorded; and although these facts in themselves are invaluable, and to know them simply as facts is certainly good, still it is immensely better for our young men to know the natural law which governs the facts, and upon which they are severally founded. As a general rule, the teaching of our young practical mechanics is too much confined to the facts of the workshop, and their attention is not directed sufficiently to the natural laws and fundamental principles by which they are governed, without which there can be no practical result of any kind. A knowledge of the law will explain any number of facts, and hence will facilitate the process of teaching. It was a common saying at one time, that an ounce of practice was worth a pound of theory. Without under-rating the importance of practical teaching, I have come to the conclusion that, so far as real progress is concerned, the ounce of theory thoroughly understood is worth any amount of practice without such knowledge.

It will thus be seen that applied mechanics has a two-fold character; it is a practical mechanical art, turning to account scientific natural principles. By the term art, is here meant that practical knowledge which men have acquired in regard to the working of, and the taking advantage of, the natural properties of materials, and the various contrivances for fashioning them into mathematical form, and applying them in accordance with the natural laws. By the term scientific principles, is here understood the knowledge which men, by their researches and investigations both in past ages and in modern times, have acquired in regard to mathematical principles and the general laws of nature which govern the universe.

To the superficial observer the work of the labouring artificer is generally associated with drudgery only, that any skill, or craft, or cunning which he may happen to acquire is the result of unthinking practice. While admitting that there is too much ground for such a conclusion, still it will be found, by those who take the trouble to look beneath the surface, that many of the busy workers are at the same time real philosophers, students of the laws of nature, whose thoughts and feelings have risen to a higher platform than the ephemeral trifles and delusions of the day, and it is to men of this class that our country is indebted for the large amount of mechanical progress made during the past hundred

years. From the manner in which handicraft producing operations have been regarded in the literature of the past, the world has at length almost come to believe that the science of the workshop has reached it by a deductive process from the labours of the learned and the studious. But it will be found that the opposite is more frequently the rule, and that the facts of practice discovered in the workshop have, by the inductive process of reasoning, been generalised into the natural law.

Before referring to the wonderful things that are now being done in the great working world, let us first try to realise man's early relation to the external world in which he found himself an inhabitant, and then trace the gradual connection which he would thus form with the science of applied mechanics before our day. In travelling up the stream of time to the remote period when man first began to have a glimpse of the elementary mechanical principles, history is silent. A long time probably elapsed before he discovered the general nature of the materials with which he was surrounded, and we arrive at historic times before men even knew that they were living at the bottom of an immense ocean of air many miles in depth, and that we live and move in this atmosphere just as the fishes do in the ocean of water. The first efforts would arise from the promptings of physical necessities, in the suggesting of simple expedients for obtaining food, covering for the body, and shelter from the weather; this, continued for a number of generations, would lead up to the first round of the ladder, namely, to be sensible of the value of working; then, after long-continued rude working, and by slow degrees, the mind would gradually acquire some perception of the wonderful adaptation of the human hand for work; this, in the course of time, would lead to the undertaking of mechanical pursuits of a simple nature; this, in combination with the aid of his latent inventive power, would result in the contriving of rude tools or implements to assist him in the performance of his daily occupations. By this time the knowledge of simple facts would accumulate. Without knowing anything of Newton's great law of attraction, the effect of gravity would be clearly realised, it would be perceived that any body or thing left to itself would fall to the ground; that some bodies were heavier than other bodies, bulk for bulk; that a body in motion had more force to do injury than the same body by mere pressure when in a state of rest. In this way man's knowledge would increase, and the first perception that "knowledge is power" was the dawn of civilisation. In course of time we arrive at the Tubal Cain era. We read in the Scriptures of Tubal Cain having become an artificer in brass and iron at a very ancient period—this important branch of industry, which after so many thousand years is still in a transition state, and far from perfect, and the discoveries and inventions of the past few years seem to indicate that it is only yet in its infancy. This reference to Tubal Cain gives us a point to start from; the number of facts which he necessarily knew in virtue of duties to be performed in his daily work is interesting to reckon up. He would know something of of the nature of heat, of the difference of temperature; that heat expanded his metals; that the different metals had different rates of expansion; that the solder which he employed to join his different metals required to have the same rate of expansion as the metals to be joined. He would know, as a fact, that heat travelled through metal rapidly without having the modern theory to explain it; he would also perceive that metals and other substances differed greatly in regard to the rate of conducting heat. The soldering-bolt which he employed would soon lead to the application of some slower conductor, as a handle in order to prevent it from burning his hand; at first a handful of sand, a bunch of hay, the corner of his leather apron, or at length some ingenious man would invent a wooden handle. He would soon find out that the black pan in which he cooked his dinner was a better absorber or radiator of heat than the bright and polished surface of the new pan when it left his workshop. He would know, if observing, that some substances, even if apparently indicating the same heat, really contained a great deal more than others—that when the pot of lead was emptied, the lead had less heat to give up than the pot; he would also know a little of malleability and of its opposite condition, and many other facts of a similar nature, all of which would become familiar to the first workers in metal, even if they could not generalise them into laws. Indeed, with all the advantages of modern science, we are still groping in the dark for the natural law that governs some of the established facts with which we are all familiar and daily practising. By the Tubal Cain era, man would know something of the invisible atmosphere; that it was a real substance; that when in rapid motion, as in a hurricane, it was capable of tearing up trees by the roots; that it could be employed to urge a fire; that it was the supporter of combustion. In time, he would know that it could be urged by a fan, and that such a fanner could be advantageously employed to blow the chaff from the corn on the thrashing-floor. As time went on, and men began to know that more work and of better quality could be accomplished by each confining himself to one description of duty, the system of subdividing labour may be considered as having commenced; this would be still further extended—its advantage both for head-work and hand-work would gradually become more and more apparent, until in our time it has become one of the leading features of civilisation.

It is scarcely more than a century since men discovered the advantage of manufacturing, as distinguished from the previous condition of what may be called making. During the past history of the world, the various articles required by man were made rather than manufactured, as a rule the work being performed at the houses of the workmen, the several members of the family taking their respective parts—a system which had many domestic advantages, but is associated with one great drawback, that it is not so economical as the co-operative manufacturing system. The first great experiment with the manufacturing system was made by Arkwright. He was a man possessed of great inventive talent, and a wonderful natural ability for organisation, even to the minutest details. By his genius, the principle of subdivided co-operation was developed in the cotton manufacture to its utmost limit, and which has since been extended by others into almost every branch of industry. In such establishments, by the united means of the factory system, the organisation of labour, the saving of expense for conveying the materials under operation from one stage to another, together with the efficiency of the machinery employed, the required articles are produced so abundantly and so cheaply by a given expenditure of individual labour, that the whole working-world has now begun to recognise the great advantage of the system in an economic point of view, and it is being adopted in all civilised countries.

In the early history of applied mechanics, machinery, in the modern sense, was not the prominent feature. Even up to a comparatively recent period, the inventive mind did not take hold of the grand idea of making the power of nature, by means of an inanimate machine, perform the drudgery of man's work, so leaving him to guide and direct by his intelligence. In those early days, ingenious men wasted their lives in contriving clever mouse-traps, curious clocks, and in the vain endeavour to arrive at perpetual motion, or in other similar objects which have been of no real use to mankind. Still, their labour did not go entirely unrewarded to the human race. It is to those persevering men that we are indebted for many ingenious pieces of mechanism, for a variety of mechanical motions and other contrivances, which were all ready waiting for the world to take advantage of, and to turn to better account when the time had arrived for entering upon the modern manufacturing system.

In this age it is difficult to realise the contrast between the mechanical art of past ages with that of the present day, more especially in this great manufacturing country, with our railways and steam vessels, where we are all so accustomed and familiarised with the wonderful results of applied mechanics in a general way that we have come to look upon everything as common which a former age would have looked upon as a miracle of art, that it is only by descending into details that the present position of practical art can be realised. It has been truly said that there is nothing of art existing but what was invented by somebody at some time or other; even the familiar bread-and-butter must have been arrived at by the discovery and invention of many thinking minds, in ages long gone by. It is only such a consideration as this which enables us to conceive the vast accumulation of facts of art which had to be established, one after the other, before a heap of iron ore could be worked and manipulated into any modern machine, say a steam-engine; and if such a heap of iron ore were to be piled up beside the finished engine in full operation, great as would be the contrast, it would signally fail in conveying any correct idea of the invention and discovery which it embraces, even when merely considered as a work of art, in the changing of the condition and form of the materials into the accurate mathematical piece of working mechanism. The amount of thinking and contriving which it involved is now far beyond all reckoning. Passing over the gradual discovery of the natural laws, by obedience to which the metal can be separated from the earthy matter, the discovery of the necessity and efficiency of some other earthy matter to act as a flux, and thus set the iron free; the invention of the blowing apparatus, capable of forcing such a prodigious quantity of air into the furnace, in order to obtain the requisite temperature, so as to reduce the metal to the condition of pig-iron, suitable for the founder's purposes; then comes the founding art, in which every step depends on strict obedience to certain natural laws, which had to be discovered before they could be obeyed, and before the engine cylinder could be formed into a successful casting. How numerous must have been the practical failures before the laws were reduced to a system of art that would ensure sound castings of the several parts. How many handy makeshift appliances must founders have resorted to between the time when the mould was rudely worked into the form by the hand and the period when men had learned to use a pattern, that is, to work from a copy of the required article instead of making an original of every production. What surprise must have been excited when the founder first discovered that fragile sand would bear the rush and rapid flow of the liquid metal into its most intricate recesses. Numerous were the fractured castings turned out of moulds before men understood the natural law which governs contraction in cooling, and, by dearly bought experience thus learned to obey. Then comes the accumulated facts of generations, now generalised into a law, by means of which a casting may have any degree of hardness or softness, or one part hard and another part soft, or both combined, with the property of strength and toughness.

It is the same with the smithing branch. Smithing is an older art than founding. In the olden time the smith was a great man in every large establishment, and many of the facts learned in those days have been handed down to us. But modern smithing differs greatly in most of its features from that of the past; it has become manufacturing rather than making, and involves an immense number of inventions and appliances. The smith deals with iron in the condition termed "wrought;" in this state the greater portion of the carbon which it contains in the cast-iron state has been eliminated or burned out, and by a process of working, either by hammering or rolling, it acquires the fibrous character, with fully three times the strength of the former. Between the two conditions there is a wide gulf of apparatus to be surmounted—the devising and inventing of the various furnaces for refining, puddling, and welding, the invention of rolling mills, cutting-machines, and steam-hammers—before a modern bar of good wrought iron can be produced. When we look into a large smithy, and see the multitude of labour-saving articles, each of which had been invented by some one between the time when the smith worked with the hammer and hand entirely, and the present day, when the various articles are produced by the numerous modifications of the principle of copying. In some the viscous mass of red-hot iron is placed within an iron mould, and by the blow of a steam-hammer the malleable material is made to flow into the required form, for this material, although the most valuable, is at the same time one of the most difficult to fashion into shape, in consequence of its unyielding toughness; hence it is that the steam-hammer stands out as the great smithy improvement of modern times.

In the modern steam-engine, the piston and other important parts are made of cast or Bessemer steel. Here another field of invention opens up. Think of Huntsman's struggles in the early days of cast-steel—the difficulty with his crucibles, and the heart-sickening failures which he had to encounter and successfully grapple with, before we arrived at the quality of modern cast-steel. Then comes the secret wonders of the hardening and tempering process, which has come down from a remote period, by means of which we can obtain any degree of hardness, or temper, or toughness, to suit the innumerable purposes of art. Still, we are a long way from the steam-engine. It is now interesting to read of the struggle with almost insuperable difficulties that had to be encountered at the Soho Works of Boulton and Watt, before men knew how a cast-iron steam-engine cylinder could be bored out correctly—the many makeshifts that had to be resorted to before the law became known that, with the cutter moving at about 16 feet per minute, it could be successfully accomplished. Then came the invention of the boring-bar, and all the other appliances which seemed to flow spontaneously from the fertile minds of Wilkinson and Murdoch, and by means of which Watt's great invention was brought to a successful issue. Still more important are those marvels of mathematical refinement, the modern copying tools of an engineer's workshop. The invention and introduction of the block machinery by Bentham and Brunel was the first effort on a grand scale to apply the principle of copying by transfer instead of the form being arrived at by the hand and skill of the workman. The sliding rest or tool-holder principle, as an amateur instrument, had been in partial use for a number of years upon the Continent, but Henry Maudslay was the first to render it a practical reality. Then Mr. Whitworth and others arose to give the system that crowning precision which we daily see, in which the principle of taking the mathematical lines from a copy by transfer, combined with being self-acting, is the great feature.

In this hurried sketch of practical mechanical art, frequent reference has been made to the principle of production by copying. Enough, however, has not been said to show the position which that principle occupies in all art-arrangements within the scope of applied mechanics in modern times. To produce the mathematical figure from some variously-contrived modification of a geometric copy is the aim of almost all invention in connection with production, as distinguished from obtaining definite form by the hand-skill of former times. It will be found, on going over any modern factory, that every thing which is done well, and at the same time done cheaply, is accomplished by means of this copying principle. A clear understanding of this as a principle will go far towards simplifying and explaining the greater number of modern shaping and other machines, by whatever nomenclature they are known. First, there is the subject to be accomplished; second, the mathematical principle or natural law to be

employed; and, third, the mechanical contrivances that are introduced by man to carry the principle into effect. Copying has thus become so interwoven with everything that we daily see that its employment goes unnoticed, and hence the vast advantage that the modern world derives from it, in almost every branch of art, goes unappreciated. We read of only one artist who at any time, and with a sweep of his hand, could draw a perfect circle, yet by copying with a pair of compasses, a true circle is produced by anyone, without any trouble. How few can draw a straight line with a pen; hence we have recourse to a straight-edge or ruler, as a standard from which we draw any number of straight lines by copying. We write our letters by hand, but quickly take a copy by transfer. The editor writes his leading article slowly, and probably very badly, so far as the penmanship is concerned, but see it in the morning impression of the *Times* newspaper, produced at the rate of 10,000 copies per hour by this principle. Or, to take another direction, to the class of things we see in our houses. The bricks, even when made by hand, are made in a mould as a copy, and the principle is still further developed in the brick-making machines, which are constructed on many different arrangements, but all form the brick by transfer. It is the same in plastering the walls. In former times the plaster was laid on in the beaver fashion, but now two straight-edges are established, and a third straight-edge is transversely employed to transfer this combination of straight lines, on the same principle as the planing-machine by the engineer, but in both it is merely copying. In forming the cornice, a profile template is made of the proper section, and is drawn along upon a straight-edge, and between the two the cornice is developed. When the plasterer resorts to flowers or other ornaments, he does not make them, he employs a mould to copy from. The copy was made carefully, by an artist probably, hence it was expensive, but by copying the produce may be equally good, and at a price within the reach of everybody. Passing to the working of wood, the baulks of timber as they are imported into England are rough and uneven, because they are squared up by hand with an adze, not by copying. When it passes to the saw-pit, the sawyer chalks a cord, stretches a straight line upon one side of the baulk, and giving the string a jerk he copies straight lines, to which he guides the saw in its gradual progress. In the sawing machine we have all the art of the plasterer's straight-edges, or the engineer's planing-machine; the baulk moves in a straight line, the saws move in straight lines at right angles, and thus produce parallel boards. In wood-planing it is the same; the hand plane-iron of the carpenter is a mere chisel when not fixed in the block of wood, but the lower side of the block being a flat surface, the chisel is approximately guided by the wood so as to transfer its flat surface to the board by copying. In wood-planing machines, the copy principle is a still greater development; the straight lines are given to the parts of the machine, some one way, in some by another arrangement, but all agreeing in this principle, that the conditions of surface or form are first given to the machine, and then these conditions are given again and again to the wood submitted to its operation, quickly, perfectly, and cheaply. Similar remarks apply to the carpenters' tools for mouldings, and beads; like the plasterer, in forming the cornice, the carpenter has a steel copy of the required moulding made for him by a tool maker; this is inserted in a corresponding block of wood, and it becomes the moulding plane. In the moulding machine, the said plane iron, so cut to pattern, revolves on an axis, the spindle is held at right angles, and the wood is passed along in a straight line. All these conditions are transferred to the wood by copying. Passing to metal, we find everywhere the same tendency. As a rule, all the iron and brass articles in our houses are made from a copy, the gas and water pipes by a die, the fire grate and all its belongings are transferred from a pattern, the ornamental parts of our chandeliers are derived from dies; so that throughout the whole range of art whatever in our houses is beautiful and good, and yet within the reach of moderate means, is produced by transfer from a copy instead of by making. This question of price is not a small matter, as those of limited wealth, equally with the more affluent, have pleasure from being surrounded with the comforts and elegancies of civilised life; and the introduction of such ornaments into working men's houses tends to refine the character, increase the self-respect, and to raise them in the scale of being; but it is entirely due to the copying principle by means of which it can be accomplished. Whichever branch of modern practical art we choose to select for illustration, or in whichever direction we wander, it is all copying by some means or other. Take bank notes; they are printed from a plate that was transferred from an original plate, which was made at great expense. The coin of the realm is struck in dies, these dies being the offspring of other dies, which originally had been made by hand. Bullets are made in dies or cast in moulds; bayonets are drawn out in oscillating or revolving dies; the tapering gun-barrel has its precise form in the rolls; wire of any section is drawn through a die; ornamental tubes as well as plain are copied from the apparatus; and in all these various productions the copy is the important point, the mechanical apparatus is merely an agency which may be varied at the constructor's pleasure.

Rising to the more important manufacturing operations, it is still the same story, that the great prominent feature of modern mechanical art is production from copy by transfer, instead of by hand as in the olden time. The most superficial can see that the rough mass of iron, in being passed through the rolls, is made to undergo two changes—the shape of the groove in the rolls gives form, and the pressure of the rolls, considered as endless or revolving dies, gives a flowing elongation. In the case of rolling plate or sheet it is the same, the distance between the rolls is the thickness, the smoothness of the rolls determines the smoothness of the plates. Power is employed to turn the rolls round, the friction draws the iron inwards, and all combined, this invention of Cort is one of the grandest examples of copying of modern times.

Let us turn to the slide-rest principle again, and examine it a little more closely as a copying agency, and likewise in regard to the immense variety of application of the principle to the most dissimilar machines, such as a lathe or a planing machine, a machine for slotting, or a machine for turning screws, or cutting the teeth of wheels, besides numerous other machines of different names that are employed in other branches of manufacture, such as those for small-arms and other war stores. A close inspection will reduce the dissimilarity very considerably, down to a very few modifications of slide-rest copying, combined with some mechanical expedients which are the alphabetical letters of applied mechanics, and may be set up into any number of arrangements, like letters into all the words in the dictionary. And what is still more important, these producing copying machines are the offspring of other machines of the same kind, and will, or may in their turn, produce all other kinds of machines of the same family likeness, *ad infinitum*.

In looking back to the early days of the old turning-lathe, before the introduction of the transfer principle of the sliding rest, it is interesting to observe that even then the lathe was a perfect instrument in so far as it was a copying machine. Those early lathes that were made with a perfectly round neck to the spindle, if any such existed, would yield a round figure in the article under operation, providing that the cutting-instrument was held steadily, and even a still higher degree of truth or roundness was obtained by the now old-fashioned dead-centre lathes, in which the article turned upon its own centres, the surface, developed by holding the cutting-instrument steadily would be as round as the circle described with a pair of compasses. With all such

apparatus, however, the chances of error were numerous. The spindles were not round, and it was next to impossible for the best workman to guide the instrument either in a straight line or any other definite figure. In all modern machine-tools the correct mathematical figure is given to the apparatus, either as a perfect circle in the lathe-spindle, or as straight lines in the lathe-bed, saddle, or slide-rest, planing, slotting, shaping machines, or otherwise. In the case of a lathe, whether arranged horizontally or vertically by various adjustments, any figure is transferred, true circles, true cylinders, flat surfaces or even straight lines, straight lines approaching to a point, thus forming cones. The leading screw can be made to transfer itself or its own opposite, right-hand or left hand; or by driving it faster or slower it will transfer screws of any other pitch, coarser or finer, to the right or to the left, and all this is accomplished without the assistance of the attendant workman beyond the first adjustment, the cutting tool being held in an iron hand, which can only move in the line or lines intended, the quality of the work depending entirely on the correctness of the machine, whether for good or bad. In all the other machines it is the same principle differently arranged. In some the article to be operated upon is made to move in a straight line, or to revolve upon a true surface, and the instrument is held over or at the sides. In others, it is found more convenient to hold the article instead of the instrument, and the instrument is moved in straight lines or circles, or otherwise. In others the instrument is held by an iron arm and moved horizontally or vertically, or in any or every direction. In some the cutting instrument revolves, and is moved over the article, or the article is moved under the revolving instrument; or to select an exceptional machine, that for cutting the teeth of wheels, here we have a circular cutter the form of the space between the teeth, this is held in what may be termed a sliding rest, and thus a copy of both combined is imparted to the wheel, and even in regard to the division of the pitch of the teeth, it is exactly the same principle, the division is contained in the machine as a copy, and may be altered at pleasure by the use of toothed wheels serving as multipliers or dividers, or otherwise. Or if we look at the numerous ways of forming screws, as in bolts and nuts, and such like, it is all done by transfer from what are called taps or dies variously arranged, but in all the apparatus is the copy of what is required, just as much as it is in the machine for turning lasts for shoemakers, or gun-stocks for the War Department, although not perhaps quite so apparent. In the gun-stock making machine an exact copy of the form is the prominent feature—a tracer transfers this figure to the instrument that cuts the rough stock into shape. In the case of any description of rifling machine for cutting the spiral groove within a gun, in order to form what is called a rifle, a bar containing the cutting-instrument is introduced into the bore of the gun, and the gun becomes the sliding-rest, the spiral movement is given to the bar, which may be derived from a spiral on the bar itself, or from a straight line set at an angle, or by other means, but in all the lines are taken from copy by transfer.

It would only become tedious to go on enumerating examples; enough has been said to show the importance of the copying or transferring principle in modern mechanical art, still it is too frequently lost sight of in the literature and teaching even of the present time; and although this general principle of working from a copy, instead of fashioning by hand-skill, may seem familiar to us, and may appear as the natural course to pursue, still that condition of mind only goes to show the great advance which the world has made in applied mechanics during the past 100 years, and although we may almost wonder that the world was so long in seeing its advantages, yet so it is with everything. Man is slow in realising the value of a great principle, and its progress is gradual, and no doubt there are many things lying hid from us now, covered over with a thin veil, which will be equally clear to the greater art-knowledge of a future generation.

Applied mechanics has so far been considered as an art, because it appears to be the natural order; first, the simple facts of practice, then these facts carefully compared with each other, and their points of agreement rapidly scrutinised, until at length the philosopher is able, by the inductive process, to generalise the facts into the general law that governs them. At the same time, it is not always so; many of its grandest achievements were deductive. Take Watt and the steam-engine. Black's speculations on the theory of latent heat prepared Watt's mind for the separate condenser; this heat could not be traced as a fact; it was absorbed and apparently lost, but by a process of reasoning downwards it ultimately led to one of the grandest facts in practical science. Another example is the case of the learned Pascal, in regard to the laws which govern fluids. It was by a deductive process from certain discoveries of Torricelli in regard to the atmosphere, that Pascal discovered that the pressure of fluids is equal in every direction, and so thoroughly did he investigate this subject that little has been left for his successors to improve upon. It was more than 100 years before this knowledge was reduced to practical account, first by Bramah in the well-known hydrostatic press, and which has been so ably followed up by Roger, by Sir William Armstrong, and others. But it will be found that in all modern water-pressure machinery of any description, and however variously constructed, that Pascal's grand law is the leading feature, and by understanding which, all the facts founded upon it are explained. It will thus be seen that all have their work to do, and if the division of labour is a sound principle in the workshop, so it is also in the study and the laboratory. We require those with the time and the talent, as well as the learning, to dive deep into the hidden recesses of nature which are yet unexplored, and whose province it is to place in a simple form the knowledge of natural laws thus acquired within the reach of those whose duty it is to carry it into practice.

After referring so much to man's doings in connection with mechanical art, it seems almost presumptuous to pass so abruptly to the laws of nature, which act over the immensity of space, as compared with these, the greatest work of man is insignificant. Still, by his ingenuity, he takes advantage of the power and laws of nature in thousands of different ways, and by his skill organises their application into all branches of mechanical art and manufacture. My object in the present lecture is not so much to explain the laws or principles in themselves, but rather to draw attention to some of the more familiar laws, for the purpose of referring to their application, and likewise to some of the various contrivances by means of which man turns them to account. By way of pre-eminence, I select, first, the grandest scientific discovery ever made by man, namely, the universal law of attraction, which was revealed to the world by our own immortal Newton, and, strange although it may appear, it will be found that this great law, under its conventional names of gravitation, cohesion, or capillary attraction is constantly in operation in all our busy workshops. With the law of gravitation we are all familiar, in its formation of a dew-drop, or a tear, or that two globules of quicksilver, placed side by side, run together and form one globule. An interesting illustration of the action of this law, upon a small scale, is seen in the manufacture of leaden shot, in which the same law that formed planets into spheres is to be seen in daily operation. The lead is melted at the top of a tower some 200 feet from the ground; the metal is poured into a kind of sieve or cullender, and passes through the holes by gravity; as in the case of rain, so here the metal separates into drops; by falling through the air, these drops lose sufficient heat to render them solid before reaching a cistern of water at the bottom. When lead is employed by itself, for want of fluidity, many of

the balls are imperfectly formed, and hence a small portion of arsenic is mixed with it in order to obtain greater fluidity, thus giving the law time to act; for when the lead sets too quickly the perfect sphere is not accomplished—it is more of a pear-shape, but with a certain liquidity each atom is drawn to a common centre into a perfect sphere. Still more instructive is the phenomenon when the metal is too liquid from an over-dose of arsenic, for then, by remaining too long in the liquid state, the little ball acquires a whirling motion before it is a solid, and, like our little world, the centrifugal force acquired from its whirling motion throws it beyond the sphere into the form of an oblate spheroid.

So far, we have two illustrations of the law—first, in forming the drop into a sphere; and next, in drawing the drops of lead down to earth; but gravity has yet another office to perform, in separating the good from the bad, and in the assorting of them into their respective sizes. When the spheres are afterwards collected, many of them are found imperfect, besides being of different dimensions. A very simple but ingenious application of the law is employed to separate the good from the bad. They are all run down an inclined plane; those that are pear-shaped run off at the sides; those that are perfectly round acquire such velocity from gravitation sufficient to carry them over certain pitfalls in the way, and so they reach the bottom in safety; but the remainder, that are not so round, do not acquire a velocity sufficient to carry them over the pitfalls, and so they drop through, and along with the other imperfect ones are gathered up to be re-melted. The whole of the good spheres, of all sizes, are then collected and poured into the upper end of an inclined revolving cylinder, having a succession of holes of different sizes upon its outer surface. As this cylinder is continually turning round, gravitation is lying in wait, and the small shot are drawn through the small holes, and fall into a box on purpose underneath; then the next size fall through other holes into another box, and so on until all are disposed of.

The kind of attraction commonly called cohesion is another modification of the same great law. In its usual acceptation it refers to the force by which the molecules and atoms of the same body are held together; but when we bear in mind that the force of gravitation is inversely as the square of the distance of the centres apart, when the particles of the same body are in contact, they may be many thousand times nearer to each other than when only separated by the ten thousandth part of an inch. As a rule, in the practice of applied mechanics, the engineer is most frequently called upon to prevent the rupture of cohesion, from the effect of some extraneous force superior to the inherent attraction of its own particles. Still there are many exceptions, and most engineers are familiar with instances of separate substances becoming united from their having been permitted to approach too closely to each other, thus allowing the natural law to assert its superiority, and which it will invariably do whenever it has the opportunity.

It is a fact, well known to those who are engaged with the softer metals, that if two pieces of lead have their pure metallic surfaces laid bare, and then put together with pressure and a twist, they will unite and become as one piece. It is not so generally known that two dissimilar metals will unite in the same manner, say steel, or iron, or brass, with lead. In the manufacture of leaden bullets by compression, where the dies have to plunge into the solid lead, it is found that, after a short time, the steel will unite with the lead, and become one conglomerate mass, hence it is necessary in all such processes to introduce some unctuous matter to prevent contact, and so hinder the law from acting. This cohesion does not take place because the metal lead is soft; it certainly requires less pressure on account of the softness, but it arises from the two metals coming together with pure metallic surfaces while under pressure. The same result may happen with hard surfaces if they are perfectly clean; even two pieces of glass that are made truly flat and clean on their surfaces will join together in the same way. A case occurred with two pieces of hard steel, six inches in diameter. Previous to the introduction of the present methods of taking the thrust of the shaft of a screw propellor in steam vessels, the thrust was received by a fixed piece of steel, a corresponding piece of hard steel forming the end of the shaft; the two came into actual contact, from the absence of oil, water, or other medium, and so became united, the shaft breaking elsewhere. Surfaces so flat, so purely metallic, and with so much pressure, are fortunately rare, but we frequently meet with an approximation to the conditions, and which, for convenience, is usually termed adhesion. Adhesion is usually considered as the union of dissimilar substances, but is this strictly correct? Is not the union between the steel die and the lead just as much the attraction of cohesion as that of the two pieces of lead or steel? The difference of term has probably arisen from the circumstance that when two dissimilar masses are thus united, they in course of time drop asunder; this dropping asunder, however, proceeds from another law of nature, a much more inexorable law than that of attraction, a law which man frequently tries to disobey, but the penalty is invariably inflicted. It is the law of expansion by heat and contraction by cold, and the variable rates of expansion and contraction of the different substances in nature that separates them. When a piece of iron is soldered or riveted to a piece of brass at some definite temperature, all is well, but when the heat is increased, the brass expands more than the iron—then commences the struggle for liberty of action; the elasticity of the materials comes into exercise as a peace-maker, but the natural law will act, by bending the structure, that is to say, the longer piece of brass will form the outside of the curve; then, as winter comes round, the contrary effect is produced, and the brass is the inner ring of the circle; so, when lead is thus united to steel, the greater expansibility of the lead causes it to strive for liberty by a wriggling process, carried on probably for years, until at length the law of attraction is defeated.

There is yet another modification of the great law, which, for convenience, is called capillary attraction. It is that property of liquids whereby they rise in tubes or other porous substances of any kind, even in a bunch of glass threads, of iron wire, ropes, or woods, or even between plates that are near to each other. Now, in this simple process, there are three forces at work, all in obedience to the great law; first, gravitation pulling the fluid downwards; secondly, the attraction that draws the atoms of the fluid to each other; and, thirdly, the attraction of the bundle of fibres, or the sides of a tube that draws the fluid upwards. From this it follows that the smaller the tube, or the closer the bundle of fibres, so the higher will it rise in proportion. All are familiar with this law in ordinary life. The corner of the towel in a basin of water empties the basin; the oil rises in the wick of the lamp; the engineer employs it to oil his machinery by a cotton wick introduced into lubricators; but in applied mechanics it has many varied duties to perform, and its irresistible effect has frequently to be guarded against as well as taken advantage of. When a rope or a piece of wood is subjected to its influence, the bulk of the mass is increased; and in the case of a twisted rope, the fibres are drawn in by the enlargement, and thus the rope is shortened. When a dry wooden wedge is driven into the crevice of a rock the wedge swells and splits the mass. Until a few years ago, all grinding-stones were fixed upon their axles by means of dry wooden wedges, driven into the space between the axle and the stone. After a time the wedges became wetted and swollen, for a while the strength of the stone resisted their efforts, until it became reduced in diameter by wear. Then the natural law, with the aid of centrifugal force from the velocity of the stone came into play and scattered the mass into fragments, at the cost of

many a poor grinder's life. In modern arrangements man has become more obedient—he now grips the stone sideways between two discs of iron, thus removing the splitting action of the wedges, and at the same time anticipating and providing for the effect of centrifugal force.

Those who have lived in tents well know the effect of rain in shortening the ropes, and thereby pulling out the pegs by which stability on the ground is maintained; but, it is not so generally known that a very heavy mass, such as the anvil of a steam-hammer, may be raised a short distance without the usual tackle, by simply tightening a bundle of dry ropes over it by means of a long pole, then wetting the ropes, when they necessarily become larger in diameter, and at the same time shorter; by this means any mass that the ropes are capable of sustaining will, in obedience to the law, be made to swing. It is said that when the statue of a celebrated hero was in the act of being raised to its present elevated site, the rope slings had so stretched by the great weight, that the blocks became foul of each other when the statue wanted but a very small distance of being at the required height, so that it might swing over upon the top of the column. The engineers who were engaged in raising it, after exhausting their skill in useless efforts, were about to lower it to the ground as a lost attempt, when an old sailor in the surrounding crowd, who saw their difficulty, and who knew the natural law, called out, "Wet the ropes;" the hint was taken, and produced the desired effect. Knowledge is always power.

The law that governs the pendulum is another kind of example of extensive application in practical mechanics, although even the pendulum law is dependent upon Newton's great law of attraction. The discovery of the pendulum law was made by Galileo, who, next to Newton, was perhaps one of the greatest philosophers who ever lived. We are all familiar with the story, that, while still a young man, he was sitting one day in the metropolitan church at Pisa, through some cause, one of the lamps suspended from the ceiling was set in motion, and, from its great length, continued to swing backwards and forwards for a long time afterwards. He was struck with the circumstance that it took the same time to make the long swing at the commencement when first disturbed, which it did to make the shorter swing just before coming to the state of rest. There were no clocks nor watches in those days, but by means of his pulse he managed to verify the fact, and with further experiments after he went home, fully confirmed and revealed the law of the synchronism of the pendulum. When of equal length, at least within certain limits, that, when the pendulum is raised at one side by the hand in opposition to gravity, the same amount of work is necessarily bestowed upon it by gravity during its descent which is sufficient to carry it to the same height at the other side, and but for the resistance of the atmosphere, and the friction of the rod, would go on continuously. This discovery may not have seemed of much value at the time, but it has turned out to be of the greatest importance to the world. It is the best measurer of time which man has yet found out. Before many years had passed, it was turned to practical account by Huygens as a clock regulator, a clock being simply a piece of mechanism to count and show the beats of the pendulum in a given time, with a weight to counteract the resistance of the air and friction. This, in time, led to the application of the balance-wheel for watches; for man, one getting hold of a clue, did not rest until he found out that a small spring could take the place of gravitation; for what gravity is to the pendulum, the little spring is to the balance-wheel; both pull to a centre of rest, but the work or force then stored up carries it as far the other way; and as a substitute for the weight of the clock, the main-spring is introduced into the watch, so as to overcome its little friction and other sources of retardation. The world had gone on many thousands of years using the plummet, before Galileo's time, but no one had previously observed that it contained the pendulum law, and but for the circumstance that the knowledge fell into the hands of that great man, it is quite possible that no other man might even yet have ascertained it. The steam-engine and water-wheel regulating governors, with which we are all more or less familiar, are but modifications of the pendulum principle combined with other forces, and, to a certain extent, are governed by its laws; and the probability is very great that, but for the knowledge of Galileo's pendulum, James Watt, even with all his unrivalled powers of invention, would have gone off in some other direction, in seeking for a principle on which to construct a governor for his engine. Thus it is that real science is ever making way. A true position once taken is never given up; errors are gradually discovered, and eliminated, and forgotten, but the laws of nature will hold their own to the end of time. During the past 100 years machinery-governors have been constructed on many different arrangements, the greater number of them are on the pedulum principle, but in none of them have we reached the extreme simplicity of the old pendulum. As a rule, man's first efforts in every kind of machinery construction is complex, but, as time advances, the thinking tear and wear of different minds, gradually render it more and more like to the simplicity of nature.

Before leaving the pendulum law, let me refer to another kindred law, that of inertia, which is that property of matter whereby it will continue in its present condition, whether at rest or in motion, unless it is interfered with from without. As this is a subject on which some practical men have unsound views, mostly traceable to the old notion of *vis inertia*, a term still to be found in some books on natural philosophy, artillery, and mechanics. There is no such principle in matter as that word implies, the only property is that of passiveness, inactivity, or inertia. Matter is as willing to be in motion as at rest, and as willing to rest as to be in motion; the same power that is required to set it in motion is required to stop it again. This error has affected arrangements in all past times, and it is only of late years that the minds of engineers have begun to shake off the thraldom. The whole principle may be explained by the pendulum. A portion of strength equal to gravitation is expended in raising it; when the ball is set at liberty, gravitation again performs the same work during its descent; if stopped when at the bottom, the same work that was performed by the right hand has to be expended upon the left hand; if the pendulum is not stopped, then the force stored up in it will carry it up until the gravitation resistance balances the previous force of acceleration from gravitation, but the ball itself is perfectly passive, and is without any living principle to influence it one way or the other. It would be interesting to trace the mental working of those engineers who are gradually breaking through the practice that was founded upon a misconception of the natural law. Familiarity with the reversing of railway and marine engines has shown it to be inertia merely that has to be overcome either in setting in motion, in stopping, or reversing, and this accounts for the rapid introduction of coupled reversing engines of light construction and without fly-wheels during the past five years, and nowhere more perfectly than at Crewe, by Mr. Ramsbottom.

Passing to another of the natural laws in connection with the atmosphere which plays a most important part in applied mechanics, we have there a striking example of the intimate relation that exists between science and art. Although this law is apparently inconsistent with gravitation, in that lighter fluids ascend through heavier, as in the ascent of balloons, or the draught in chimneys, yet this law, like that of the pendulum law, is equally dependent on the law of gravitation. It is merely in obedience to that great law that the heavier air of the atmosphere descends, and the specifically lighter air in the chimney or the balloon is floated upwards. The ship floats on the water because, bulk for bulk, the ship

is lighter than the water; so the balloon, bulk for bulk, is lighter than the air, hence it rises in the great ocean of the atmosphere.

In ancient times men were fully acquainted with the raising of fluids, such as water, and of the existence of the air. They even made machines, such as pumps, to take advantage of the air-pressure, yet they had no idea of the laws by which it was regulated; hence it was a blind groping in the dark until the law was understood. It was as well known to the world two thousand years ago as it is to us that water would rise in the pipe of a pump to about 30 feet, but, not knowing the true cause, they invented an explanation, as men do now when they are groping in the dark, and as we constantly are in regard to many things. The explanation was that the water rose in the pipe because "nature abhorred a vacuum." It was in the middle of the 17th century that Torricelli discovered the law, and then all mystery was removed, and we now know why nature abhors a vacuum, or why the water rises in the pump. The story of Torricelli's discovery has been often told and is well known to all, yet is always interesting to the young mechanic. A pump was being erected in Florence; it was deeper than ordinary, and commanded some little attention at the time. During their leisure hours, we can picture the intelligent young lads of that Italian city gathering around the new pump. When it came to be tried, for some reason the water would not come up. We may imagine all sorts of coaxing being resorted to, water poured in at the top to induce other water to follow, but to no purpose, and they were obliged at last to abandon it as a lost attempt. The great Galileo was consulted. He was now a man of mature age, and was considered the greatest man of his time. It is said that after consideration he gave it as his opinion that nature abhorred a vacuum up to a certain height only; but this, I consider, to be a very doubtful statement. The youth Torricelli, who was a favourite pupil of Galileo, did not feel satisfied. He possessed a clear intellect, and in farther reflecting over the matter, it occurred to him that the atmosphere might have something to do with it; that possibly when the pump was worked the air might thereby be exhausted, and that the surrounding atmosphere resting on the surface of the water in the well would thereby push up the water into the empty space in the pump. Still he had only a glimmering idea, when a most happy thought suggested itself. He said, "If the atmosphere has something to do with it, then mercury, which is 13½ times heavier than water, would not rise above 28 inches; if I fill a tube with mercury, having one end closed and the other open, then by immersing the open end in a cup containing that liquid, the mercury will not run out, but remain at a height in proportion to the weight of the atmosphere." The experiment was made, the mercury stood at nearly 29 inches; according to the laws which govern liquids it ought to run down. There must exist an enormous pressure equal to some 34 feet of water column, but by some agency was prevented from running down. What can prevent it from heaving up the liquid mercury in the cup? It must be the equally weighty atmosphere resting on the surface. It was afterwards ascertained that the atmosphere rests on the earth's surface with a pressure equal to 14·7 lbs. on every square inch. No sooner was the law of the atmospheric pressure discovered than it began to yield fruits. Up to this time there was no barometer, nor did Torricelli yet know that he had actually invented one. Before many months the rumour of the new theory reached France. It was the celebrated Pascal who, on hearing of the discovery and the inference deduced from it, made the remark that it might be put beyond all doubt by making the experiment beside a mountain, and, by proceeding up or down, the mercury would rise or fall as the column of air was decreased or diminished. The experiment was accordingly performed beside a mountain, and the result was exactly as had been anticipated. The world had now obtained its valuable instrument the barometer, and this again soon led to other results, and eventually to the invention of the steam engine, which, as originally constructed, was entirely dependant on the pressure of the atmosphere for its efficiency. Before two years the knowledge of the discovery had reached England. Among the first to hear of it was a noble youth, the Honourable Robert Boyle, who longed to make the acquaintance of Torricelli. He went to Italy, and was in time to see the last days of the great Galileo, who died in 1643. But the news of the discovery had spread into Germany. Otto de Querricke, the Consul of Magdeburg, is busy trying experiments with the well-known hemispheres, and is struggling with the invention of an air-pump for the purpose of exhausting them. These hemispheres, in their day, were a great invention, and rendered all the more interesting from the circumstance that it was by means of them that the attention of mankind was first drawn to some of the properties of air. The inventor, Otto de Querricke, had two hemispheres made, about a foot in diameter; he had no air-pump, but by some means managed to get out the air by first filling them with water, and then pumping it out, at the same time taking care to prevent air from getting in. It took the world by surprise. We read that the hemispheres were pressed together so powerfully that six of the emperor's horses were unable to separate them. By the experiments with the air-pump, Otto de Querricke discovered the elasticity of air, and added greatly to the world's store of knowledge regarding the whole subject. During these experiments, he was visited by Robert Boyle, who, by his ingenuity and perseverance, gave to the air-pump, that well-known form in which it has been handed down to us, with the exception of a few recent improvements.

Before twenty years these discoveries began to bear fruit in other directions, for, in a small town in Holland, in the year 1663, we find this knowledge of the pressure and elasticity of air being turned to practical account. At that time the Dutch were the great engineers of Europe, and occupied that place in engineering that we now hold. John Vander Heydon was a great engineer, with considerable practice in the erection of pumps, but, to his frequent disappointment, he found that when he had to give an intermittent motion to water there was constant danger of either breaking the pump or of bursting the pipes, arising from the non-elasticity of the water. Happening to hear of the Torricellian experiment, and also of the doings of Otto de Querricke, it now occurred to him that he could introduce an elastic cushion of air into the pipes, so that the immediate effect of the piston would be to compress the air, when the air by its elasticity would produce a constant stream of water outwards; this he carried out into practice, and it answered most admirably. Before he was aware, Vander Heydon had really invented the fire-extinguishing engine, and by the end of that year the first fire-engine was constructed, in which the discharge from the pumps went to compress the air in a central air-vessel, the elasticity of the air being the agent to send the continuous squirt of water outwards. Since that time the air-vessel has been applied to every extensive ramification of water-pipes, but the world should not forget that the first idea in modern times belongs to Vander Heydon. I have said modern times, because that great man Hero, of Alexandria, 120 years B.C., had a fountain in his courtyard, constructed on a similar principle.

In this hurried and most inadequate sketch, a feeble attempt has been made to show the relation that subsists between art and science in a small branch of applied mechanics, my chief object being to forward the teaching of the simple principles and laws of nature in every school, and to all the youths who are to become our future workmen, to let them know that there cannot be a practical result of any kind without a fundamental principle, and that before entering the workshop their

minds should be well grounded in the unalterable laws on which their work is founded. Such knowledge encourages the mind for practical duties, and prepares it for grappling with the multifarious questions that are continually arising, and will prevent them from falling into practical error.

The simple principles of the mechanical powers, which were so well known by Archimedes, have, by the perseverance of man, during many ages and in many countries, become the refined mechanism of our factories and workshops; yet, with all the profound sagacity of his mind, he did not perceive that such simple elements could admit of so many combinations and arrangements. Therefore, in our pursuit after the economic application of natural law, we must not overlook these other natural laws that may not seem now to bear so directly on our industrial operations. Time and study will adapt them all to some useful purpose, by the well-directed thought of a future Watt, or a Stephenson, or a Whitworth.

Proceedings of Institutions.

EXAMINATION PAPERS, 1869.

(*Continued from page 705.*)

The following are the Examination Papers set in the various subjects at the Final Examination held in April last:—

ALGEBRA.

THREE HOURS ALLOWED.

1. Multiply $a^3 - 7a^2 + 5a + 1$ by $2a^2 - 4a + 1$, and show that $a.\dfrac{x + a + \sqrt{x^2 - a^2}}{x + a - \sqrt{x^2 - a^2}} = x + \sqrt{x^2 - a^2}$.

2. Investigate a rule for finding the highest common divisor of two algebraical expressions.

Simplify the fraction

$$\frac{x^7 - 3x^6 + x^5 - 4x^2 + 12x - 4}{2x^4 - 6x^3 + 3x^2 - 3x + 1}$$

3. Show that, in the ordinary scale of notation, a number is divisible by 9 if the sum of its digits is divisible by 9.

4. Determine in what cases $x^n \pm y^n$ is divisible by $x \pm y$.

Find a factor which will rationalize $\sqrt[3]{2} + \sqrt{3}$

5. Solve the equations,

$$\frac{x + 7}{2} - \frac{x + 2}{3} - \frac{3x + 7}{12} = \tfrac{1}{4}$$

$$\left.\begin{aligned} x^2y + xy^2 &= 180 \\ x^3 + y^3 &= 189 \end{aligned}\right\}$$

6. If h be a root of the equation $ax^2 + bx + c = 0$, show that $ax^2 + bx + c$ is divisible exactly by $x - h$.

7. If $\dfrac{a}{b} = \dfrac{c}{d}$, and $\dfrac{m}{n} = \dfrac{p}{q}$, prove that $\dfrac{ma + nb}{ma - nb} = \dfrac{pc + qd}{pc - qd}$ Show that, if any number of fractions be equal, each is equal the nth root of the fraction of which the numerator is the sum of any multiples of the nth powers of the numerators, and the denominator the sum of the same multiples of the nth powers of the denominators.

8. Show how to insert n harmonic means between a and b.

9. Prove that the number of combinations of n things taken r together is the same as the number taken $n - r$ together.

10. Write down the rth term of $(a - x)^n$

What term of $(1 + x)^{-\frac{1}{2}}$ is equal to thirteen times the same term of $(1 - x)^{\frac{1}{2}}$?

11. A man has a capital of £A, which he invests at r per cent., and every year he spends £a. What will be his capital at the end of n years, supposing him to invest any overplus he may have at the end of each year at the same rate per cent?

12. Determine the series of which the sum of n terms is n^2.

Find also the sum of the squares of n terms of the preceding series.

13. Given p the probability of an event happening in one trial, find the probability of its happening r times exactly in n trials.

GEOMETRY.

THREE HOURS ALLOWED.

To obtain a first-class certificate at least six problems and four propositions must be correctly done; and to obtain a second-class, four problems and six propositions.

1. Define *right angle, circle, square, parallel lines.* What is an axiom? a *Postulate?* Write down Euclid's XIIth Axiom. Why is it wanted?

2. If two triangles have two sides of the one equal to two sides of the other, each to each, and have likewise their bases equal; the angle which is contained by the two sides of the one shall be equal to the angle contained by the two sides equal to them, of the other.

3. If one side of a triangle be produced, the exterior angle is greater than either of the interior opposite angles.

Draw the figure for both cases.

4. If two triangles have two sides of the one equal to two sides of the other, each to each, but the angle contained by the two sides of one of them greater than the angle contained by the two sides equal to them, of the other; the base of that which has the greater angle, shall be greater than the base of the other.

5. If the square described upon one of the sides of a triangle, be equal to the squares described upon the other two sides of it; the angle contained by these two sides is a right angle.

6. Divide a given straight line into two parts, so that the rectangle contained by the whole and one of the parts, shall be equal to the square of the other part.

7. The diameter is the greatest straight line in a circle; and, of all others, that which is nearer to the centre is always greater than one more remote: and the greater is nearer to the centre than the less.

8. From a given circle cut off a segment, which shall contain an angle equal to a given rectilineal angle.

9. Describe a circle about a given triangle.

10. If the outward angle of a triangle made by producing one of its sides, be divided into two equal angles, by a straight line, which also cuts the base produced; the segments between the dividing line and the extremities of the base, have the same ratio which the other sides of the triangle have to one another: and conversely, if the segments of the base produced have the same ratio which the other sides of the triangle have; the straight line drawn from the vertex to the point of section divides the outward angle of the triangle into two equal angles.

11. In right-angled triangles, the rectilineal figure described upon the side opposite to the right angle, is equal to the similar and similarly described figures upon the sides containing the right angle.

12. Planes to which the same straight line is perpendicular, are parallel to one another.

13. If a solid angle be contained by three plane angles, any two of them are greater than the third.

PROBLEMS.

1. If the middle points of the sides of a triangle be joined, the triangle so formed is one-fourth of the original triangle.

2. If two sides of a triangle be given, the triangle will be greatest when they contain a right angle.

3. Divide an equilateral triangle into nine equal parts.

4. In any triangle the squares of the two sides are together double of the two squares of half the base, and

of the straight line joining its bisection with the opposite angle.

5. Three points being in the same plane, find a fourth point where lines drawn from the first three shall make given angles with one another.

6. Given a regular polygon, find another which shall have the same perimeter, but double the number of sides.

7. Show how to divide a given line in harmonical proportion.

8. The diagonals of a trapezium two of whose sides are parallel, cut one another in the same ratio.

9. Given the lengths of the three straight lines drawn from the angles of a triangle to the points of bisection of the opposite sides; construct the triangle.

10. If a circle be described about a triangle, and perpendiculars be drawn upon the sides from any point in the circumference; the three points of intersection are in the same straight line.

(*To be continued.*)

SANITARY PRINCIPLES OF COTTAGE IMPROVEMENT.

On Saturday, the 17th instant, Mr. Edwin Chadwick gave a "garden tea party" to the committee of the Ladies' Sanitary Association, to the Council of the Society of Arts, and to others interested in the sanitary improvement of dwellings, at his house at East Sheen, for the purpose of showing some new forms of construction, and especially for displaying a new mode of ventilating with air—both warm and fresh—invented by Capt. D. Galton, R.E., in a new model cottage, occupied as a gardener's lodge, attached to his house, on principles which were explained in an address. Amongst those present were the Earl of Shaftesbury, Sir P. Burrell, the Right Hon. W. Cowper, Henry Cole, Esq., C.B., Arthur Russell, Esq., M.P., George Melly, Esq., M.P., Frank McClean, Esq., C.E., Colonel Murray, R.E., George Godwin, Esq., F.R.S., Professor Owen, Dr. Farr, Dr. Sutherland, Dr. Aldis, Dr. Garth Wilkinson, J. Rendle, Esq., Hyde Clarke, Esq., J. Bell, Esq., the Secretary, and the Assistant Secretary of the Society of Arts; the Hon. Mrs. Cowper, Madame Bunsen, Miss Geraldine Jewsbury, Miss Mary Macaulay, and Miss Griffiths, the Secretary of the Ladies' Sanitary Association. The Dukes of Buccleuch and Devonshire, and Lords Fortescue, Stanley, Cawdor, Northbrook, and Ebury sent letters expressive of regret that previous engagements prevented their being present on the occasion.

Mr. Chadwick addressed the company, as they were seated in the garden, as follows:—My Lord, Ladies, and Gentlemen,—I shall have difficulty in conveying, within any compass, for this occasion, my sense of the great importance of the rising movement which may be aided by the principles of the construction of the very humble-looking little cottage to which I have besought the honour of your visit. The sanitary object attainable by the improvement of the dwellings of the wage-classes is no less than a reduction of nearly half the prevalent premature disability from sickness, and half their mortality, which is proved to be due to the conditions in and about their dwellings, including over-crowding. The Society of Arts has promoted new arts, such, recently, as pisciculture and oyster-culture, which are being earnestly pursued, with a special solicitude as to the habitats of the creatures as the chief means; and it may really befittingly promote, as a new or as a neglected art, on which the progress of other arts must depend, puericulture, for which earnest solicitude as to the habitat is also needed, and for the result of which there is great promise; for we have had of late, from medical officers and heads of establishments, evidence that is consolatory for past efforts of sanitary improvement, displayed in district orphan asylums of the metropolis—most striking to those who have visited them, as I have done, after lapses of time; that as the common lodging-houses have been regulated under Lord Shaftesbury's Act, and the low courts and dwellings—former fever-nests—from which these orphan and destitute children chiefly come, have been improved by rudimentary measures of a sanitary police, the type of children has been improved; they become less ugly, and ferocious, and repulsive in their aspect, and the school teachers attest that they are less difficult to teach and to train industrially. In this view of the mental and moral, as well as the physical improvement of the population, I may, I hope, suggest to the noble ladies of the Sanitary Association that the principles in question have, moreover, claims upon them in respect to the extension of an improved order of marriages, and the reduction of a demoralising celibacy amongst the wage-classes; for, of the million and a-quarter of men of the marriageable ages who remain single, has it been seriously considered how many are withheld from marriage by the want of befitting homes;—how many are deterred by having only places presented to them which are dark and filthy, deprived of due light and air (yet dear) to which they could take a wife;—how many are deterred by the aspect of squalid misery they witness on the part of the married, of whom, in Manchester, Liverpool, and Glasgow, even in times of prosperity, large proportions are born only to die, and of all born one-half, as Dr. Farr's dire records show, are in their graves before their fifth year? Of a sound, well-trained, industrial, self-supporting, and productive population, I assert as an economist, that notwithstanding the present depression of the labour market, our country needs more population, especially to supply the increasing claim by emigration, which is commonly of our best population, leaving behind larger proportions of the dependent, the pauperised, and the worst. But practical sanitary science affords brighter prospects. Large aggregations of orphan and destitute children in the institutions, such as those to which I have referred, were formerly, notwithstanding high dietaries, the seats of devastating epidemics; but now, with clean air, clean persons, and clean constructions—with yet much to do—these same institutions have become sanitary standards, with death-rates less than one-fifth of those prevalent amongst children of the same ages of the general population. My confident belief is that, by the rudimentary sanitary principles and practical sanitary art, to which I would now solicit your attention, as applied in the model cottage you will see, the death-rate amongst children and the common insurable disability to work on the part of adults may be reduced to one-third of what it now is. In various model dwellings the death-rates have been reduced by about one-third, but, unhappily, with economical results which do not encourage, and, indeed, rather discourage, imitation. By the application of the principles of construction you will see displayed, I have a confident expectation that the greatest reduction may be effected, with a better promise of a "commercial return." The great sanitary evil to be contended against in the cottage and house site and the habitat for puericulture is damp, which lowers temperature and lowers strength; generates painful diseases—rheumatism—and, lowering strength, predisposes to all other passing causes of disease, and especially to consumption. The first article to be insisted upon in a sanitary specification is, that by drainage of the site if it be necessary, "the water-table shall be lowered not less than three feet below the surface." Throughout the country it has been of late observed that a diminution of consumption has followed good subsoil drainage works. In this particular instance, the site being a deep gravel, in which the water-table is several feet below that minimum, there was no necessity for this precaution. My first condition of a sanitary preparation, as respects the construction of the house itself, is "that the flooring shall be impervious to rising wet, the walls to driving wet, and the roofing to falling wet or to snow, and that they shall be absolutely damp-proof." As illustrative of the conditions of the common constructions, I may here

mention that the common bricks of which cottages are made, absorb as much as a pint or a pound of water. Supposing the external walls of an ordinary cottage to be one brick thick, and to consist of 12,000 bricks, they will be capable of holding 1,500 gallons or 6½ tons of water, when saturated fully, which they sometimes are. To evaporate that quantity of water would require nearly a ton of coal well applied. These bricks give off their moisture slowly. It is unsafe to inhabit, in less than nine months or a year, the houses constructed of the common materials; and almost a double death-rate has attended recently the occupation of a brick-built model dwelling. When I examined, as a reporter, the model dwellings built at Paris by the Emperor, I found the appearances of damp on some of them that had been built two years. The *concierge* who showed one block had her head bound up, and was suffering from an attack of rheumatism, connected with the dampness of the houses. The Empress has since paid attention to the subject, as I am informed and I hope, with better effect. But it is proper to mention, as showing how little is to be expected, not merely from architectural science as it is, but from curative science when uncombined with preventive or sanitary science in construction, and also as showing that the poor are not the only persons who suffer, that the medical officers at the recently-constructed hospital at Netley have been afflicted with rheumatic fever, arising from the excessive dampness of the brick construction of their quarters. Some military officers' quarters, constructed chiefly, I believe, of stone not long ago at Dover by an eminent civil architect—which is often as bad as brick—were, I am assured, so damp, that it was found to be impossible to occupy them, though they had cost one thousand pounds each. A gallant friend, who the other day examined the cottage I shall show to you, exclaimed, "What superior officers' quarters such cottages would make," though they would cost one-tenth the sum expended on the damp construction at Dover. I think it right to mention these things in illustration of the common state of information on the question. The opportunity of my constructing a model cottage, as I may call it, arose from the need of erecting a new lodge for my gardener and his mother, in lieu of one enlarged from a two-room to a three-room cottage, built by my predecessor as tenant to this house—my learned friend, the Hon. Adolphus Liddell. He is a man, as everyone who knows him is aware, of solid virtues, who would be the last to do harm to any living creature. If he happily had had a ray of sanitary science, he would have been aware that in keeping the poor woman in that cottage he was victimising her, as happened, with rheumatism, from the damp brick floor and the damp walls and ceiling. His regret at what he unwittingly did to this poor old woman by the common error will be sharpened when he learns that it was at double the expense of the construction by which I trust she will now be relieved. Parliament has—in what shall I say—conferred great sanitary powers, not upon a Minister of Health, but of all men upon the Secretary of State for the Home Department, from whose visible occupation with other subjects you may see what is his power of attention to that subject. Now, it may be mentioned, as a point of observation for the Sanitary Commission now sitting, that his only adviser within the office, so far as I am aware, for the selection of sanitary officers and the exercise of very large sanitary powers must be, on very important questions for the health of populations, the permanent Under-Secretary of State, my predecessor here, the Hon. Adolphus Liddell, who, I should be glad to hope would find, amidst the multiplicity of his other duties, some small scrap of time to amend his deficiency of sanitary knowledge, of which his old lodge, which you may see here, may be presented as a monument. H.R.H. the late lamented Prince Consort, with whom I had correspondence on this question, accepted completely the principle of the dry, damp-proof construction, and endeavoured to apply it by hard-burned hollow bricks, glazed for interior wall facings. I undoubtedly consider that a construction of vitreous tiles or bricks the best possible, but for trade reasons, stated in my report on the exhibition of model dwellings at Paris, they are unattainable at present. The late Captain Fowke first directed my attention to concrete, as the most advantageous and the cheapest material available for cottage construction, and gave some specimens at the South Kensington Museum. Portland cement is a stronger material than Roman cement, and, as was shown at the International Exhibition, its use is extending throughout Europe. Those who wish to be informed particularly in relation to it will find all about it in the report of the Children's Employment Commissioners—that it originally imbibes less water than the common brick material, parts with it more rapidly, hardens and becomes utterly impermeable to water. My specification, "that the walls and ceilings shall be impermeable to water or damp," is complied with in this instance by the contractor, Mr. Nicoll, by the use of a new material for wall and roof construction, of which Portland cement concrete forms a part. You may imagine, as adopted for houses, the Crystal Palace principle of construction, with iron framing and bearers, but, instead of glass, opaque slabs, made of a web of straw compressed to about one-fourth the space of loose straw into a mat, which is spread over a framework of iron wire. Upon this compact web of straw, layers of hard bitumen are put on both sides. Over the bitumen is placed a layer of concrete. If the bitumen be of sufficient thickness and hardness, and properly spread, it appears impossible that wet can penetrate that walling; and although the outer layers of concrete might, if not well made, for a time, imbibe some portion of moisture, it could not pass through the bitumen. The straw, kept dry—and it should be kept completely dry,—by the bitumen—is, as we know, a non-conductor of heat, and the bitumen should be preserved in hot weather by the non-conducting power of the outer layer of concrete, which is also an entire non-conductor of damp. Mistakes have been made with the first attempts, in carrying the economy of the iron framing too far, and occasioning cracks in the roofs; but two years and a-half experience of a lodge on this principle of construction at South Kensington is very satisfactory. The next articles of a sanitary specification applicable to cottage construction are, "that the walling shall be washable," "that it shall be such as not to harbour vermin," and "that it shall be of a light, agreeable colour." It is a sanitary rule, as applicable to closely occupied dwellings, that the walls shall be cleansed at least once a-year, and some authorities have required that it shall be done at least four times a-year. To provide for lime washing it has been provided that the brick walls of the Peabody and other model dwellings shall be kept bare. At the Board of Health, at epidemic periods, when houses were struck with fever, we ordered the inmates to leave, and the houses to be cleansed. In some instances the orders were disobeyed, and fresh population came into the uncleansed houses, and they were attacked with fever, proving the deleterious quality of the deposit on the walls. The cost of lime-washing, as often as it is required to be repeated, is a serious tax. In hospital-construction the cost of the washable wall facings is often as much as ten shillings a superficial yard. You will see the sort of wall facings that have been given by Mr. Nicholl in the several rooms of the cottage at from one-tenth to one-twentieth of the hospital prices. The way in which the sanitary specification that the flooring shall be of a good non-conducting material, and be water-tight and damp proof, you will see is attained by squares of the cheaper wood laid upon a layer of bitumen. The occupant attests that this flooring, which you will see, is a great immediate improvement in comfort. So far as the shell of the cottage is concerned, it is submitted that it is an

improvement on the principle and the quality of construction upon the common dwellings. If the workmanship be good—and the contractor ought to be held to make good for a period of time all defaults from the sanitary specification—I do not see that the dilapidations will be greater, and I do believe they will be less, than in the common constructions. The contest is for reduction of price as well as for improvement in quality, and the economy may be achieved at the expense of stability, unless the point be guarded against, but, at the worst, I do not believe that the new construction can be so bad as the more common old one. Constructions in most forms of entire concrete walling appear to be better in quality, and may be lower in price, than brick, where good sand, or gravel, or other wall material is close at hand. But if the three-inch walls of this cottage construction have sufficiently good non-conducting power, or as good non-conducting power as the common nine-inch walls at the same price, they give an important gain in space. The cottage you will see has a gain of 564 cubic feet of interior space from three-inch instead of nine-inch walls; and, by having the entire space up to the roof, there is a gain of 720 cubic feet, or in all 1,284 feet more; that is to say, space such as in some constructions would be considered to suffice for two more persons. This is an undoubted gain for the next great point of a sanitary specification:—"That the ventilation shall be (that is to say in cold weather) with air that is warm as well as fresh." All common modes of cottage ventilation ventilate by cold air, and are almost invariably contended against by the inmates. The new method of ventilation, invented by Capt. Douglas Galton, R.E., by a fresh-air flue, in which the air is warmed, has been experimented upon in this country, and tried in a number of barracks. It has been tested by Dr. Park, of Netley, as to the hygrometrical condition of the warmed air, which he pronounces to be satisfactory, and he tells me that he intends to apply the principle to his own dwelling. It has also been carefully tested in many experiments in Paris, by General Morin, of the Institut, and, undoubtly, it is in principle a decided success. The soldiers in the barracks warmed by it declare that they are no longer, as heretofore, roasted in front whilst they are frozen behind. By this method the air may be changed three times an hour, or oftener; and nearly fifty per cent. of the chimney heat, now wasted, brought back into the room. Though the ventilation is, of course, the most active when the fire is alight, it was found, upon experiment, that from the continued warmth of the flues and the mass surrounding the flues, the change of air effected was considerable, even as late as six o'clock in the morning. The concrete is peculiarly adapted for the construction of tubular smoke and air flues at a cheap rate. This, as far as I am aware, is the first instance in which the important principle has been applied to a cottage, and until we have a winter experience, it cannot be pretended that the best adjustment of the fresh-air flue, and the means of warming it by the chimney flue, have been attained. According to General Morin, the ventilating chimney is a means of saving fifty per cent. of the coal consumed in domestic fires; and the estimated consumption of coals in our domestic fire-places is forty millions of coals annually. I commend to your notice a newer arrangement, by Mr. Nicoll, by which the same fire-place that gives radiant heat, and warming, and ventilation to the front room, keeps a boiler and an oven at work in the next. This is already reported, on trial by the housewife, to be a success. In conclusion, I may state for consideration another article of a sanitary specification, which will be realised here:—"That the complete construction of the house shall be such that if it be left clean, unoccupied, and closed for any time, it shall remain dry, free from any close, musty, or foul smell, and shall be immediately habitable, without the need of fires or of any special preparations for safe occupancy in winter or in summer." This cottage is detached, and unconnected with any system of sewers; and the plan in use here is a moveable pail under a seat, into which pail is to be put all the soap-suds, house-slops, &c., which serve to dilute excreta, the whole being removed daily, or before decomposition can commence, and deposited in a trench, or applied, at the discretion of the gardener, as liquified manure, the principle of the plan being to take the manure to the prepared soil, instead of bringing prepared soil to only a part of the house manure, as is the principle of the earth-closet system. Where the house is connected with a public system of sewerage, which, it is to be hoped, would be a self-cleansing system of sewers instead of sewers of deposit, which are only extended cesspools, the fundamental item of a sanitary specification, I take occasion to state, would be in the following terms:—"The house shall be provided with a water-closet on the syphon principle, so shaped, and so provided with water as to be effectually self-cleansing throughout, and to remove at once from beneath the premises all fæcal matter or waste water, and to be so trapped as to prevent the ingress of vitiated air from the sewer in the event of accidental stoppages, and to be at all times free from foul smells." Now, as to the cost of this cottage construction. My conclusion is that an improved cottage construction, on whatever principle, will be only obtainable when cottages become a manufacture (which is not yet), with the advantage of much machinery for the repetition of numbers. I think acknowledgments are due to Mr. Sharp, the architect, and to Mr. Nicoll, the contractor, for their steady efforts to reduce and to keep down prices. I am assured by them that detached cottages, such as the present specimen, with 4,800 cubic feet of internal capacity, may be repeated, in half a dozen at a time, for about one hundred pounds each; or, if a dozen cottages in a row (where it must be so, for I do not like cottages in rows) be taken of the same qualities, guaranteed damp-proof, but without decorations, at about eighty-five pounds each. These (apart from the present main question of quality and economy in use) are, as far as I know, important reductions in prices. To the members of the Ladies Sanitary Association, who do so much with little money, who have circulated such admirable tracts on the sanitary treatment of children and on domestic management, I respectfully commend the promulgation of sanitary principles for the improved construction of the people's homes. The first of these principles is the requirement, by specification, of dry foundations, of dry and warm floors, of perfectly damp-proof walls and ceilings, walls washable and fair to see, and means of ventilation with air that is warm as well as fresh, saving half the common consumption of fuel, and giving really comfortable homes. To my colleagues of the Council and to the members of the Society of Arts, I venture to commend the consideration of the perfectionment of the arts and appliances by which these several ends may be best attained for the poorest of the population.

After the delivery of this explanatory address, the party went to visit and examine the cottage. Time did not admit of any technical or professional discussion, and the company separated with general expressions of gratification to the host and hostess with the afternoon's proceedings.

We are requested by Mr. Chadwick to state that he will gladly allow the cottage to be shown to any member of the Society of Arts who has a special interest in the subject, and that he will be thankful for any suggestion of further improvements.

PATENTS AND PATENT LAWS.

By W. Bridges Adams.

The word "monopoly" is one of exceeding ill-odour with the great mass of the community, and to affix such

a name to patents is considered a very clever move on the part of their opponents. It catches the public ear, and the public is very apt to take things for granted that appear to conform to its interests. What is a monopoly? A privilege conferred upon special individuals, for their own advantage, to the disadvantage of the community. At first sight numerous private rights appear to be monopolies—land, mines, forests, rivers, the raw material of the world, which are the property of the whole human race, as tenants in common; and for individuals to possess and own them as private property is simply a concession granted, because they will produce a generally greater fruit by the process of individual enclosure than by a general scramble. The conversion of the raw material into useful forms, by the operation of the human brain and human hands, creates another kind of property, giving the raw material far greater value by mental and physical labour, labour which would not be given unless the owners could reap some of the fruits of it by an enclosure of the results of their own brains or hands as their own property. Origination of new and useful ideas and forms, producing something better and more useful than has been produced before, is the most valuable kind of labour, and therefore the world, in proportion as it becomes civilised, gives exclusive property, for a longer or shorter time, to the producers of the ideas, and goes still further in giving hereditary rights to long-continued industry.

Language is common property; but the author of a book, putting language into new forms in combination with ideas, is endowed with what is called "copyright" for a term of years, a monopoly, in short, for the reason that, without that monopoly, the books would not be produced, or only a very few books would be produced by a few wealthy and powerful persons; and the very title of the book is also a monopoly. Another person produces a picture which has a high value, and the right to reproduce that picture by engravings, or photographs, or other means, is reserved to him. Another produces new combinations of musical sound, and the multiplication of copies of this music is as much his own property as the original. Another produces a piece of sculpture, with the same results. Another produces a new design for furniture, or patterns for dress, or other manufacture, and that is as much his own, with the exclusive right to sell it entire or in copies, as though it were the corn and cattle of the farmer, or the fruit of the orchard owner, or the vegetables of the market-gardener.

This monopoly goes still further. The style and title of a firm is private property; and, as if to guard against the contingency of the same Christian and surname in combination being used for competition by a namesake, trade-marks were invented to ensure the monopoly, and every possible means are resorted to, to prevent a trader's individuality from being trenched on by his neighbours. Yet more, a proprietor of a newspaper, with no individuality, and who purchases all his wares ready made from other persons, has the exclusive right to a particular word or combination of words out of a dictionary, which, if he be the first to assume, no one can appropriate till he chooses to abandon his right.

Throughout all these things it is the right of property which the law jealously guards, mental or other. But for this law, a large mass of mankind would disguise themselves in their neighbours' likeness, to reap the profits accruing from their neighbours' reputation.

What are called patents are mental originations, multiplied in matter, and the law professes to confer on the originator the sole right to use and sell them to the public for the course of fourteen years. Some of these originations are very popular, and an enormous trade grows up, from which large profits accrue, and it is very commonly an article not of real importance to the welfare of the community that makes the largest profits; but whatever it may be, trade rivalry is excited, and any means are resorted to for evading the patent without payment to the inventor. Everything previously known in the trade is at the disposal of the rivals, but the Naboth's vineyard they covet is the new thing which the public prefer, either for its superiority or its cheapness, and which has been the production of the inventor's brain. So they set to work to defame him, to deny his originality, to call him a monopolist, to decry his invention, to try to evade it by inferior methods, and, finally, to take advantage of inefficient laws to plunge him into costly trials that may ruin him and put the invention out of use, if they cannot appropriate it to themselves without paying anything for the cost of its production.

A few years back, an attempt was made to decry and abolish patents at the meeting of the British Association, and now once more an attempt is making to obtain a huge monopoly, under pretext of abolishing another—not a monopoly as of old in the case of the corn-laws, for the benefit of landlords or landowners, but for the supposed benefit of trade-lords and capitalists generally. Large manufacturers, material converters, and similar people, desire to get the use of brains without paying for them, or to keep things as they are. It is not a case of patentees against the community, as their opponents endeavour to make out, but a case for the community itself, as interested in progress, against wealthy traders who would keep down all progress, if by so doing they could keep up their own profits. It is the case of the community, in behalf of the active brains that work for them with mental capital, and without material capital, against the dull and inert brains with material capital in masses, which at present, stimulated into competition by the restless brains around them, lead an uneasy life, and would fain become the slaveholders of the active brains, and prescribe limits to their labours under their own control, and for their own imaginary benefit. It is an attempt to create an hereditary trade aristocracy by taking away the fulcrum through which clear brains rise into the possession of material capital, and their owners elbow the inert rich from their seats. And, not uncommonly, it is those who have grown rich upon patents who are the most strenuous opponents of other men's patents.

The common ground of opposition is that patents impede progress. If they did, that would be sufficient reason for their abolition. But assertion is not demonstration. It is asserted that the patent is a monopoly which no one but the owner can use. Quite true; but so is land a monopoly which no one but the owner can use, the difference being that the patent is a monopoly for fourteen years, and the land for ever. The patent is a fourteen years' monopoly of individual brainwork, the land monopoly is that of the material works of the Creator. If the land were the property of the State, the rentals would belong to the general community as a tax-fund, and the community gives it to individuals on the supposition that they will manage it better for the general benefit of the community than the State could, the rental being the payment for their trouble. The patent is a limited property, the land is an unlimited property, both conferred by the community, and capable of resumption if demonstrated to be mischievous to the community.

The brain-worker can only, in the case of patents, operate by the agency of matter, the property of the landlord, who exacts a large share of the brain-work in return for the use of the matter. But the brain-working patentee has no monopoly. He is exposed to the competition of all others using the landlord's matter, or the materials of the Creator, save in the patentee's particular mode. And no sooner has he achieved a success, than other inventors are immediately at work to eclipse him, to the benefit and advantage of the public; and it is notorious that, even in the case of a successful invention not superseded by another improvement, commonly half the fourteen years' term expires before an invention is brought even into limited use.

The large manufacturer has his choice of patents by competition amongst brains, saying nothing of the stored-

up records of lapsed patents at the Patent-office, which he rarely has recourse to, save to compete with, and defeat, something new, which a rival manufacturer has produced under a patent, and turned to profit. It is well known that few manufacturers will embark in new things without the protection of a patent, for the reason that money must be expended experimentally, and that rivals lie in ambush to reap the profits in competition, without outlay, and consequently can undersell the originator, and for this reason the records of lapsed patents in the Patent-office are not resorted to, but remain dead letters.

It has been sought to make a distinction between copyright and patent-right. There is none; they are alike, in their integrity, original emanations of the human mind, and we may be quite sure that the abolition of patents would soon be followed by the abolition of copyright in books or works of art. Copyright in designs is copyright in a representation. Patent-right is copyright in form, and utility, and methods of production; whether brain imagination be multiplied in printed books, or in music, or in engraving, or artistry, or design, or theatrical exhibitions or shows, or stamped on matter under what are called patents, it is the same process of expressing mind in matter as an origination; and as the originators are comparatively few in number, it is desirable to cultivate them, and give them enclosures of mental domains wherein to have free scope for the exercise of their various arts, for precisely the same reasons that the enclosures and private ownership of land—a common property—is granted to the producers of food, and for other purposes.

It is simply the system of bad laws to which all the evils of patents are traceable. There was a time when, amongst the manufactures of printed fabrics, all new designs were kept secret as far as possible till the moment of issue, and all were busy bribing, or trying to bribe, their neighbours' designers. The Act for Copyright in Designs abolished this system of piracy, and with it the secrecy. Were patents abolished, one of the results would be a return to secrecy in all small things, a closing of manufactories against inspection, and a general dearth of information to mechanical periodicals, while improvements, involving a large outlay of capital, would cease to be made, unless perchance in government establishments.

If the spread of knowledge be a national advantage, the inducement to secrecy by the abolition of the patent —OPEN—would be a serious evil.

Amongst the reasons alleged for the abolition of patents, one is, that the patentees gain no advantage—being ruined by opposition and lawsuits in case of the invention being successful.

This is the greatest farce of all, as if land property would be safer than brain property, were it protected by as bad and inefficient laws as patents are subjected to, and as if there were any difficulty in making as efficient laws for patents as for books and designs, were only influential men interested in bringing them to pass, and lawyers not interested against them.

Another allegation is, that the great mass of modern patents are useless. If they are useless they need not be coveted. If impedimental, they certainly must supply something useful. But it is again alleged that they are frivolous. But is not trade itself widely frivolous? Yet what merchant is there who despises anything frivolous, provided only large profit be mixed up with it? What is more frivolous than the majority of theatrical farces, yet what is there more carefully guarded against piracy? But, say the objectors, patents are granted for things not new, and merely serve as an excuse for lawsuits. That simply means that the law and practice have not yet been fitly established. Some say that patents are becoming so numerous that they cannot keep count of them, and so unwittingly infringe them. This is not logical. The patentee might as well object, "The great manufacturers make so many new things without giving me notice, that I cannot keep count as to my originality." This complaint on the part of manufacturers only proves that they manage their business badly. It is surely part of the business of a great manufacturer to know of everything produced in his special art, and, therefore, he should keep a book of patents as regularly as his price-list, with a managing clerk to it. He can, at small cost, have all the specifications in his trade supplied to him as fast as they come out, and he can index them and mark out all the real novelties and utilities, and put them to use by agreement with the owner. It is said that every British subject is bound to know all the laws, or take the consequence of breaking them, and certainly a British manufacturer is bound to know all the patents in his trade as part of his business.

All existing knowledge and manufacturing experience up to the present time is the joint property of the whole nation, less certain things protected by patents expiring in fourteen years. But these patents are the "Naboth's vineyard," coveted by the lords of trade.

But they may fairly say that amongst the numerous patents there are many fictitious ones, involving lawsuits, and thus deterring them from the use of what is really common stock. That is to say, the patent-laws are bad laws, so bad, that were all laws equally bad, the nation would be in a condition of anarchy. To abolish the patents instead of to reform the law would be a precedent upon which we might abolish all laws.

Let us begin at the beginning. Patents are virtually granted for something new and useful, thereby to teach the public, and the reward for such teaching is a fourteen years' exclusive right. What, then, is novelty?" There is nothing new under the sun, absolutely. The patent is really granted for something new to the existing generation, as an inducement for a skilled man to bring it into use. The title should, therefore, be put on a similar footing to that of land. A piece of unowned land, unclaimed for thirty years, becomes the property of whoever may occupy it, and for ever. Therefore, supposing patents to be in the interest of progress, absence of public use for thirty years should constitute a claim to anything useful as a novelty for fourteen years, or such time as might be deemed equitable.

Everybody of legal age should be competent to apply for and obtain a patent, but as any preliminary examination and refusal might involve an accusation of nepotism or a contingency of error, not afterwards to be amended, it is desirable that protection should be granted, if desired by the applicant, after pointing out to him the defects; and that the specification, after completion, should be put on open, not secret trial, by a competent judge in the presence of the patentee, and the original fees should cover this cost. It is not desirable that a model should be put in at first, as involving the employment of workmen and the risk of discovery before protection is granted; and models being expensive, it is not fair to encumber the patentee with costs.

The affirmation of the patent by the court should facilitate all further litigation as to title and right, the court itself taking the initiative, or acting at the instance of a complainant.

Pecuniary damages should be dealt with by a magistrate, as in the case of copyrights, or by the ordinary courts of law.

Fictitious patents abolished by the court would cease to be a nuisance in the hands of sharking pretenders. There are very few patents requiring deep thought to apprehend them when produced, or any length of time when legal quibbling is abolished.

An inventor should not be bound to license other persons, for the reason that they might be rivals, only taking a licence in order to damage his invention in public reputation. If an unreasonable man, he would damage himself by limiting the use. If a manufacturer, he might be interested in selling at the lowest price without royalty profit, and thus as a small capitalist he might compete with great capitalists by securing the trade in a better article.

If the invention were a small item in a large machine, and the inventor required an unreasonable royalty, that would simply be a stimulus to other inventors to make other improvements, and this would be clearly in the interest of the public.

In cases where the subject of a patent has been in private use previous to the specification, unknown to the patentee, it would become a question for the court to decide as to whether the public had been kept out of the knowledge furnished by the patentee, and, if so, the patent should be confirmed, subject to the use of the first user, but without giving to him the right to license earned by the patentee by his publication.

No excuse of ignorance of a patent should be admitted as a plea or mitigation of infringement, because, with the full means of obtaining the records of the Patent-office, the ignorance must arise either from wilfulness or negligence.

Patents are the Magna Charta of the material progress of a nation, by the agency of the rich brains of men, poor in practical capital, who can mould matter to man's uses after new and useful fashions, just as copyright is the Magna Charta of the nation's progress by the agency of men of rich brains who can mould language to men's uses after new and useful fashions. When laws shall be made to take away this charter and throw brains into common stock, one of the sources of England's eminence, her true equality, will have departed from us, and the trade lords will find that their vitality has departed with it. They will compete with each other with increasing competition and lowering profits, till their trade becomes as wild land, which no one cares to cultivate. They will then find that the fourteen years' mental enclosure, which induces men of thought to bring forth new things, is also one of the processes essential to profit, and that by abolishing it they "kill the goose which lays the golden eggs."

Trade-marks are the legitimate arms and quarterings of a trade aristocracy, guarantees of honesty in execution, and which become valueless as a manufacture becomes debased. They are monopolies in one sense, as they enable the owners to keep to themselves a large trade so long as they keep up their character, and the law now jealously deals with their infringers. The patent is also a trade-mark exclusive for fourteen years, enabling the owner to establish a reputation for originality and improvement, and to keep his reputation when thrown into competition with rivals. And with patents confined to the owners of manufactories, that would simply be establishing a caste of veritable monopolists.

The question has been dealt with thus far simply in the interest of the public, regarding the inventor merely as a part of the public. But the true inventors are more than this—they are a select body of students, who foresee those things that the manufacturing men of routine pass by blindfolded, and thus stir them up to action; and the public is deeply interested in caring for these men, and guarding their interests as their own. From the trade point of view, the mere manufacturer only looks to the profit per-centage attainable by the conversion of raw material into wrought, and would work up the whole raw material of the land, and afterwards throw it into the sea, if realising the per-centage thereby. It is this class of men that deteriorates our national manufactures in money competition, that makes rails as brittle as cast-iron, and delights in shoddy, that has no perception of, or care for progress, but only for money.

It is not thus that the greatness of England has grown; nor is it of the highest importance that inventors should reap enormous fortunes, albeit trifling in proportion to the gain to the general community; but it is desirable that they should be in the unanxious position requisite for the most advantageous pursuit of their studies and experiments, as a result of their own labours.

The nation in which all classes of its people can rise in succession, according to their faculties and cultivation, from the lowest position to the highest, must ever be more powerful than a nation of castes, and a nation without laws efficiently protecting mental as well as physical property must degenerate into a land of castes—or robbers.

There is yet another allegation on the part of opponents of patents. Having to pay a royalty in England, other nations paying no royalty can undersell them. It is scarcely so, for other nations are as desirous of having patents as English people are. Of the two republics, America and Switzerland, the former abounds with patents, the latter has none. The reason is, that in the former case they are a function of the Federal government, in the latter of every separate canton, rendering patents a practical impossibility. But citizens of Switzerland expatriate themselves, and get patents here and elsewhere, and it is probable that the patent branch of legislation will be transferred to the Federal government, and Switzerland will cease to be an exception to other civilised states.

With a climate and condition like that of England, where workmen live longer and do more days' work in every year than in most other countries, it is impossible that she should be undersold in her indigenous manufactures, so long as her materials shall endure. Capital embarked in the growth and training of a workman is profitable in proportion to the length of his working life, and the faithful and honest work produced.

The assumption that every patentee only forestalls a number of other persons, who would have discovered or planned the same thing, may or may not be true, but this does not concern the public. What the public want is individuals who will work, and teach in the best mode he can, something new and useful; and daily experience tells us that such individuals cannot be obtained save on the condition of thereby obtaining a specific sphere of action involving their own benefit as well as that of the public. Let any one try if, by simply publishing a new and useful thing, he can get it taken up unless he can offer an exclusive right with it. Neither is there any probability in the assumption that all the principles of action have been discovered, and that the details are in every one's hands. The tree of universal knowledge is yet far from from having been plucked, and it is to be desired that the men of science, as well as the men of practice, should be not only recognised but rewarded, as the benefactors of the community—not rewarded, as M. Chevalier proposed, by the State, but by the community. We do not want political inventors, with a government reward as a compensation for something other than an invention, and with their own friends to apportion it. We want for them the only true appreciator, the public.

There is no difficulty in remedying all the evils complained of in the present practice of patents. Forms of specifications can be prepared, embodying everything that is required to be stated, leaving no loopholes, and preventing verbiage, giving an exclusive privilege to make something useful, and leaving it open to competition to make something still better. The life of the inventor patentee is no lazy life. He has the public for a master, and a very exacting master too, content with nothing but the best or the cheapest, and ever ready to abandon its idol of to-day for its idol of to-morrow, succeeding each other in constant following. What do the long list of patents in the same arts mean, save that the human brain works only from step to step, eclipsing yesterday by to-day, and thus preparing the way for the morrow, a 'vantage ground being gradually attained, till the process culminates in an apparent perfection, at last found to be no perfection, when a fresh start is made to a new elevation. By the sweat of the brain within his brow the inventor diminishes human labour and the sweat of many brows, for his only profit is out of the service he renders to mankind, who will not pay for anything they do not appreciate as useful or pleasant. No State reward is needed as a stimulus to this kind of labour. The inventor only asks to be let alone to reap the crops he has himself sown, secure against depredation.

It was Prince Albert by whom the amended Patent Law, then being worked at by the Society of Arts, was finally urged, and it was Lord Granville who brought in the Bill and passed it through Parliament, in the course of a very few days, because it was believed that only thus could a number of latent inventors amongst mechanical men be brought to light for the benefit of the Great Exhibition. It was this Bill which, by reducing first cost, multiplied the number of patents, and put poor men more on a level with capitalists. And it would appear that non-inventive capitalists would rather be without these patentees, and would prefer to buy up their inventions for their own purposes, and so limit the public choice in the market. Patents give a large market for constant improvements, which would not exist without them. All the large manufacturing towns and cities of England may be said to be built upon patents, and were patents abolished, the result would be similar to that of the abolition of the Edict of Nantes; the imaginative brains would depart from England, and settle down in the countries wise enough to understand their true interests. Viewed from the monopoly point, the wisest course the manufacturers could take would be, not to abolish patents, but to enhance their cost. If patents cost £5,000 each, with efficient laws to maintain them, every poor man would be shut out, and patents would become the practical monopoly that the manufacturers insist on calling them. But the motive would thus be too gross.

The subject cannot be too widely discussed, nor the facts elicited too clearly, for we cannot as a nation afford to risk our prosperity in order that a small number may grow richer at the general cost. We want a general diffusion of wealth, and not a greater aggregation in masses. Large manufactures tend to the growth of quantity rather than quality. Small manufacturers tend to the growth of quality, and that diffusion of wealth so largely trenched on of late by the gigantic establishments which permit only two classes, the very rich and the very poor. The higher classes, living on incomes, the result of land or hoarded wealth, are deeply interested in the question, for it is a question of property right; and in the diffusion of property rather than in its concentration lies its safety. The convenience or profits of manufacturers is but a small consideration, as well as the convenience or profits of inventors. The national prosperity is the real question at issue. Shrewd Frenchmen tells us that we began patents some fifty years before them, and, therefore, they have never been able to overtake us. Were we now to abolish patents for fifty years, our human energy would be expended in producing original workers for all other nations, and excluding our own.

Patents.

From Commissioners of Patents' Journal, July 23.

Grants of Provisional Protection.

Ammonia, generation and treatment of—2116—I. Baggs.
Animal and vegetable substances, preserving—2028—G. Buchanan.
Artesian wells, application of pumps to—2105—C. Chapman.
Bedsteads, &c., knobs for—2078—T. Kendrick.
Boilers—2051—W. Arnold and W. Carnelley.
Boilers, &c.—1716—J. Stewart and T. Charlton.
Boot and shoe scrapers—2043—F. Walton.
Breakwaters, &c—2074—J. W. Jackson.
Cartridge boxes—2099—C. Mertens.
Cartridges, &c.—2076—C. E. Brooman.
Casks, preventing waste of liquids in filling—2041—D. Cope.
Cast-iron, converting into forgeable steel—2108—C. P. E. Roche.
Cotton, &c., machinery for preparing and spinning—2100—E. Pettitt.
Dovetails, machinery for cutting—2049—J. Robinson.
Electric currents, apparatus for producing—2062—I. L. Pulvermacher.
Fabrics, finishing fibrous and textile—2082—S. Read.
Fabrics, &c., drying, airing, and warming—2085—J. Bannehr and H. Matthews.
Fire-arms—1992—T. Jones.
Fire-arms, breech-loading—2115—J. Barnett.
Fire-arms, &c., breech-loading—2071—F. J. Manceaux.
Fish hooks—2061—I. Williams and R. C. H. Wallendahl.
Food, &c., treating certain substances for—2092—J. Dewar.
Grain, cleansing—2098—C. D. Abel.
Heating apparatus—2114—S. E. Crispe and J. West.
Horse shoes—2084—J. B. Couper, jun.
Horse shoes, machine for manufacturing—2088—W. R. Lake.
Iron and steel—2047—R. Mallet.
Kitchen cart to be used for military and other purposes—2080—C. L. Caldesi.
Lamps—2067—J. H. Jones.
Lamps—2070—G. A. Nowell.
Letter boxes, &c.—2093—C. A. Bates.
Looms—2068—M. A. Muir and J. McIlwham.
Marquetry, &c., producing—2087—W. R. Lake.
Match boxes, &c.—2055—R. P. Faucheux.
Moneys, coins, and medals, manufacturing—755—J. M. Napier.
Motive-power, obtaining—2069—J. Aitken.
Mowing and reaping machines—2112—A. V. Newton.
Paper, beating engines employed in the manufacture of—2123—J. W. Reid.
Paper-making machinery—2111—R. Craig.
Phosphorus, utilising the residual sulphate of lime produced in the manufacture of—2101—J. H. Player.
Pumps—2081—J. Beard.
Railway level-crossing and other gates—2066—F. Baker.
Railways—2060—T. Knowles.
Reaping and mowing machines—2057—J. G. Rollins.
Rick stands, iron vermin-proof—2096—W. Bayliss.
Shafting and gearing, couplings and wheels for—2091—Q. Dunlop, T. J. Martin, and W. Orr.
Shaving mugs—2058—J. Wright.
Ships' sails—2109—W. P. Bain.
Speaking pipes—2094—E. Sutton.
Speaking tubes, &c., spring-stopper for closing mouth-piece of—2124—J. Leetch.
Squares for finding the centres of circles, &c.—2056—C. S. Berthon.
Steam-engines, boilers, and furnaces—2083—J. S. Crosland.
Stoves or fire-places—2120—T. Richards.
Submarine cables, appliances for finding and for picking up—2121—R. Willcox.
Sulphuric acid, recovering nitric acid in the manufacture of—2077—J. Gessert.
Surface condensers and refrigerators—2097—J. Henderson.
White lead—2102—W. R. Lake.
Windlasses—1905—W. Clarke and E. Walker.
Wood-sawing machinery, &c.—2090—W. R. Lake.

Inventions with Complete Specifications Filed.

Artificial fuel, &c., moulding—2195—S. Hall.
Blasting, and apparatus employed therein—2166—J. H. Johnson.
Blotter or ink absorber—2179—V. E. Mauger.
Fire-bars—2155—P. Murray.
Pianoforte bridges—2119—J. A. Horlick.
Pianoforte hammers—2118—J. A. Horlick.

Patents Sealed.

226. R. G. Lowndes and M. M. Callum.	273. J. Box.
229. J. Carr.	278. J. Pickering.
241. J. Wilson.	307. J. A. Limbert.
243. W. R. Lake.	317. A. E. Harris.
252. T. Vaughan & J. W. Smith.	332. C. E. Brooman.
253. H. Barcroft.	374. H. A. Bonneville.
256. J. H. Johnson.	399. L. A. C. St. P. de Sinçay.
261. C. Lungley.	558. A. Jobson.
262. A. C. Pass.	637. J. Townsend and P. Forbes.
266. W. Brown and T. H. Garbutt.	1075. G. D. Hughes and A. H. Sellers.
	1469. J. Townsend and P. Forbes.

From Commissioners of Patents' Journal, July 27.

Patents Sealed.

270. R. Blackbee.	428. G. A. Nowell.
272. L. P. Hébert and L. A. Moulin.	432. B. P. Stockman.
276. G. Hawksley.	477. F. Walton.
280. J. McDonald.	699. J. P. Budd.
289. T. Whimster.	728. T. Obach.
302. A. S. Andrews.	737. F. O. Palmer.
319. W. A. Smith.	781. J. and W. Thomlinson.
320. J. Bird.	820. J. Ramsbottom.
330. C. D. Abel.	914. C. Marsden.
340. H. and J. Bryceson and T. H. Morten.	928. N. Voice.
347. R. W. Knowles and G. Green.	1036. A. Helwig.
389. H. J. Richman.	1167. J. Vivian.
390. F. Jenkin.	1351. R. Saunders.
408. W. Hilton.	1360. F. W. Kaselowsky.
418. G. Broadhurst and J. Kershaw.	1551. J. Langham.
	1554. A. J. Dudgeon.
	1591. L. J. Crossley & R. Hanson.
	1694. J. A. Bindley.
	1730. G. W. Ley.

Patents on which the Stamp Duty of £50 has been paid.

1890. H. Trotman.	1965. T. and J. Bibby.
1906. E. Leigh, H. T. Palmer, and W. E. Whitehead.	1912. G. T. Bousfield.
	1957. J. Phillips-Smith.
1935. J. Vavasseur.	1968. J. A. Birkbeck.
1948. W. Weldon.	1982. J. Robinson
1953. J. Orr.	1941. H. A. Bonneville.

Patents on which the Stamp Duty of £100 has been Paid.

2956. M. and R. M. Merryweather and E. Field.	2130. W. Spence.
	2108. W. Clark.

Journal of the Society of Arts.

FRIDAY, AUGUST 6, 1869.

Announcements by the Council.

Examinations, 1870.

The Council have this year decided to remove from the Programme those subjects in which the Science and Art Department holds examinations, which, it appears, are now largely taken advantage of by the same class of persons (and very often by the same individuals) as those who sit at the Society's examinations. The following subjects will therefore not appear in the programme for 1870 :—

Algebra.	Light and Heat.
Geometry.	Chemistry.
Trigonometry.	Mining and Metallurgy.
Conic Sections.	Botany.
Navigation, &c.	Animal Physiology.
Principles of Mechanics.	Free-hand Drawing.
Practical Mechanics.	Practical Geometry.
Magnetism, Electricity, &c.	Mechanical Drawing.

Owing to a prize of £5 having been kindly offered by Earl Fortescue, President of the British Branch of the International Decimal Association, the subject of the Metrical System will be retained.

The programme is now in preparation, and will include some further modifications in the system, but the above, being by far the most important, are announced at the earliest opportunity.

Improved Cabs.

The Council of the Society of Arts offer the following medals for improved hackney carriages specially suited to the metropolis :—

The Society's Gold Medal for the best and most convenient open hackney carriage for two persons.

The Society's Silver Medal for the second-best ditto.

The Society's Gold Medal for the best and most convenient closed hackney carriage for two persons.

The Society's Silver Medal for the second-best ditto.

The Society's Gold Medal for the best and most convenient hackney carriage for four persons, either open or closed, or both.

The Society's Silver Medal for the second-best ditto.

Lightness of construction, combined with adequate strength and durability, will be especially considered in making the awards.

The awards will be made after actual trials of the carriages extending over a certain period.

Communications describing the carriages must be sent to the Secretary of the Society of Arts before the 1st January, 1870, the carriages to be sent to a place hereafter to be appointed.

The Council also offer the Society's Silver Medal for the best instrument, to be affixed to a cab or other hackney carriage, for indicating the fare as between the passenger and the driver, whether by registering the distance travelled or otherwise, and which instrument shall also indicate, for the convenience of the cab-owner and of the driver, the total distance travelled during the day and the total amount earned. The instruments competing, with full descriptions of their construction, to be sent to the Society's House before the 1st January, 1870.

Competitors may, at their option, sign their communications, or may forward with them sealed letters containing the name and address of the writer.

The Council reserve to themselves the right of withholding all or any of the medals, in case none of the carriages or instruments possess, in their opinion, sufficient merit.

Subscriptions.

The Midsummer subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

National Elementary Training and Education.

The first display of the physical and industrial training on the half-time system at the North District Surrey School, on the 3rd July, had given, to the members of the Council who attended it, deep impressions of the importance of the system, far deeper than any they had before entertained, or could have conceived, of the effects of the bodily training, without having witnessed them. The Council, therefore, begged to have a repetition of the exhibition, for the sake of members of the Society who are in Parliament, as well as of others who are specially interested in the subject of national elementary education, who had been unable to be present on the first occasion. A second display was therefore obtained on Saturday, the 24th July. Amongst those present were—The Hon. Dudley Fortescue, M.P., Mr. Bernhard Samuelson, M.P., Professor Huxley, F.R.S., Professor Masson, Mr. Henry Cole, C.B., Mr. J. Scott Russell, F.R.S., Mr. Edwin Chadwick, C.B., Mr. Hyde Clarke, Mr. Seymour Teulon, the Rev. Mr. Raven, Mons. Arles-Dufour, and Major-General Wilford, R.A., who were received by Mr. J. C. Bennett, chairman, and Messrs. J. Kent, L. Adams, J. Carter, and the Rev. Mr. Congreve, members of the Board of Managers of the school.

All doubt of the benefit of the examinations, and of their repetition in the interest of the administration, was decisively dissipated by the results of the visits in the vindication of the advantages of the treatment of orphans and destitute children in buildings, apart from the adult paupers—in the great gain in efficiency, as well as in the economy of the school-teaching power, by a division of educational labour in the school—in the great gain of bodily aptitudes for labour by the military drill and gymnastics, as well as by the industrial training; and by the evidence of the general gain in the economy of results. Under the former and too prevalent present practice, only one child out of every three turn out indifferently well at present, whilst here the absolute moral and industrial failures scarcely exceed one or two in fifty. In the minds of those present who examined the training in this institution, with a due consideration of the inferior material operated upon, there could not be the slightest doubt of its superiority of economy in result, even with some increase of present charges over any plan of treatment in cottages, wheresoever uncrowded and fitting cottages might be found. It was regretted that the facts displayed in these visits should be so long unknown to members of the legislature, and to those specially interested in the subject of national elementary education. In answer to congratulations of the members of the Council on the general success of the administration, Mr. J. C. Bennett, stated that he had always been in favour of such visits, and he should be glad if visitors would come frequently and unexpectedly; and he recognised fully the fact that they stimulate the minds and the attention of the pupils as well as all the officers. He expressed the obligations of himself and the other members of the Board of Managers to the Council of the Society of Arts for the notice given to their labours by the distinguished visitors who had examined them. Professor Huxley, after pointing out to the children briefly the value in their after working-life of the kind forethought of the managers, thanked the latter for the opportunity of witnessing this successful experiment in industrial and general education. One valuable feature was that it began at the bottom, whereas most begin at the top, hoping that the streams of knowledge would percolate down below; but there might be said to be a stratum of clay on a layer of sand, and he had been one of those who had vainly been working at the top for many years. The right course is to work on the masses at bottom—let knowledge flow upwards. Few, he said, can know the difficulties of the managers of these schools, from official and non-official ignorance. Non-official ignorance is ever ready to check the guardians in each liberal effort, and official ignorance is equally obstructive. The remedy for these evils is a better knowledge of what is being done by the guardians in such institutions.

On the general question of the improvement of national elementary education, these visits served as an important demonstration of the practicability of teaching the "three R's" in a highly improved manner, up to decimal fractions inclusive, together with music, elementary drawing, and a bodily training and drill, superior to anything afterwards attainable before the eleventh year, when the wage-classes must have the benefit of their children's services, and of gaining between two and three years for technical instruction of the children of those classes who can afford to allow them to remain up to the thirteenth or the fourteenth year. The examination papers of the pupil teachers, and also the examination of the elder classes in the school in geometry, and other points for technical training, were demonstrative on these points.

Those who are specially interested in the promotion of technical education are recommended to visit this school, and also the Central District School of London at Hanwell, and examine the gains generally practicable for technical education by an improved organisation of the means of elementary instruction. The Council are led to believe that the City of London Middle Class School, originated by the Rev. W. Rogers, a member of the Council, and recently organised under the Rev. Mr. Jowitt, will furnish important illustrations of the superior technical instruction that may be extensively imparted within the two or three years of time that may be gained by a better organisation of primary elementary instruction.

Major-Gen. Wilford, R.A., late Governor of the Royal Military Academy at Woolwich, was good enough to review the military exercises* of the juvenile forces, and he pronounced the drills to be excellent. He considered the drill to be really as good, even at this stage, as any that would really be required, and that it would not be forgotten by the boys. It was better than the drill in France. He thought we over-drilled our men for practical purposes. He complimented the managers of the institution that, whilst they had imparted to the boys qualities of great value for civil life, they had also imparted qualities of high importance, if needs were, for the military service of the country.

The Council considered it of importance that these bodily attainments, practicable in the juvenile stages under a national system of elementary education, should be more extensively displayed and publicly witnessed. They, therefore, proposed that the managers of the chief schools in the metropolis, where the military drill has been introduced, should be invited to send their boys to be reviewed at a grand school review at the Crystal Palace, the directors of which agreed to pay the expenses of their transit and to give them refreshments. In the absence of the President of the Society, His Royal Highness Prince Arthur, with the gracious approbation of Her Majesty, consented to direct the review, and to distribute any assigned prizes or proper commendation for excellence in drill. Cordial approbation had been expressed of the proposal from the War Office, and of an invitation that the boys of the Royal Military Asylum, at Chelsea, should take part on the occasion; and similar approbation was anticipated from the naval authorities for the participation of the boys of the Royal Naval School at Greenwich in the exercises. The managers of eight large district schools and institutions immediately and cordially responded to the invitation given by the Council. On the whole they were prepared to expect that an immediate array of between two and three thousand boys would have been presented for review before his Royal Highness. But some obstacles prevented the plan being realised before the time fixed for the departure of his Royal Highness for Canada, and the Council were compelled to postpone it. The Council regret the disappointment occasioned to the great body of children, whose expectations were excited, and to the managers of the educational institutions, the drill masters and the school teachers, but the Council trust that the disappointment will be compensated by a more complete and larger organisation for another and early occasion, for which they venture to recommend the schools to prepare themselves.

It may be proper to observe that, whilst there may be large differences of opinion on the question of a national military organisation, the Council have received the expression of almost unanimous opinion, amongst the military and naval members of the Society and other military authorities, in favour of the general introduction of military drill and naval exercises as part of a system of national elementary education. But without derogating from the importance of that object, as one of national economy, the Council would call the attention of the Institutions in Union, and of educationists, as well as of their members, to this subject, as one strictly in unison with their civil objects, as a means of improving technical education and the advance of the productive

* On the first visit, the boys of the Lambeth School were drilled after those of the North Surrey School had been exercised in review, when the drill of the Lambeth boys was pronounced to be superior. On this occasion it was noticed, as one advantage of these repeated visits and comparative inspections, that the North Surrey Institution had been stimulated to improve its drill, and had succeeded, especially in the most difficult of marches—the march in slow time.

power of the country. In justification of this distinct view, the Council draw attention to the following practical evidence, given to the Newcastle Commission on Popular Education, by some eminent members of the Society, and others of the largest practical experience as leaders in arts and manufactures:—

Joseph Whitworth, Esq., F.R.S.

What number of working men, mechanics or labourers, may you have in your employment?—From 500 to 800.

Are they adults?—Chiefly adults.

Have you had experience of any inconvenience which the application of a naval or military drill, in the education of children, would serve to prevent in large establishments?—Yes, in large establishments like ours, it is frequently necessary for men to act in concert. We find great loss of power by men not acting in concert. Serious accidents frequently happen from this cause, as well as much general disorder.

What do you believe would be the value given to a youth by a previous naval or military drill, or both, in his school education?—I would consider a youth of double the value who had a previous training in a drill which gave him habits of order and cleanliness. I do not mean his own personal cleanliness, but keeping everything he has to do with in a high state of cleanliness. A youth who has had a training of the nature of a drill has a pleasure in attending to commands, whilst another, not so trained, is dull, and dilatory, and inefficient. The drill, besides correcting defects, brings out special bodily qualifications. Thus, one youth, who is remarkably strong in the upper extremities, will be found to be specially adapted to one sort of work, whilst another, who is more powerful in the lower extremities, will be the best fitted for another. But the drill would be of great use, as giving qualifications for all occupations.

Have you had any experience of the effects of naval and military discipline in improving the qualifications of workmen?—We always prefer a man who has been a sailor to take charge of the men employed in rendering assistance to others, in lifting and removing objects from place to place; he is more apt in the use of blocks and tackle, and better drills the men to act in concert.

William Fairbairn, Esq., F.R.S., of the firm of Fairbairn and Sons, Mechanical Engineers, Manchester.

What number of mechanics and labourers do you employ?—Nearly 1,000.

What is your experience and observation as to the effects observable of the military or the naval drill on the habits and efficiency of labourers as workers?—We find that men who have been soldiers or sailors obey orders with greater precision than others, that they are more punctual, and more tractable, and require less superintendence or attention than the others. We do not meet with men who have been drilled amongst the skilled mechanics, but we find the drilled men amongst the common labourers, as compared with whom they are very superior. We have had for many years, as foreman of our labourers, a man who had been trained as a sailor, who had in fact been a sailor, and we find him extremely handy. His knowledge of the use of tackle in raising heavy weights is extremely convenient, as well as his habits of command over the men; moreover, there is a much less risk of accidents from men who are so trained, they go about their work with more knowledge and skill than the undrilled.

What, from such experience, is your view of the expediency of the naval and military drill as a part of school exercises and gymnastics, and its effects on the efficiency and value of the scholars as workers in after-life?—In my view, a greater benefit could not be conferred on the population of the country than to provide for them a military and a naval drill, interspersing with their school instruction systematic gymnastics. It would be in every way profitable to them and salutary. Their active bodily training cannot begin too early, and from my own experience as a boy, when it was a favourite game to "play at soldiers," it would be as agreeable as it would be useful to youth in the duties of ordinary civil life.

You have mentioned the avoidance of accidents as one benefit experienced from the employment of drilled men. Are you aware that the total number of deaths registered during the last year from accidents from contusions, stated in the official reports as arising chiefly in the employment of the agency of steam, was above 5,800 in England and Wales alone?—I was not aware of such an extent of loss over the whole kingdom, but I was aware that in the Manchester district the average loss of life from boiler explosions alone is, as near as I can recollect, about 120.

Have you not, in writings or addresses, represented the necessity of having a higher order of education and intelligence for the management of the agency of steam?—I have endeavoured repeatedly to show the absolute necessity of a higher scale of intelligence, such as an improved training and education might impart, not only to the working population having charge of the great new agency of steam and steam machinery, but to those having superior direction of that agency. The great mass of accidents arise from ignorance of one sort or other, or neglect. The ignorance is displayed in instruction, as well as in management.

Robert Rawlinson, Esq. C.B., Civil Engineer, late one of the Sanitary Commissioners to the Army in the Crimea.

Have you not had an extended practical experience in public works and with working men?—Yes.

Would special naval and military drilling and gymnastic training at school give useful aptitudes for labour generally?—In my opinion, based on experience and observation, I think school drilling and training would prove of the utmost consequence to the boys in after-life. I may give a few instances. In all engineering and building trades, men are frequently required to use their strength in concert, lifting, carrying, and drawing. Men, to use their joint strength, not only effectively but safely, must have confidence in each other. Two trained men will lift and carry more, easily and safely, than four untrained men. I have frequently seen trained men weed out untrained men, where heavy lifting has been required, because they dare not risk the danger arising from unskilled strength; and few have performed with more safety work which would have been lighter and easier if all had been equally skilled. Men frequently reject the assistance of unskilled men, as there is absolute danger in having them near. Frequently accidents arise from using men unskilled in lifting, in hoisting, and at capstan work. Men who have been sailors make by far the best labourers, and coasting sailors the best of all. In Liverpool, Welsh sailors are preferred for all purposes of scaffolding; that is for making tall scaffoldings for buildings. Men who have been marines are next best, and then men who have been soldiers. Boys should not only learn to march, but to lift, carry, and pull in concert. There are many necessary feats of strength in all trades which are more matters of knack and tact than of brute strength. Brute strength frequently fails to do that which comparative weakness can accomplish easily with skill and confident concert. There is no regular system of training in concert to use human strength in the best manner in any trade, so far as I know; acting in concert is matter of necessity, and practice gives facility and confidence. Drill and training would probably double the effective human power of any establishment, especially if numbers are instructed in joint feats of strength. That which is taught to youth is never forgotten in after-life.

Mr. George Sykes, Machinist and Engineer.

Was foreman at the manufactory of Sharp, Stewart, and Co., Manchester, formerly Sharp Brothers, engine makers. He had nearly 300 men under his direction.

Amongst the men there were some who had been soldiers in the line; they were distinguished as most steady men, as keeping everything tidy and orderly, and being prompt and active. "I am quite satisfied that they were worth more money than others in the shop. If I were the employer, I would give 2s. or 3s. a-week more than to others to whom £1 a-week is paid. I am satisfied, from observation, that the habits begot by the drill would improve workmen to at least that extent. There is much loss of labour by the awkwardness of labourers not pulling together, not lifting together, and not being unanimous. Many accidents are occasioned by awkwardness; three out of four that I have seen have been from awkwardness and stupidity, which was not displayed by the soldiers. As a foreman, I should not have had half the trouble if all had been drilled and had had the same habits of obedience, and would have 'been told' as the soldiers."

From your experience of the effects of drill, if you had a son, and there were an opportunity of getting him into a school were pupils received a good drill, would you be willing to pay extra for it, to improve his qualification as a working man?—Yes; if I were paying 1s. a-week, which is what is commonly paid for a good private day school, I should be willing to pay 1s. extra for his teaching in a school where he would be drilled and have a good bodily training and be well set up. I am sure it would be worth while.

The Count Gasparin.

The Count Gasparin, an accomplished statesman of France, the writer of the most able work on agriculture in Europe, in treating of the inconvenience to which agriculturists, small farmers of France, are subject, adverts to the liability of the family stock of labour, that of their sons, being disturbed by the conscription, or os their being taxed to procure substitutes for their sonf when drawn to serve in the army. He says, that if the labour of the son can be supplied by a little more activity on the part of the other labouring members of the family, if the labour of that son be not absolutely necessary,—but above all if it be necessary to go into debt to raise the price of the substitute,—the father of the family cannot be too strongly advised not to prevent his son joining the army. "We have," says the count, "experienced such good effects from the adoption of this advice, that we cannot too often repeat it here. The families who have followed it have saved their money, and they have seen the son return more vigorous, more intelligent, more respectful, more capable, having lost his rusticity *(sauvagerié de la campagne)* and become able to deal with men with more ease and consideration. Our discharged soldiers are, in general, the best subjects of their villages; it is amongst them that we find our best foremen and our best stewards, whilst their brothers who have remained at home are only common loutish labourers."

Sir Francis B. Head, Bart.

Of military evidence, bearing on the use of the drill for civil service, that of Sir Francis Head, Bart., R.E., may be cited:—

No animal, whether on four legs or on two, however he may enjoy life, can be of any use in the workshop of man until he has been sufficiently divested of that portion of his natural inheritance commonly called "a will of his own."

What's the use of a cow, if she won't allow either man or maid to milk her? What's the use of a horse, if he won't put his head into a collar, or suffer a saddle to be placed on his back?

The dull-sounding but magic little words of command, "Eyes right!" "Eyes left!" "Eyes front!" "Right turn!" "Left turn!" "Right about turn!" "Left about turn!" "Quick march!" "Halt!" "Stand at ease!" "Attention!" &c., instil into the minds of a lot of little boys the elements, not of war, but of peace. Instead of making them ferocious, these words (to use Mr. Rarey's expression) "gentle" them, until, by learning to be subservient, not to their own, but to the wills of others, they become fit, in every possible department, to serve their country.

On entering the Foreign-office, Home-office, the church, the counting-house, the manufactory, or the farm, in which they desire to labour, their habit of obedience would prove so beneficial to their employers as well as to themselves that I feel confident, if a system of drill be once adopted in our public and private schools, a tall, undrilled young man, like a raw, unbroken horse, would, by the generality of dealers, be considered as "unserviceable."

Infirmary.

As much interest was excited among the visitors to the infirmary of the Institution, the following particulars are given:—

In an establishment like the Anerley School, where nearly 1,000 children are assembled, equalling in number the children in a large town, it is a matter of certainty that some disease must exist. To prevent, as far as possible, the propagation of disease from one to another, early separation of the sick from the healthy is deemed of the utmost importance; and in order to treat those who are sick in the best manner possible, an infirmary is provided, to which every case, however apparently trivial, is always sent, and it is usually found that from five to ten per cent. of the children are affected with some ailment or another, but generally of no important kind.

Until within the last few months, no child was received into the schools from the union workhouses if suffering from any disease, unless the disease was of such a nature as to render the return of the sick child dangerous; but now, on the contrary, sick children are sent as well as healthy ones; therefore the infirmary at the North Surrey District Schools is, to some extent, the children's infirmary for the North Surrey school district. As far as the children in the schools are concerned, this is not a good practice, as disease is introduced from external sources, which has, in some instances, been communicated and spread to other children of the establishment.

The great and injurious source of illness is from children who are always going out and into the schools, and from others introduced in the way before-mentioned. The infirmary is calculated to receive 170 patients, each having a separate bed, with 750 feet of cubic space to each bed. The height of the wards does not exceed twelve feet, in order that, in calculating the cubic air space, a sufficient area may be provided to prevent the beds being too closely placed together, and to render the warming of the wards more easy. The infirmary faces to the south-east. There are eight wards, besides two small wards for special cases. In every ward a small space is parted off for the nurse or servant to sleep in at night, where everything that goes on in the ward may be seen and heard. The wards are ventilated by sash windows on each side, by Sheringham ventilators, and by an air-shaft over the gas-burners, and by this means the wards are kept perfectly sweet and properly aired. To each ward latrines are provided, with a bath-room with hot and cold water, a sink, and two water-closets, quite separated from the wards by a ventilated passage. The pipes from the sinks and baths have their outlet over a trapped draw outside the building, with which they have no direct communication, so that no sewer gas can enter from the drains. A large day-room is provided on both the male and female side, for convalescents. All the cooking and washing, &c., are done in buildings adjacent to the infirmary yards, so as to be entirely separated from the main buildings. The infirmary was built from plans drawn by the superintendent and medical officer, which were carried out under the superintendence of the architect, Mr. Birney, of Croydon.

Cantor Lectures.

ON APPLIED MECHANICS.

By John Anderson, Esq., C.E.

Lecture II.—Delivered Monday, April 19th.

Applied Mechanics in relation to Natural Properties of Materials.

The branch of this subject which relates to the construction of machinery resolves itself into several distinct parts. First, there is the object which is to be accomplished by the machine; secondly, the natural or mathematical principle to be employed in accomplishing the object; and thirdly, the mechanical arrangement which has to be contrived and made in order to carry out the principle. Then, after the machine is constructed, there is, fourthly, the power of nature to be employed in giving motion to the machine, and then after that comes the combination of solitary machines into systems for the development of manufacturing operations, and embracing their application to the various purposes of life in the working world generally, nearly all of which depend on natural principles much more than on men or man's mechanism. It will thus be seen that the machinery subject is made up of two grand divisions—first matter, then motion. Both this lecture and the next will have reference chiefly to the natural properties of materials, to the natural laws of the processes, and to some of the means employed in giving them definite forms for their intended purpose. The fourth lecture will refer to matter in motion.

To the young engineer who has just left school for the workshop, there to learn the duties of his future occupation, the various materials with which he comes into contact have a different appearance to the reality. Most of them have the appearance of being solid continuous masses, and rigid in their nature. After a little experience he begins to find that such is not the case; that everything is more or less porous, all of them differing in density; that none are positively rigid; that all are more or less elastic; that many of the substances usually called solid have a property resembling the flowing or unstable property of fluids; that they can be variously modified in regard to their toughness, brittleness, tenacity, or rigidity; and that, in their relation to heat, each and all are similarly yet differently affected, according to their peculiar natures or characteristics. With such properties all are more or less familiar, but there are other physical conditions that are too little studied in the workshop.

The constitution and mutual connection of the primary or indivisible atoms composing the molecules of any substance, such as iron or copper, is a subject not very clearly understood even by the learned, but philosophers nearly all agree that the ultimate indivisible and indestructible atoms consist of exceedingly minute particles, which are invisible to the most powerful microscope, and are indeed very much smaller than the mind can realise; but it is supposed that these primary atoms are not in actual contact with each other, but that the entire structure is what may be termed cellular, pervaded by a portion of infinite space around each atom, and by space only, the distance of separation being far too small for the gross matter of gas or atmospheric air to penetrate, space only filling up and forming a continuous envelope or wrapping of empty space, penetrating as a sort of network around each individual atom, and that all are held together by the universal law of cohesive attraction, and kept apart by the mysterious agency of heat, or by some other similar influence still more obscure.

The investigation of the physical laws, so far as they relate to the primary atoms, lies far beyond the verge of applied mechanics; indeed, it is a subject that almost reaches to the spiritual, but the aggregation of these atoms into the secondary or molecular condition intimately affects all our operations. The individual molecules of matter, as thus composed of a number of primary atoms, are likewise so exceedingly small as to be beyond the imagination. Still, they have mechanical properties; they separate from each other and mix with other molecules, and they permit heat to push them asunder into a wider space. This also is an obscure subject at the present time, and one beset with many practical difficulties, because our knowledge is not definite enough; the natural laws that govern the molecular adhesion, and the order of their arrangement with other molecules, are not yet thoroughly understood, and there are at this moment many practical operations depending on such mixings, coatings, or combinations that still wait for a clear solution, and which will not be solved satisfactorily until the natural law that regulates molecules is ascertained more fully; still the knowledge is advancing, and every succeeding year reveals another and another of nature's secrets. A due appreciation, however, of what is already known in regard to this molecular structure or condition of materials, will greatly assist in preparing us to understand the possibility of such remarkable properties as malleability and ductility, in consequence of which the particles, or rather the molecules, can be spread out, gathered in, or even pushed about, or can even be drawn out from amongst each other. It also enables us to comprehend the nature of the various changes that take place in regard to their molecular adhesion or tenacity and compressibility, by the presence or infusion of other molecules, such as in the union of iron with a trace of silica, which, from its behaviour, would almost seem as if it formed a coating of invisible varnish around the particles; or the still more striking effect when the silica is eliminated, when we frequently see the superseding varnish of oxygen, or whatever physical condition it may assume, which from some obscure reason seems to produce brittleness when in the red-hot state. Equally important changes are produced by the presence of sulphur, phosphorus, manganese, carbon, or other substances. Equally wonderful are the changes wrought in regard to their varying conditions of elasticity and brittleness, hardness and softness, toughness, malleability or ductility, by what may often seem to be a small cause to produce such an extraordinary effect, more especially in regard to the change produced by different modes or rates of cooling, or by other analogous treatments, all of which phenomena we can daily witness and ponder over in the workshops of applied mechanics, even if we may not always be able to afford a ready and clear explanation.

We may consider materials under this secondary aggregation of a number of atoms into molecules which are probably held together by the force of attraction, but which are prevented from getting into actual contact, probably by the repelling influence of heat or some other agency, for although the presence of heat may not be perceptible to our senses, especially at low temperatures, still, by increasing the heat, we then find that it gradually overcomes the cohesion, and that the solid body at length becomes a liquid, such as in the case of ice becoming water; or the liquid metal, as in the case of lead; or by still further increasing the heat, its presence sometimes becomes visible, even with water when contained in a vessel strong enough to bear the pressure, and frequently with lead, even in an open vessel, or as we daily see in the case of cast-iron when it is melted by the founder. In all these instances the molecules of the solid substances are pushed beyond the range of cohesive attraction which existed in the solid, and of which man learns to take advantage. He then devises arrangements for pouring the metal into moulds or otherwise, and by waiting until the heat has passed off, either by conduction or radiation, the law of molecular attraction again asserts its dominion over the solid, and the molecules are brought closer together into a more rigid state of relationship one with the other.

By still further increasing the heat, as in the case of water

when converted into steam or vapour, the invisible molecular particles of the water but now in the state of steam, are thereby separated into space, finally beyond the reach of each other. It is the same with the metals or other substances, provided that a sufficiently high temperature is employed. Even the metal iron is thus converted into vapour, and its molecules pass off into space, probably never to meet again.

Besides this minute molecular or secondary structure of materials, there is a still coarser order of structure, variously modified into a crystalline, cellular, or tubular arrangement, which may be seen with the microscope, and even with the eye. It is so coarse in some materials as to permit the air or even water to permeate the mass. In such materials we often find the molecules arranged in porous clusters, crystals, fibres, cells, or otherwise, according to the nature of the particular substance, each substance having its own peculiar characteristics, and all governed by special properties of their own, quite distinct from the general laws which govern all matter alike. In this branch of applied mechanics it is chiefly the coarser properties that have to be dealt with and considered. We may consider such substances in regard to the molecules of matter composing them, which are, in virtue of laws not yet well understood, thus found to arrange themselves into crystals that are apparently held together by the influence of cohesive attraction, and kept a certain distance of space apart by repulsion, from heat probably, and that these two forces are antagonistic and in constant operation, thus keeping every mass in a condition of restless activity, atoms amongst atoms, and molecules amongst molecules, and crystals amongst crystals, and when the repelling influence arising from the presence of heat is able to overcome the attractive force, then the force of cohesion is thereby diminished, and hence it is that the molecules of the metals, for example, are more easily moved about when at a high or red heat than when at a lower temperature, which the smith takes advantage of and not only do we find that the attraction is lessened, but that the distension of mass, arising from the repelling influence, is such as sensibly to enlarge the volume of the substance, so that the difference of dimension is measureable, and sometimes to such an extent as to be even perceptible to the eye.

The natural condition or property of matter, termed porosity, as exhibited by different kinds of common materials, may be looked upon as the opposite condition implied by the word density, hence both terms may be considered as co-relative, as the greater the density, so the mass is, of necessity, the less porous, and both terms may be applied to the same substance.

The whole of the materials used by the engineer, such as the woods and metals, are more or less porous, and, as already stated, sometimes even to the admission of such coarse substances as air and water.

With the porosity of woods, all are more or less familiar. Cork is almost a type, being so porous and compressible. Cork, when sunk a few hundred feet in water, will have its porous structure so filled up by the fluid pressure, as to render it incapable of floating for some time, until it has undergone a process of desiccation. Charcoal, also, is so porous as to admit of many times its own volume of gas to be condensed within it.

A good illustration of the extreme porosity of wood is afforded by the Boucherie system of preserving timber, by forcing a liquid through its pores from end to end. The tree or log is laid upon the ground, to obtain fluid pressure. A ring of vulcanised india-rubber is introduced, in order to form a close joint between the end of the tree at its outer margin and a circular or other shaped plate, or even thick board, which is held to the tree by means of screws. Into the centre of this board or plate a stop-cock is inserted, which is connected to a pipe leading upwards to a cistern containing the liquid, placed some sixty or seventy feet from the ground, the cistern containing either sulphate of copper, chloride of zinc, or some other antiseptic solution. When the stop-cock is opened, the fluid pressure from the preserving solution in the cistern fills the space between the board and the tree, and so by fluid pressure causes the sap to flow out of the other end of the tree or log in a clear stream, and in large quantity, thus showing the great porosity of the wood in being able to hold such a volume. In the course of an hour or two the whole of the sap is expelled, and the antiseptic fluid makes its appearance at the other end. The solution is allowed to remain in the pores of the tree, thus leaving it thoroughly saturated throughout its entire length.

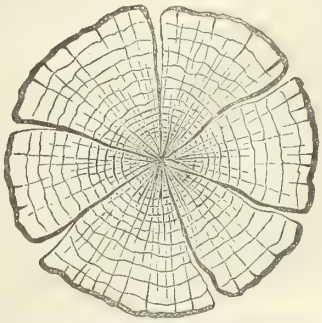
In the carrying out of this process, it is interesting to observe the difference between the respective periods of time that the solution requires to pass through a tree lengthways and through a thin board cut tranversely from the same. For example, a tree ten feet long as compared with a board one inch thick, are both found to require about the same period for the liquid to pass; that is to say, it proceeds 120 times faster the one way than the other, arising from the conditions of structure. Advantage is taken of this peculiar porosity of wood, in the manufacture of the wooden pins or trenails which are sometimes used to fasten railway chairs upon the sleepers, and also for a variety of other purposes. The trenails are generally made of oak, which are first formed into round pieces one and a half inch in diameter, then, by means of mechanical pressure, they are forced into a metal die one inch in diameter, where they are allowed to remain for an entire day, at a temperature a little under that of boiling water. When the trenails are taken from the dies they are thus reduced two-thirds of their original diameter by the collapsing of the longitudinal tubular structure, but when they are driven into the sleeper they soon have the opportunity for the capillary laws to come into play by absorbing moisture, then they regain about three-fourths of their original diameter, thus taking a firmer hold of the sleeper, and at the same time their strength is increased in addition.

Notwithstanding the extent to which timber is used in the mechanical arts, it is singular that the natural law by which the contraction or shrinking of wood is governed is too much disregarded in practical operations. It is a subject which seems to have been entirely neglected by writers on the subject, for I am not aware of any book that explains the subject fully, and have only met with one individual (Mr. Wilson, of Patricroft,) who has thoroughly studied it as a philosophical question, and reduced it into the every-day unerring practice of his own works. The wretched state of the floors, doors, and shutters in many of the London houses too plainly give ample and complete evidence of our persistent disobedience of the law, more especially in this quarter, and the only hopeful consolation is that we do not go unpunished, as the penalty inflicted may in time lead to improvement.

An examination of the end section of any exogenous tree, such as the beech or oak, will show the general arrangement of its structure. It consists of a mass of longitudinal fibrous tubes arranged in irregular circles that are bound together by means of radical strings or shoots, which have been variously named; they are the "silver grains" of the carpenter, or the "medullary rays" of the botanist, and are in reality the same as end wood, and have to be considered as such, just as much so as the longitudinal woody fibre in order to understand its action. From this it will be seen that the lateral contraction or collapsing of the longitudinal porous or tubular part of the structure cannot take place without first crushing the medullary rays, hence the effect of the shrinking finds relief by splitting in another direction, namely, in radial lines from the centre, parallel with the medullary rays, thereby enabling the tree to maintain its full diameter, as shown in Fig. 1. If the entire mass of tubular fibre composing the tree were to contract bodily, then the medullary rays would of necessity have to be crushed in the radial direction to enable it to take place,

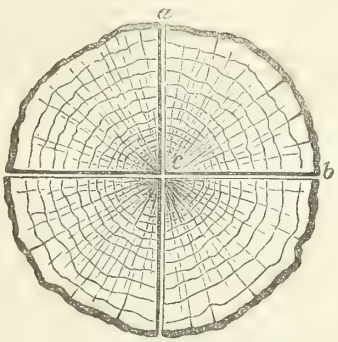
and the timber would thus be as much injured in proportion as would be the case in crushing the wood in the longitudinal direction. If such an oak or beech tree is

Fig. 1.



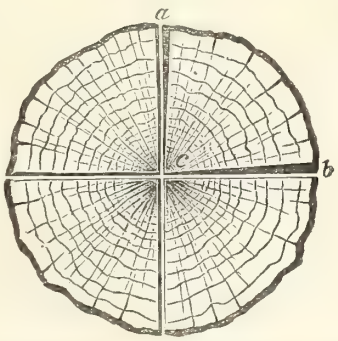
cut into four quarters, by passing the saw twice through the centre at right angles, before the contracting and splitting has commenced, the lines *a*, *c*, and *c*, *b*, in Fig. 2 would be of the same length, and at right angles to

Fig. 2.



each other, or, in the technical language of the workshop, they would be square, but, after being stored in a dry place, say for a year, it would then be seen that a great change had taken place both in the form and in some of the dimensions; the lines *c*, *a*, and *c*, *b*, would be the same length as before, but it would have contracted from *a* to *b* very considerably, and the two lines *c*, *a*, and *c*, *b*, would not be at right angles to each other by the portion here shown in black in Fig. 3. The medullary rays are thus

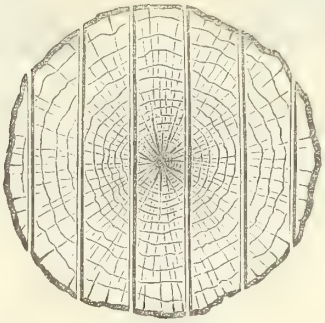
Fig. 3.



brought closer by the collapsing of the vertical fibre.

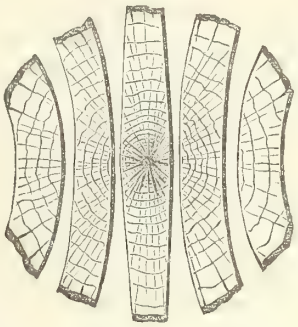
But, supposing that six parallel saw cuts are passed through the tree so as to form it into seven planks, as shewn in Fig. 4, let us see what would be the behaviour

Fig. 4.



of the several planks. Take the centre plank first. After due seasoning and contracting, it would then be found that the middle of the board would still retain the original thickness, from the resistance of the medullary rays, while it would be gradually reduced in thickness towards the edges for want of support, and the entire breadth of the plant would be the same as it was at first, for the foregoing reasons, and as shown in Fig. 5. Then,

Fig. 5.



taking the planks at each side of the centre, by the same law their change and behaviour would be quite different; they would still retain their original thickness at the centre, but would be a little reduced on each edge throughout, but the side next to the heart of the tree would be pulled round or partly cylindrical, while the outside would be the reverse, or hollow, and the plank would be considerably narrower throughout its entire length, more especially on the face of the hollow side, all due to the want of support. Selecting the next two planks, they would be found to have lost none of their thickness at the centre, and very little of their thickness at the edges, but very much of their breadth as planks, and would be curved round on the heart side and made hollow on the outside. Supposing some of these planks to be cut up into squares when in the green state, the shape that these squares would assume, after a period of seasoning, would entirely depend on the part of the tree to which they belonged, the greatest alteration would be parallel with the medullary rays. Thus, if the square was near the outside, the effect would be as shown in Fig. 6, namely, to contract in the direction from *a* to *b*, and after a year or two it would be thus, as seen in Fig. 7, the distance between *c* and *a* being nearly the same as they were before, but the other two are brought by the amount of their contraction

Fig. 6.

Fig. 7.

closer together. By understanding this natural law, it is comparatively easy to know the future behaviour of a board or plank by carefully examining the end wood in order to ascertain the part of the log from which it has been cut, as the angle of the ring growths and the medullary rays will show thus, as in Fig. 8. If a plank

Fig. 8.

has this appearance it will evidently show to have been cut from the outside, and for many years it will gradually shrink all to the breadth, while the next plank, shown in Fig. 9, clearly points close to the centre or heart of

Fig. 9.

the tree, where it will not shrink to the breadth but to a varying thickness, with the full dimensions in the middle, but tapering to the edges, and the planks on the right and left will give a mean, but with the centre sides curved round, and the outside still more hollow.

The foregoing remarks apply more especially to the stronger exogenous woods, such as beech, oak, and the stronger home firs. The softer woods, such as yellow pine, are governed by the same law, but in virtue of their softness another law comes into force, which to some degree affects their behaviour, as the contracting power of the tubular wood has sufficient strength to crush the softer medullary rays to some extent, and hence the primary law is so far modified. But even with the softer woods, such as are commonly used in the construction of houses, if the law is carefully obeyed, the greater part of the shrinking, which we are all too familiar with, would be obviated, as the following anecdote will serve to show. It was resolved to build four houses, all of the best class, but one of the four to be pre-eminently good, as the future residence of the proprietor. The timber was purchased for the entire lot, and the best portions were selected for house No. 1, but by one who did not know the law, and to make certain of success this portion of the wood had an extra twelve months' seasoning after it was cut up. The remainder of the wood was then handed over to a contractor for the other three houses, who had an intelligent young foreman who knew the structure of wood as well as how to obey the law, and who, therefore, had the wood for the three houses cut up in accordance therewith. The fourth house was built the following year by another man, but long before ten years had passed, and to the great surprise and annoyance of the proprietor, it was found that his extra good house No. 1 had gone in the usual manner, while the other three houses were without a shrinkage from top to bottom. As Solomon says, "Wisdom is profitable to direct."

A similar want of correct knowledge of the natural figure and properties of the structure of wood, such as the oak, is constantly shown by the imperfect painting to resemble that wood, as exhibited on the doors and shutters of many of the houses of this metropolis. If we cannot afford to have genuine wainscot doors, as in France, but yet desire to have an imitation, it would surely be worth the trouble to have a block cut from the quarter of an oak tree, and to have each of its six sides planed and polished, in order to make plain their several features. The house-painter would then see what nature really is, and thus save us from the ridicule of other nations, when we mix up "silver grains" and all the other natural features upon one side of a board or panel.

Before proceeding to the consideration of the metallic properties, let me enumerate some of the leading characteristics of iron in a few words. Cast-iron is the metal as extracted from the earthy ore. As a rule it is extremely impure. It contains, besides other substances, from five to two per cent. of carbon, partly in chemical combination, and partly free or uncombined; its ultimate strength varies from about five to fifteen tons per square inch, according to quality, the average being between seven and eight tons, and its limit of elasticity is not far from the third of its tenacity, and most frequently is in the vicinity of from three to four tons per inch, but more generally under than over; it has scarcely any malleability; it is more brittle than tough or ductile; as a general rule, still, by certain mixtures, its toughness or ductility, or elasticity, may be greatly augmented. Its great redeeming quality is the property that it can be so readily melted into the liquid state, so that it can be poured into a mould like water, thus enabling us to obtain castings of any form or dimensions with the utmost facility. In a general way, the fluidity depends mostly on the proportion of carbon present in the alloy; hence, with an abundance of carbon, it becomes so liquid and so thin as to run freely into the most intricate forms required in art, and the slight increase of volume that takes place at the moment of crystallization into a solid, has the effect of still further giving a sharp impression of the ramifications of the mould.

Wrought-iron is made from cast-iron by a process of purification through the flame of a furnace, thus freeing it from the greater portion of its carbon by oxidation, down to one-quarter per cent. and under, and sometimes even to a state of almost purity. This elimination of carbon and other substances, combined with working under the hammer or rolls, produces a great change in its nature; it has lost the property of becoming a liquid, but it has acquired the almost equally important one of being weldable, that is to say, by heating two pieces to a certain high temperature, which produces the viscous condition, they may be united into one piece by pressure or hammering, that is, if the metallic surfaces are perfectly clean. By this change the strength of the iron is increased to about eighteen tons in the inferior sorts, up to twenty-eight tons in the higher qualities, with an average tenacity of twenty-two or twenty-three tons per square-inch; the limit of its elasticity varies from about eight tons up to twelve tons, but generally it is a little under ten tons; it has also acquired the property of being tough, ductile, and malleable.

Steel may be described as a nearly pure iron, chemically combined with a nearly pure carbon. The best qualities are made by placing the finest wrought iron in a refractory box containing charcoal, which is kept at a red heat for about a week. During this period the carbon vapour is infused into and amongst the iron molecules, and it gradually becomes what is termed from its appearance "blistered steel," which can not only be hardened, but can, by well-known means, be united to cast-iron or welded on to wrought-iron, and is frequently so used where rigidity and hardness are required, such as for the face of a smith's anvil, or the faces of hammers and such-like instruments of the ruder class; and when this blistered steel is drawn down under the tilt or steam hammer, it is then called "shear steel," and is used for all kinds of ordinary cutlery, swords, springs, and such like. But, for more particular purposes, these bars of blister steel are broken up into small pieces, and melted in a crucible into the condition termed cast-steel; the

impurities float to the surface, and are skimmed off, the steel is then poured into ingots, and then hammered or rolled into bars, or otherwise, as may be required, and by this means the most of its remaining impurities are eliminated. Such steel is used for the greater number of purposes where the highest excellence is essential.

Steel varies greatly in regard to its steely property, and depends on the amount of carbon which has been infused into the iron, and this varies from about $\frac{1}{4}$ per cent., in the so-called mild steel, up to 1 per cent., or even higher, in the stronger qualities. Steel is made by various other systems, such as the Bessemer process, but it is not my present purpose to explain them, the ultimate object of all being the same. Other methods reach the goal by a more "rough and ready" path, consequently they are cheaper, but they have not the fine qualities of the best cast-steel.

The strength of iron is much increased by the introduction of carbon, to give it the steely property. The strength of the lower quality, called mild steel, ranges in the vicinity of 30 tons per square inch, and in the higher qualities it reaches to 75 tons in its natural state, and this, by certain processes, may be raised to 120 tons. Steel is distinguished not only for its strength, but also, in an equal degree, for its fineness and closeness of structure, and, above all, for the wonderful property that it may be softened or hardened, made tough or brittle, or modified, so as to render it suitable for the varied and innumerable purposes required by man, and more especially in the engineering workshops of modern times, where its use is indispensable.

Although the metals differ greatly in regard to their density, still the porous property is much less observable than it is with wood, and it is only occasionally that we find the passage of water through its pores. This, however, will take place sometimes in the case of soft cast-iron in a great mass, and with the water at several tons pressure per square inch; then the water may be seen like dew all over its outer surface; it is the same even with gun-metal bronze in forcing pumps, that is if an improper mixture of copper and tin, and imperfect treatment have been employed in their manufacture.

The mixing of two distinct metals into an alloy such as copper and tin, gives greater density to the compound; the alloy called gun-metal consisting of $90\frac{1}{2}$ copper and $9\frac{1}{2}$ tin, occupies a volume smaller by $\frac{1}{15}$ than the two taken separately; this is on the same principle that, if a pint of oil is mixed with a pint of water, the result will not be equal to two pints. It would appear that the molecules, or fine particles of the tin, find their way into what may be considered as vacant spaces in the copper, and the result of this mixture is to improve the metal in most respects, with the exception of malleability and ductility.

Of late years the subject of mixing different kinds of metal in certain proportions, in order to obtain higher qualities for particular purposes, has had great attention; for example, a mixture consisting of 60 parts of copper with 40 parts of zinc gives great malleability and a tenacity of from 20 to 22 tons per square inch, nearly the double of what the metals give when taken separately, and even this mixture of copper and zinc, with the addition of 4 of iron and 2 of tin, gives another remarkable compound still more dense, particularly suitable for gun purposes, barring the expense, and no doubt man will yet find out many other instances to meet his ever-increasing wants.

But still more remarkable is the density arising from mixing different sorts of alloys of the same metal, say cast-iron. A numerous mixture of sorts gives a denser and stronger metal than the average of all taken separately, and advantage is greatly taken of all these properties in order to obtain the quality of iron best suited for particular purposes, so that cast-iron alloys of proper selection may thus be obtained of almost any tenacity between five and fifteen tons of ultimate strength, and with the other requisite properties varied to suit the intended purpose.

Another peculiar feature of some of the metals in this respect is the fact that, apparently, they can be rendered more dense, or at least closer in molecular structure, by other means, such as by pressure in a fluid state, which seems to compress gas vacancies in the mass, or this may be accomplished in some metals, such as copper, by pressure when in the cold state, as by rolling or hammering. During the past year or two, Mr. Whitworth has been making a number of valuable experiments in subjecting fluid steel to hydraulic pressure, so as to increase its density and strength for gun purposes. For hundreds of years founders have used pressure for the same purpose, in what is called a "dead head," that is to say, a column of fluid metal rising several feet higher than the casting, thus giving, if desirable, an extra pressure of about 15 lbs. per square inch, and an extra opportunity for the gas bubbles to float upwards; but in Mr. Whitworth's experiments the pressure is increased to several tons per square inch, and the engineering world is looking forward with great interest to the result, as, if successful, it will open up a new field for investigation; for thus it is that science advances, little by little; when it once gets a firm hold of an idea, a law, or natural property—first the idea or proposal, then the course of experiments, at length the world-wide application.

The rendering of metal more dense, or of closer structure, by means of pressure or hammering when in the cold state, is observable all through the arts. The copper for utensils, such as a teakettle, is subjected to a hammering process called "planishing," and may be made so compact thereby as to be suitable for a spring for gunpowder machinery instead of (for that purpose at least) the more dangerous metal steel. Even soft wrought-iron is frequently treated in the same manner, and used as a spring, but wholly on account of its cheapness, and it is much inferior to steel for spring purposes. Compressed lead-bullets are denser than cast bullets; they have fewer air or gas vacancies, and invariably have the preference on that account, but it is not clear that the actual molecules in contact are susceptible of being pushed closer together.

In the boring of brass guns, in order to condense the interior, the last boring instrument makes the bore about the tenth of an inch smaller than the required dimensions. There is then introduced a blunt instrument, called a "condenser," which, as the gun revolves, is forced along the bore, thus enlarging the bore to the proper size without cutting away the metal, that is to say, the metal is sufficiently porous to admit of the inner surface being pushed outwards, yet without the condensing effect reaching the outside so as to enlarge the exterior diameter. By this means a harder and stronger interior is given to the bore, and the operation affords a good illustration of Professor Tyndall's theory, as the heat developed is in proportion to the motion of the molecules. Even a piece of steel can be rendered more dense. This is shown by an interesting experiment which is sometimes made to test the properties of malleability and resistance to compression. The specimen is in the shape of a small cylinder of steel, which is put under a testing machine with pressure sufficient to flatten it down very slowly into a button form, and nicely rounded on the edges; the original ends are now, in the centre, of a larger diameter, yet without separating the atoms. It thus acts as a liquid, the ends being in the centre is due to the friction on the compressing surfaces, and from the increased density, with the effect of motion in the particles, it has acquired greater strength than it possessed before the distortion of form and the changing of relationship of the particles. Even with those who are dealing with such metals daily, and still more those who are not so much accustomed to see the flowing properties of solid metals —this movement of the so-called solid particles amongst each other like water or tar—this remarkable property may not have excited their attention so much as the subject deserves. To my mind it is one of the most

wonderful things in nature that are to be met with in our workshop treatment of the metals, and which will now be shortly considered under the natural properties of malleability and ductility.

In order readily to understand these two remarkable properties of malleability and ductility, which are now turned to such good account in almost every branch of the mechanical arts, it will be convenient to think of the malleable or ductile metals, such as lead, tin, copper, wrought iron, and steel, as substances that can be moved about like dough, that can be spread out as with a roller, that can be elongated by drawing out with the hands, that can be squirted through a hole by pressure like macaroni, or even that the dough can be pushed or gathered back again into its original mass of dough, that is, if proper means are employed to perform the operation gently, and this may be done without breaking the continuity of the particles of which the mass is composed. Such a statement may well seem fabulous, but it will be my province now to enumerate many things in connection with metal much more wonderful than what I have said regarding the dough, and even more strange than the change in dough when overtaken by the biscuit state from the baking process.

It is difficult to understand the possibility of the malleable and ductile properties without fully realising that their particles are fluid, in a certain sense, and that this is due to the molecular arrangement, not so fluid as water, tar, or bitumen, but still a fluid which will flow in obedience to sufficient pressure, and just as those fluids require time when acted upon by gravity, so the metals require greater time and more force than gravity, the rate of flow being determined by the nature of the metal, the softer metals requiring less pressure and flowing faster than the harder; and in the case of steel the flow is extremely slow, but with pressure, time, and patience, it also may be overcome, and made to flow gently, into any shape or form, while in the solid condition.

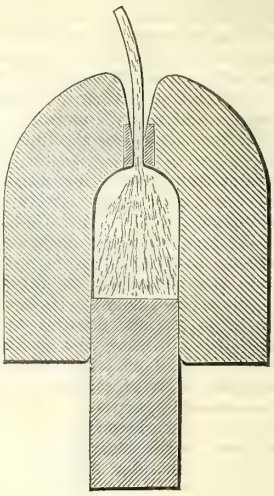
For a number of years the flowing property of the softer solid metals, such as lead and tin, has been taken advantage of very extensively, in the squirting of pipes and otherwise, and for thousands of years the malleable and ductile metals have been under treatment by man, and a vast number of practical facts have been thus accumulated, but it is due to M. Tresca, of Paris, to say, that he has done more than, perhaps, any other man in regard to the investigation of the natural laws by which the flow of solids is governed under varying circumstances, and the most interesting point of all is the great similarity that exists between the flow of solid metal and that of the flow of water—that in the flow of solids from an orifice there are the same converging currents, eddies, and that the quantity of metal issuing is dependent on the same conditions as water when issuing from orifices of different arrangement, and only differs in degree.

From time immemorial man has been familiar with gold as a flowing metal, both as malleable and ductile. It is in consequence of these properties that gold may be beaten into leaves so thin that it takes 290,000 to make one inch in thickness, or it can be drawn into a wire so fine that an ounce weight would extend a distance of fifty miles. The flowing action which takes place in coining a sovereign or other coin, is very apparent. This process is not the mere stamping which it is generally considered to be, but the particles of the gold have really to flow in the same manner as a liquid, from one part of the die to another, in order to fill up the deeper recesses of the die from the shallow part of the space, and so form the perfect coin from the rush of gold penetrating everywhere. As, however, gold is not one of the most common metals of applied mechanics, its presence in the workshop is less seldom met with than some of the others which have been already enumerated.

The metals lead and tin are both malleable and ductile, but their malleability, or spreading-out property, is much greater than their ductility, or drawing property, and both being soft, and having the flowing property in a pre-eminent degree, they can thus be squirted or rolled to any extent, or into any form of pipe or sheet, so that the want of ductility is scarcely felt.

The diagram (Fig. 10) will explain the nature of

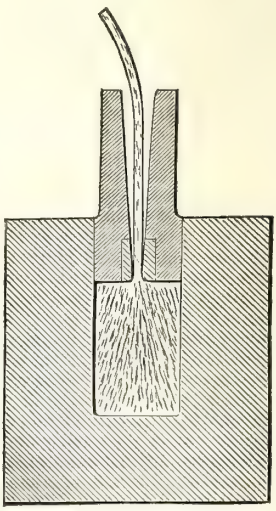
Fig. 10.



apparatus which is employed to squirt these metals when in the solid state. It is a powerful syringe filled with solid metal, with pressure on the piston varying according to the dimensions; in some the force required is 2,000 tons. In the earlier machines the arrangement was exactly the same as in an ordinary syringe, as shown in Fig. 10, but it was found that the fluid pressure of the metal within the syringe created such an inordinate amount of friction upon the inner surface as to rapidly wear out the several parts; but by a slight modification, more in accordance with sound principles, the defect has been obviated.

In the arrangement shewn in Fig. 11, the piston

Fig. 11.



contains the orifice, and in pressing against the upper

surface of the metal, causes it to remain in a state of rest within the containing vessel; but as fluid pressure is equal in every direction, the solid finds the orifice as a point of less resistance, hence it flows outwards in a continuous stream, thereby avoiding the friction of the solid lead within the cylinder. It will thus be observed that a rod of lead or tin can be squirted of any form or dimensions, depending on the die or orifice. In the Royal Arsenal may be seen lead thus squirted into continuous rod, and then wound upon reels like yarn, to be again unwound and made into bullets by self-acting compressing machinery; but the whole of the several processes are entirely due to the flowing property. Man's mechanism is very subordinate, and may be varied to any extent as circumstances may require.

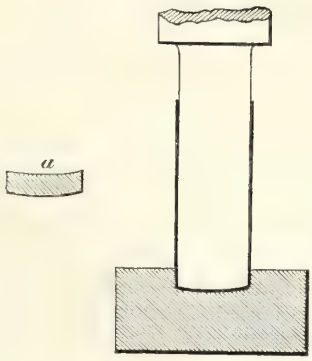
Pipes are made with the same facility as rod, by the mere insertion of a steel pin, the size of the required bore, placed in the bottom of the cylinder, and exactly in the centre of the orifice, thus forming an annular space through which the metal flows outwards as a continuous pipe; or, by making this pipe of sufficiently large diameter, and then cutting it open by a stationary knife as it leaves the machine, the pipe becomes a sheet of lead, which, by means of suitable rollers, may be wound on a reel as a long web of sheet lead, or the sheet lead may be rolled out by rollers. In both ways the same mechanical work has to be done; the respective friction is a disputed point.

A very singular result was obtained by an attempt to squirt brass pipes, which are extensively used as steam boiler tubes and for gas-fitting purposes. This brass consisted of 60 parts of copper and 40 parts of zinc, and of various other proportions, but, singular to relate, the pipes so squirted were zinc rather than brass; the most of the copper remained in the vessel, and refused to flow. We are not to infer from this that the copper would not flow, but rather that the union between the zinc and the copper was less than the pressure necessary to make the copper flow, the mixture may have been more mechanical than chemical, or the temperature may have been such as to have had the zinc too near its melting-point. Whatever is the explanation the subject is well worth further experiment. In all such operations, the nearer the lead or other metals are to the liquid state, the easier it is accomplished, but it must be solid.

Lead or tin may be rolled out to any extent, either singly or both combined, or with a thin coating of tin or other metal upon one or both sides of the lead, so as to have a leaden substance, but yet covered with a tin surface, perhaps not thicker, if so thick, as the leaf called tin-foil, thus combining economy with scarcely any disadvantage, for many purposes.

A beautiful illustration of the flowing property of tin is shown in the manufacture of the German capsule, in which the paint for artists is made up for sale and use. A button of tin, as in Fig. 12, is laid in the recess of a

Fig. 12.



die in a fly press; a corresponding punch or die, a little smaller, is then brought brought down upon it with a smart blow, thus leaving, from the difference of dimensions, an annular space between them, when the metal at once squirts upwards like water, but at a velocity much faster than the eye can follow, thus converting it into a perfect capsule. The form of the punch and die depends on the article to be made, but in all provision has to be made for the admission of the atmosphere on the removal from the dies.

From these remarks, it will be seen that, by understanding a few of the natural properties of these metals, how completely they are under man's control, and by knowing the simple laws, he can modify the apparatus in thousands of different ways, in order to produce whatever may be required.

We next have to consider the flowing malleable and ductile metal, copper, which has these several properties in a high degree, and, from its subserviency, is turned to great account in the arts. This metal may be rolled into sheets of extreme thinness, or, by suitable means, drawn into pipes, or worked into other difficult shapes, but I shall only select one or two illustrations of what can be done with this metal by a course of kind and gentle treatment, for on this success entirely hinges.

In the sugar and other manfactures there is a demand for large copper vessels, some nine feet in diameter, of hemispherical form, with a flange like the brim of a "wide awake" hat, turned outwards around its edges. Now, the mass of copper to form this immense pan is made to flow gradually outwards into this shape by a process of first rolling, and then, after arriving at a certain stage, by a continuous hammering, thus working the pan out of a single disc of copper. Supposing this disc to be like an immense cheese, some four feet in diameter by six inches in thickness, let us try to realise the condition of the particles of which this copper cheese is composed, and which have to work their way outwards, continually parting with and forming new relationships, but still particle holding on to particle, although sliding about and amongst and away from each other, until they at length have become a thin hemispherical dome, without a flaw or single break in its continuity. Let us more closely consider this process for a little. The mass of copper to be operated upon is composed of extremely small molecular particles arranged in crystals, held together by the still mysterious property of cohesive attraction. If the mass were composed of water, or even tar, the effect of gravitation would be to spread it outwards into a broad, thin sheet of tar or water, or even into a mould the shape of the pan, but as the copper is not so fluid, and more tenacious than those substances, it requires a corresponding force or pressure, immensely greater than gravitation, in order to make the particles of copper flow. The first operation is by rolling the mass between two powerful rollers, the effect of which is to cause the metal to flow out in the direction in which it is rolled, but not to the sides; this is on account of the friction it meets with from the surface of the rollers, but for no other reason. This elongation, by spreading out longitudinally, tends to elongate individual molecules and crystals into fibre, and, if the rolling were repeated always in the same direction, it would become fibre visible to the eye. This is not done, however, in the present case. The mass is then passed through the rollers another way, namely, at right angles, thus breaking up the former fibre into fibre in another direction, and by repetition, long fibre in a particular direction is avoided. After this rolling has been repeated for a number of times, a change begins to come over the fluidity of the mass, just like the dough becoming biscuit; it is less willing to move, it has become much harder and more brittle than it was at the commencement, and if the rolling were persevered in, it would soon crack at the edges. This change from free to rigid arises probably from the increased density and closeness of the molecular structure, resulting from the movement of the

molecules upon each other; but now another law of nature is brought to bear upon the metal. It was found out long since that if metal in this hard state is heated to a certain temperature, somewhere in the vicinity of a red heat, that the frozen particles are at once liberated from this condition of restraint, and have again resumed their former fluidity or malleability, and are again equally ready for work. This valuable process is called annealing, and is one of the great discoveries of past ages that have been handed down to us; it is invariably resorted to in all such processes, and need not, therefore, be always repeated in my descriptions where it is resorted to. By repeated rolling and annealing the mass is spread out into a large thin disc, with all its particles in continuity, and if it served any useful purpose, by means of a suitable apparatus and plenty of patience, it could be made to flow back again into its original condition of mass by a gathering-up process, but that is not the object in this case; it has now to be worked or curved round into an immense hemisphere. To accomplish this the steam hammer is employed; the hammer for convenience is set upon a transverse overhead girder structure, so that there is perfect freedom on the floor of the workshop for the manipulation of the pan all round a small convex anvil, which is fixed at a sufficient and convenient distance from the floor. The pan is suspended by means of a sling from a swing crane, so that the workmen may move the copper-pan about freely upon the anvil, while the steam hammer is at work giving light blows in rapid succession all over the necessary parts of its surface, as guided by the skill and knowledge of the workmen, in order to bring it gradually and approximately into form, and of uniform thickness. By this time the metal is gradually becoming thin, and hence more easily made brittle, when an extra blow on any given part might be one too many, which, of course, would destroy the whole by breaking up the continuity of the copper, to prevent which the annealing process is resorted to again and again. The pan is now probably too large for admission into the annealing furnace, but man is ever ready with an expedient when he knows the principle. A hot blast as a substitute is now directed upon the brittle parts of its surface, and thus the malleable quality is again restored, and so by successive hammerings and annealings it is at length completed.

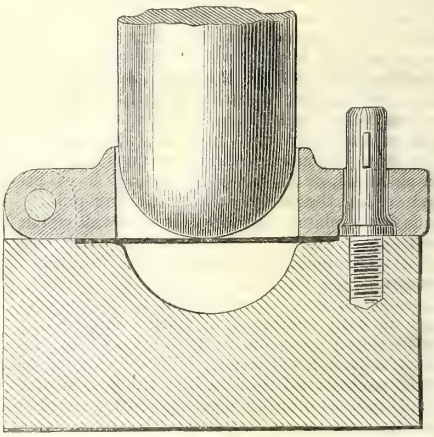
Looking at such a hemisphere, and then thinking of the dumpy mass of copper from which it came, it would be interesting to trace the path by which the remoter particles have reached their present position, and to unravel the wonderful relationship which exists between them severally, if any; or how many partings of friendly molecules took place by the way; or if any, how many new connections were formed with other molecules. However it may be, we find the same tenacity and strength to be still maintained throughout the entire mass, and that any change produced is for the better in all respects. It will also be observed that all this is in accordance with and depending on the natural properties, and in virtue of natural laws. Even the steam hammer itself is a gravitation hammer more than it is a steam hammer. Heat or steam is merely another power of nature employed by man to raise the hammer from the anvil, that is, to overcome gravitation, for, when left to itself, it falls in obedience to the law, and expends its work upon the anvil, and, just like the molecular structure of materials, it is simply attraction and repulsion acting in another way. Man's part is to apply nature.

For the same or a similar object, there is another class or principle of apparatus extensively used in the mechanical arts, under many modifications, whereby the solid fluid is made to flow in a more definite direction, by having it so enclosed within dies or otherwise, in which it is thus constrained to move, provided that sufficient external force, given by increments, which is brought to bear upon the piece of metal under treatment, and by means of which most marvellous results are obtained, but only when the means employed acts gently on the metal under operation; indeed, this is the whole secret of success. At the present time a great amount of attention is being directed to the best modes of obtaining the flow of metal into other forms, yet without disturbing or distressing the material of the flowing solid. Three typical illustrations will suffice to show the principle, and although dissimilar as regards the conditions of apparatus, they all agree in the grand leading feature.

There is a great manufacture carried on in Birmingham and elsewhere, whereby flat sheets of solid copper or iron are constrained to flow into a mould, in order to form hemispherical or other shaped basons of various sizes. This may not seem a great feat, after describing the making of the large sugar pan, still this is a much more difficult operation, and can scarcely be credited, from the circumstance that a disc of the proper thickness or substance has to be at once pressed into the hemispherical form, and yet without puckering the metal at the edges. If we try to press a sheet of soft paper into such a shape or form, such a result in iron will seem almost an impossibility, and it is only by keeping in mind the natural or moveable property of the molecules of the malleable metals, that the particles thereby can be pushed in amongst each other, or drawn, or spread out, and all with equal readiness, from such considerations the impossible vanishes to some extent.

The diagram (Fig. 13) will explain how this is accomplished. There is first a block or die containing a recess the shape of the required article, with another suitable recess on its upper surface wherein to hold the flat disc of sheet iron or copper; then there is placed on this disc a folding plate, which is fastened in such a manner as to grip the metal disc firmly, but yet not too rigidly. A corresponding die or plug is made to conform to the lower recess, and this is pressed or driven downwards through a hole in the upper plate, thus acting upon the surface of the iron disc, and forcing it downwards into the lower die as prepared for its reception, until it finally reaches the bottom. But what becomes of the irrepressible puckering? It is almost entirely prevented by the presence of the upper plate, which only allows the solid metal to flow over in an even stream like water over the edge of a fountain, the force of the pressure being sufficient to overcome the friction of the upper plate, as well as moving the particles, and the flowing character of the molecular particles thus adapt themselves to the new circumstances, there being no empty space for the puckering to form, and most remarkable of all, even the brim, which came from the large diameter of the original outside, scarcely shows a pucker in its now altered dimensions, for when the dish is turned out

Fig. 13.



of the die, the brim is of a smaller diameter than the original disc. What an amount of movement amongst the molecules this implies, inwards and outwards.

A second illustration of this constraining principle is afforded by the die system of striking up ornamental articles in deep relief, and of almost every description of pattern as mostly used for various purposes in dwelling houses. To accomplish this great change a series of dies are employed in succession; the thin sheet of metal is laid in a pair of dies, No. 1, when a falling weight drives them together, thus stretching or setting in the sheet only just as much as it will bear at one operation; it is then put into another pair of dies, No. 2, which is still deeper in its recesses than No. 1, and there receives another blow which carries it a little farther; thus by frequent annealings and change of dies, repeated again and again, almost any form may be struck up, the united result thus gradually producing deeply embossed articles, but to produce which, sometimes as many as twenty dies will be required in succession.

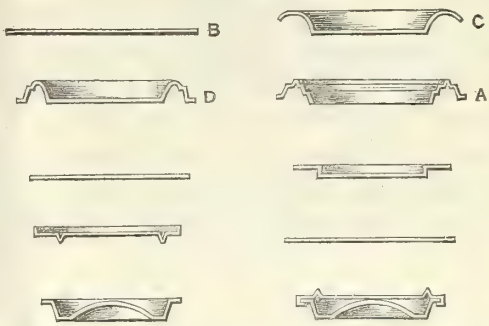
The principle of working metal into form by a series of dies in this fashion, was discovered about eighty years ago, and was considered at the time to be a perfect marvel of ingenuity; and if it fails to excite our wonder, now that our minds are familiarised with the working of metal, it only shows the advance that has been made in the general knowledge of this branch of the art, and from this may be inferred that our young workers are more likely to rise to a higher platform than that which we have reached.

There is yet another typical system of operations of this class for altering the shape of malleable metals, namely, that of causing the sheet metal to conform or flow into hemispherical, oval, or irregular forms by motion, which was invented in France a few years ago, but which is now extensively adopted in England. The process is called "spinning," and is rapidly superseding the die-stamping method wherever it can be employed advantageously, because it acts more kindly on the metal. It is the result of gentle pressure combined with rapid motion, and involves a great principle; the effect is due to motion in connection with time. The chief feature in all such changing of form, is the giving sufficient time for the particles to move or flow. To press the flow too rapidly would cause the sheet to tear from rupture of particles. In the operation of spinning, this tendency to tear is defeated by communicating a very rapid circular motion to the sheet of metal, and then by means of an instrument or instruments held in the hand, a gentle pressure is brought to bear on one point, thus causing a slight depression, but as the sheet is spinning at a high velocity, the depression at once forms a circle, and so by continuing the pressure of the instrument it is moulded into any form accordingly.

The operation of spinning is performed in a species of lathe. A mould of the required form is generally fixed on the end or face plate of the revolving spindle; the sheet or disc of metal is held by pressure from another headstock against the mould, and thereby the local pressure of the instrument is thus adroitly formed into the shape of the mould behind it.

On the table before us are specimens of the progressive manufacture of the lids of powder-cases, as they are made in the Royal Arsenal by this principle of operation, termed "spinning," by examining which, its nature will be understood; it will also be seen how much change of form, or rather movement among molecules, is requisite to produce the rigid or brittle condition that necessitates the annealing process, in order to restore the malleable and ductile property, which is required to still further change the shape. There is first the entire mouthpiece of the case in the form, here shown, in Fig. 13*a*, ready to be attached to the flat surface of the case top; the stationary part has reached its present peculiar shape, A, through five stages. It is first cut into the flat disc, B, then the disc is spun so far as C; it is now requiring to be amealed, and, after this, it is turned into the

Fig. 13*a*.



third condition; it is then spun into the fourth stage, D, and from that to the finished article, A. The lid which fits into A is composed of two separate pieces, both made by spinning from discs, and both pieces, when complete, are united by spinning over a lap of one upon the other. It will be observed that certain corrugations are produced by the process; these add greatly to the strength, but scarcely anything to the cost. It will also be seen how nicely the lid fits into the mouthpiece; this nice fit does not depend on the workmen, but wholly on the mould in the lathe, from which it is correctly transferred by copying, by the pressure of the spinning instrument.

The French, who were the originators of the process, employ it with great dexterity in a variety of ways, more especially in the production of such articles as large oval dish-covers. The sheet is secured to the centre of what may be called an oval chuck, and by a dexterous use of two pieces of greased box-wood held in both hands, the workman very cleverly prevents the sheet from puckering as he spins it into an oval, and finally turns over the outer edge into a border, thus giving it rigidity as well as a neat finish. The time required for the operation is so short as to be scarcely credible, and has to be seen to be appreciated.

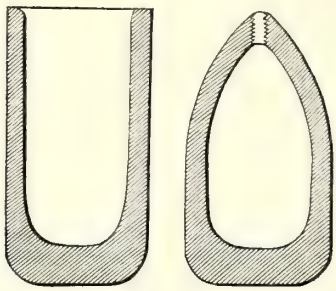
The metal wrought-iron, as used by the smith, is also exceedingly malleable, both hot and cold, but especially when it is hot. All are familiar with this metal in the condition called "tinplate," which is a thin sheet of iron spread out with rollers, afterwards cleaned, then covered with tin as a preservation from oxidation as well as for appearance, besides the facility which it affords for being united by solder in the hands of the tinman.

In the Great Exhibition of 1851, a foreign exhibitor had an iron book, in which the leaves were made of iron as thin as tissue paper, and iron may be seen of any substance or shape, every variety of bar, or, worthy of Vulcan, up to armour plates of fifteen inches in thickness or 25 feet long, 5 feet wide, and 8 inches thick, as made at the well-named "Cyclops" Works. Iron or steel may be drawn into gun-barrels like dough over a mandril, but one of the most marvellous illustrations of the malleable, ductile, and flowing properties of wrought-iron is shown by the manufacture of quicksilver bottles. These bottles are made in various ways; in the process referred to the bottle is made out of a circular disc of iron plate, which contains the quantity of iron necessary to form the article. By the stamping process already described, the disc of iron is gradually brought round to be of a cylinder shape resembling the form of drinking glass called a tumbler. This cylinder is then put upon the end of a steel pin or mandril, and, by mechanical pressure, is pushed through a hole, which hole is smaller than its own dimension, thereby reducing its exterior diameter, but at the same time drawing or rather pushing the iron over the mandril in the same manner as a piece of dough could be drawn over the finger to fit like a glove. This process is repeated through a succession of smaller and smaller holes, one after the other, until at

length it becomes a long cylinder, close at one end but open at the other. The neck of the bottle has next to be formed on the same principle, by an often-repeated pressing and twisting at the open end into a conical die, by which means it is gradually and successfully brought to the form of the bottle neck, in which a screw is afterwards formed for the stopper by the ordinary means.

During the Crimean war, a large manufacture of wrought-iron shells was carried on in the Royal Arsenal, not precisely, but nearly in the same manner. They were made in an elongated form, and of an oval section, as shown on the diagram, Fig. 14. These shells were

Fig. 14.



made out of a single piece of iron, in which, to form the cylinder, welding was so far employed, but were then brought to the bottle shape by what may be called hammers. The mouth of the shell was attacked simultaneously by a circle of hammers, whose united surfaces afforded the required shape, while the other parts of the machine prevented the shell from flinching during the operation, and thus it gradually came into the required bottle shape without any puckering, which most men would previously have expected. Such a result was entirely due to the uniform effect of the combination of hammers, thus constituting a sort of die.

The elongation of a quicksilver bottle over a mandril partly anticipates the nature of the ductile property, yet not entirely so. Ductility is that natural property by means of which a solid substance, such as iron, steel, and other metals, can be drawn or pulled out to almost any degree of fineness. This property, although often accompanying malleability, does not do so in some cases, such as in lead, possibly for want of tenacity, as lead can be squirted into a thread of any fineness by pressure. This natural property of ductility is taken advantage of to produce endless variety of form, but in all the mechanical principles employed are nearly alike—namely, to pull the metal through a rolling or stationary hole, and thus to alter its form or dimensions.

To take the simplest and most familiar case, that of common wire-making, the iron or other metal is first rolled out into a long bar of small diameter; the end of this bar is reduced in pointed fashion so as to enter a conical hole in a steel "draw-plate," as it is termed, the hole being smaller than the remainder of the bar; a pair of pincers worked by machinery seizes hold of the small end of the bar; the draw plate is held rigidly; then the force applied is sufficient to overcome the unwillingness of the particles to move, but the flowing property permits the change, and the iron rod is thereby drawn out into a smaller and longer wire, which is repeated through smaller and smaller holes in succession, with occasional annealing, until at length the requisite fineness is arrived at. From this it will be seen that the shape of the wire depends on the form of the hole in the draw plate, and may be to any pattern—sprigs of flowers for the calico printer, toothed pinion steel wire for the watch and clock maker, or even tempered steel wire of all sizes for the pianoforte maker.

Wire has been used in Europe for more than 400 years. At first it was made by drawing down, in blacksmith fashion, with the hammer upon an anvil. The draw-plate was invented in Germany about 300 years ago, but it was comparatively little used until recent times. Now, the rolling-mill and the draw-bench are combined into one system of manufacture, by means of which the rate and diminished cost of production have developed the trade so enormously as to have led to the use of iron and steel wire for ropes, bridges, fencing, telegraph, and so many other new purposes, that it has at length become a great branch of industry.

Hollow tubes are now manufactured of all sizes, and out of all the ductile metals. This apparently difficult process is accomplished in several ways. With one system it is done by first forming a hole through a short, dumpy piece of metal, either by casting or drilling; into this hole a mandril is inserted, and then the dumpy mass, by means of the drawing process or by rolls, is passed through a succession of holes until it covers the mandril from end to end. This mandril may be a fine wire, or large enough to form the tubes for a steam boiler. A similar process, but substituting rolls for the draw-plate, is mostly employed for the larger sizes. The same or similar principle is frequently employed to make tubes, close at one end, these tubes being of various sizes; in such case the holes are not passed entirely through the mass; the mandril is inserted, and is then pushed through the successive holes in the draw-plate, until the metal is extended over the mandril. Sometimes the piece is formed from a disc into a thimble form, and then put on a mandril to be elongated. There is also an extensive manufacture of iron wire and of iron tubes, both being covered with a thin brass tube, by which means not only beauty but greater strength is obtained at a reduced rate; and for such purposes as these articles are used, viz., picture-rods, hand-rails, shop windows, carpet-rods, and such like, the arrangement fulfils the object equal to an entire brass structure. The iron-wire or tube is made as before described; the outer brass tube is made in a similar manner, but sufficiently large to admit of its being slipped over the iron. The iron may now be considered as a mandril, and the two are drawn through the draw-plate together, thus fixing the thin brass tube upon the iron, while the whole surface exposed is brass.

The so-called copper wire which is now extensively used by upholsterers for the spring cushions of sofas, beds, and similar purposes, is merely iron wire, which is made in the ordinary manner until just before the last process, when it is immersed in a solution of sulphate of copper for a short time, sufficient to allow a thin film of copper to be deposited on the surface of the iron wire. The iron wire thus covered with copper is now drawn through a draw-plate, by which it is rendered hard and elastic, and suitable for a spring, at the same time the dull surface of the deposited copper is made as bright as a new farthing, and serves to protect the wire from oxidation.

There is yet another application of the natural law, which a few years ago would have been reckoned an impossibility, it is the process for drawing conical tubes. Nothing yet said will explain how this can be done. A taper mandril will suggest itself, which, so far, is simple. But the die of varying diameter, how is that to be obtained? For a long time rolls for rolling taper gun-barrels have been in use, in which a succession of tapering grooves are formed, while, by dexterous management, the roller contrives to insert the thick end of the gun-barrel at the precise point in the revolving rolls, and thus the gun-barrel is elongated towards the muzzle by means of the narrowing groove in the rolls; bayonet blades are likewise drawn out in the same manner. In the process to which I now refer, for the drawing out of the long tapering brass tubes, an expanding die is used for a draw-plate. This die consists of a ring of block-tin, containing a small per-centage of copper, to give it a little greater rigidity; this ring is applied at the smaller end

of the mandril, and the brass is drawn through the die. By this means two effects are produced, first, the metal is drawn over the mandril to a small extent, and, secondly, the die is destroyed, from the extension to which it has been subjected; it is therefore thrown into the melting-pot, to be cast into a new die, and thus, by a succession of new dies, the metal is gradually drawn over the steel taper mandril, until it is covered with brass from end to end, when the steel mandril is withdrawn.

There is yet another remarkable process in connection with this natural property, which is taken advantage of in the formation of ornamental twisted tubes of various patterns, such as we see in the gas fittings of churches and other places. To produce such tubes, the brass is first drawn into a plain tube upon a mandril, in the way described; this plain tube is then passed through a succession of revolving blunt screw-tools, having the required form upon their interior surface. In form the tool is arranged as a screw nut, but not being adapted to cut the metal, and the plain tube being without a mandril, its surface is slightly depressed by the screw pressure, and by a succession of such screw-tools, or nuts, it is finally depressed to the finished ornamental pattern as required.

We sometimes see these ornamental tubes of a diamond screw pattern, where the spiral is crossed by another spiral, uniformly along the entire surface. This is done by means of two sets of screw tools, one set turns to the right hand, the other set to the left hand, and between the two the pattern is formed. This pattern may be of any section, plain, square, octagonal, ribbed, rounded, or otherwise, all depending on two principles, first, the flowing properties of the atoms of the metal, and secondly, the copying arrangement, by which the required pattern is transferred to the tube under operation, thus shifting the relative position of the molecules, yet without cutting the metal.

Referring again to the wire-drawing process, such is the effect produced by the operation that, contrary to what might have been expected, the strength of the wire or steel is greatly increased. In the case of iron of an ultimate strength of 25 tons per inch, it is increased in strength fully 10 tons, and some of the best iron, with a strength of 28 tons, is raised to 40 tons. The most remarkable change in this respect is in the case of steel music-wire. The mild steel out of which this is made has a strength, when in the natural state, of from 30 to 40 tons, according to its steeliness, but when tempered mildly by being made red-hot and then cooled in oil, and elongated into wire, its strength is increased fully threefold. At the same time, if such steel or even iron wire is made red-hot, so as to allow the natural law to assert itself, all these high conditions vanish, with only one redeeming quality, that the wire then becomes more pliable, and similar in strength to the iron or steel out of which it was made.

The knowledge that this treatment of steel has the effect of increasing its strength and toughness so enormously, has produced fruits in several directions. One of these, bearing on the present subject, is the attempt to draw steel tubes of any length, or section or substance. Throughout the engineering world there are many purposes (indeed, wherever motion is involved) for which a strong light material would be extensively applied, provided it could be obtained at a moderate cost. To accomplish this operation, a hole or slit, according to the section required, is first formed in a short thick mass of steel; two dies are employed, the one internally (which remains in use throughout the operation), the other externally (which has to be exchanged for a smaller one at every passage). Then enormous hydraulic pressure is brought to bear in pulling it through the vacant space between the internal and the external dies, thus leaving a portion of the steel behind, which forms a reservoir of steel for the increased length, by future elongating with that which could not pass through at the rate of motion of the apparatus, but to follow suit as it has opportunity, and then, by annealing the mass of steel, and using smaller and smaller external dies in succession, the thick lump becomes gradually elongated into any length of any section, and, if necessary, with the high qualities of the music wire.

With the object of carrying out such a maufacture, a company was recently formed in London to produce steel tubular forms of any size or section. A variety of remarkable specimens were produced by them which made every engineer's mouth water, and although commercially it has not yet succeeded (simply because the arrangements of the world were not quite ripe for it), still that, judging by all past experience, does not affect the question any more than the receding wave affects the rising tide. The grand fact remains that it is a possibility, by sufficient pressure and patience, to cause solid steel to flow into any hollow form of section without breaking its continuity; it is a wonderful triumph of mind over matter which cannot be ignored, and which has yet to accomplish most important results in the future history of the mechanism of the working world of applied mechanics, and the advantages are so apparent and so numerous, that its ultimate success is only a question of time.

My chief object in making the foregoing remarks, is chiefly to show that the natural laws which govern materials and things are a great lesson to be taught to our young students, before they enter the workshops of applied mechanics, and to show that the varied operations of the practical worker are thus intimately blended with the profoundest philosophy, and that the fashioning of matter into the various forms required by our civilisation, is not the drudgery, to a thinking mind, which it is generally considered to be, but that we are fellow-workers in carrying out and taking advantage of the natural laws, as laid down for men by the Grand Designer of the Universe.

EDUCATION, SCIENCE, AND ART IN INDIA.

Mr. Grant Duff, in an admirable statement of the finances of India, in the House of Commons on Tuesday last, spoke as follows:—

"The next item to which he would allude was education, science, and art—our civilising agencies, which, with its £780,000, showed very poorly beside our colossal military outgoings. The purely educational portion of this sum of £780,000 went, for the most part, to the maintenance of government schools and colleges, but some of it also for grants in aid, scholarships, payment of inspectors, government book depôts, &c. We had six classes of schools in India—1, village or vernacular schools; 2, district schools, where English was taught in the higher classes; 3, colleges, where the education was conducted in English; 4, two presidency colleges, each with a faculty of Arts and Law; 5, the engineering and medical colleges; 6, the normal schools. In all, we might have about 20,000 school establishments, with a continually improving network of official inspection. It was a matter for congratulation to those who had had of late years the disposal of Indian patronage, that when the University of Edinburgh was called upon to select a successor to a man so very eminent as the late Sir David Brewster, it sent to the other end of the world for the Director of Public Instruction at Bombay. So much for our teaching machinery. Our machinery for testing the success of our higher education consisted of three universities—one at Bombay, one at Madras, and one at Calcutta; all three modelled on the University of London, and doing their work extremely well. £780,000 would not be a large sum, if the whole of it were spent on education, but out of this inconsiderable amount came innumerable expenses, such as those of our great surveys, the trigonometrical, the topographical, the revenue, and others; so also did the expenses of observatories, museums, scientific

and literary institutions, botanical gardens, and other things too numerous to mention. In the Central Provinces, which were about as big as the British Isles, surveys and museums seemed to have cost, in the year of which he was speaking, the magnificent sum of £35. This was, however, the day of small things in all these matters, and he heartily hoped that this item of Indian expenditure would steadily increase, because money expended on education and civilisation would, to take the lowest view, soon pay us cent. per cent."

ANNUAL INTERNATIONAL EXHIBITIONS OF SELECTED WORKS.

Her Majesty's Commissioners for the Exhibition of 1851 announce that the first of a series of annual international exhibitions of selected works of fine and industrial art will be opened in London, at South Kensington, on Monday, the 1st of May, 1871, and be closed on Saturday, the 30th September, 1871.

The exhibitions will take place in permanent buildings, about to be erected adjoining the arcades of the Royal Horticultural Gardens.

The productions of all nations will be admitted, subject to obtaining the certificate of competent judges that they are of sufficient excellence to be worthy of exhibition.

The objects in the first exhibition will consist of the following classes, for each of which will be appointed a reporter and a separate committee:—

I. *Fine Arts.*—1. Painting of all kinds, in oil, water colours, enamel, porcelain, &c. 2. Sculpture in marble, wood, stone, terra-cotta, metal, ivory, and other materials. 3. Engravings, lithography, photography, &c. 4. Architectural designs and models. 5. Tapestries, embroideries, lace, &c., shown for their fine art and not as manufactures. 6. Designs for all kinds of decorative manufactures. 7. Copies of ancient pictures, enamels, reproductions in plaster, electrotypes of fine ancient works of art, &c.

II. *Scientific Inventions and New Discoveries of all kinds.*

III. *Manufactures.*—(*a.*) Pottery of all kinds, including that used in building, viz., earthenware, stoneware, porcelain, parian, &c., with machinery and processes for the preparation of such manufactures. (*b.*) Wool and worsted fabrics, with the raw produce and machinery for manufactures in the same. (*c.*) Educational—1. School buildings, fittings, furniture, &c.; 2. Books, maps, globes, &c.; 3. Appliances for physical training, including toys and games; 4. Specimens and illustrations of modes of teaching fine art, natural history, and physical science.

IV. *Horticulture.*—International exhibitions of new and rare plants, and of fruits, vegetables, flowers and plants, showing specialities of cultivation, will be held by the Royal Horticultural Society, in conjunction with the above exhibitions.

In Classes II. and III. producers will be permitted to send one specimen of every kind of object they manufacture, such object being distinguished for novelty or excellence. Detailed rules applicable for each of the above classes, and lists of the separate trades engaged in the production of objects of manufacture, will be issued. Special rules for horticultural exhibitions will be issued by the Royal Horticultural Society.

The arrangement of the objects will be according to classes and not nationalities, as in former International Exhibitions.

One-third portion of the whole available space will be assigned absolutely to foreign exhibitors, who must obtain certificates for the admission of their objects from their respective governments. Foreign countries will appoint their own judges. The remaining two-thirds of the space will be filled by objects produced either in the United Kingdom, or, if produced abroad, sent direct to the building for inspection and approval of judges selected for the British exhibitors. Objects not accepted for exhibition must be removed according to the notices given, but no objects exhibited can be removed until the close of the exhibition.

All exhibitors, or their agents, must deliver at the building, into the charge of the proper officers, the objects unpacked and ready for immediate exhibition, and free of all charges for carriage, &c.

Her Majesty's Commissioners will find large glass cases, stands, and fittings, free of cost to the exhibitors, and, except in the case of machinery, carry out the arrangement of the objects by their own officers.

Her Majesty's Commissioners will take the greatest possible care of all objects, but they will not hold themselves responsible for loss or damage of any kind.

Prices may be attached to the objects, and exhibitors will be encouraged to state their prices. Agents will be appointed to attend to the interests of exhibitors.

Every object must be accompanied with a descriptive label, stating the special reason, whether of excellence, novelty, or cheapness, &c., why it is offered for exhibition.

Due notice will be given of the days for receiving each class of objects; and, to enable the arrangements to be carried into effect, strict punctuality will be required from all exhibitors, both foreign and British. Objects delivered after the days appointed for their reception cannot be received.

Reports of each class of objects will be prepared immediately after the opening, and will be published before the 1st June, 1871.

Each foreign country will be free to accredit an official reporter for every class in which objects made in such country are exhibited, for the purpose of joining in the reports.

There will be no prizes, but a certificate of having obtained the distinction of admission to the exhibition will be given to each exhibitor.

A catalogue will be published in the English language, but every foreign country will be free to publish a catalogue in its own language if it think fit.

THE LONDON CAB SYSTEM.

The following is an abstract of the Bill for amending the law relating to hackney and stage carriages within the metropolitan police district, prepared and brought in by Mr. Bruce, Secretary of State for the Home Department, and Mr. Knatchbull-Hugessen:—

It proposes to enact that one of Her Majesty's Principal Secretaries of State may, from time to time, license to ply for hire, within the limits of this Act, such number of hackney and stage carriages of such description, and to be distinguished in such manner, as he may by order prescribe. Any license in respect of a hackney or stage carriage under this section may be granted at such price, on such conditions, be in such form, be subject to revision or suspension in such events, and generally be dealt with in such manner as the said Secretary of State may by order prescribe, subject as follows:—

That a hackney or stage carriage license shall, if not revoked or suspended, be in force for one year, and there shall be paid in respect thereof to the receiver of the metropolitan police, to be carried to the account of the metropolitan police fund, such sum, in the case of a hackney carriage not exceeding £2 2s., and in the case of a stage carriage not exceeding £3 3s., as the said Secretary of State may prescribe.

That in any such orders provision shall be made for the transfer of a hackney or stage carriage license to the widow or to any child of full age, of any person to whom a hackney or stage carriage license has been granted, who may die during the continuance of such license, leaving a widow or child of full age, and also for the transfer of a hackney or stage carriage license to the husband of any woman to whom such license has been granted and who marries during the continuance thereof.

Penalties are also to be imposed on the use of unlicensed carriages.

No hackney or stage carriage shall ply for hire unless under the charge of a driver having a license from the Secretary of State. If any hackney or stage carriage plies for hire in contravention of this section, the person driving the same, and also the owner of such carriage, unless he proves that the driver acted without his privity or consent, shall respectively be liable to a penalty not exceeding 40s.

A license to the driver of a hackney or stage carriage may be granted at such price, on such conditions, be in such form, be subject to revocation or suspension in such events, and generally be dealt with in such manner as the Secretary of State may by order prescribe, subject to this provision, that the license shall, if not revoked or suspended, be in force for one year, and there shall be paid in respect thereof to the receiver of the metropolitan police, to be carried to the account of the metropolitan police fund, such sum not exceeding 5s. as the Secretary of State may prescribe.

The Secretary of State may from time to time, by order, make regulations for regulating the number of persons to be carried in any hackney or stage carriage, and in what manner such number is to be shown on such carriage, and how such hackney carriages are to be furnished or fitted.

For fixing the stands of hackney carriages, and the distances to which they may be compelled to take passengers, and the persons to attend at such stands.

For fixing the rates or fares, as well for time as distance, to be paid for hackney carriages, and for securing the due publication of such fares; provided that it shall not be made compulsory on the driver of any hackney carriage to take passengers at a less fare than the fare payable at the time of the passing of this act.

For forming, in the case of hackney carriages, a table of distances, as evidence for the purpose of any fare to be charged by distance, by the preparation of a book, map, or plan, or any combination of a book, map, or plan.

For securing the safe custody and re-delivery of any property accidentally left in hackney or stage carriages, and fixing the charges to be paid in respect thereof, with power to cause such property to be sold or to be given to the finder, in the event of its not being claimed within a certain time.

In fixing the stands for hackney carriages within the City of London and the liberties thereof, the consent of the Court of the Lord Mayor and Aldermen shall be required to any stand appointed by the Secretary of State.

No hackney carriage shall be compelled to take any passenger beyond the limits of this Act, or a greater distance for any one drive than six miles.

During such portion of time between sunset and sunrise as is from time to time prescribed, no driver shall ply for hire unless the hackney carriage under his charge be provided with a lamp, properly trimmed and lighted, and fixed outside the carriage in such manner as is prescribed.

In this Bill "stage carriage" is defined to mean any carriage for the conveyance of passengers which plies for hire in any public street, road, or place within the limits of this act, and in which the passengers or any of them are charged to pay separate and distinct, or at the rate of separate and distinct, fares for their respective places or seats therein." "Hackney carriage" means any carriage for the conveyance of passengers which plies for hire within the limits of this Bill, and is not a stage carriage.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb.

Delivered on 13th July, 1869.

197. Bill—Telegraphs.
202. ,, Public Works (Ireland).
292. Friendly Societies (Scotland)—Report.
299. Constabulary (Ireland)—Statement.

Delivered on 14th July, 1869.

181. Bill—Metropolitan Board of Works (Loans).
208. ,, Drainage and Improvement of Lands (Ireland) Act (1863) Amendment.
209. ,, Irish Church (as amended by the Lords).
210. ,, Inclosure Awards (County Palatine of Durham) (amended).
211. ,, Nitro-glycerine.
282. Municipal Boroughs (England and Wales)—Abstract.
305. Witnesses (House of Commons)—Report from the Select Committee.

Delivered on 15th July, 1869.

177. Bill—Corn and Grain Measurement.
207. ,, Roads and Bridges (Scotland).
212. ,, Contagious Diseases (Animals) (No. 2) (amended in Committee, and on Re-commitment).
213. ,, Poor Law (Ireland) Amendment (No. 2) (amended by Select Committee).
214. ,, Metropolitan Building Act (1855) Amendment.
280. Superior Courts of Common Law, &c.—Return.
294. Registration of Voters—Report.
307. New Zealand, Part I. (War)—Return.
310. Post Office Savings Banks—Return.
313. Clerk of Assize—Report.
320. Cattle and Sheep—Report of Dr. Simonds.
Technical Instruction in Germany and Switzerland—Report.

Delivered on 16th July, 1869.

215. Bill—Parochial Schools (Scotland) (amended).
216. ,, Trades Unions (Protection of Funds).
217. ,, Public Schools Act (1868) Amendment.
87. Public Accounts—First and Second Reports.
317. New Courts of Justice—Correspondence.
322. Education (Scotland)—Minute.
Miscellaneous Statistics of the United Kingdom, Part VII.

Delivered on 17th July, 1869.

201. Bill—Warehousing of Wines and Spirits, &c.
203. ,, Clerks of Assize.
206. ,, Cinque Ports Act Amendment.
290. Isle of Man—Account.
309. Brewers, &c.—Accounts.
314. Adulteration of Food and Drink (Metropolis)—Return.
Public Petitions—Twenty-ninth Report.

Delivered on 19th July, 1869.

218. Bill—Courts of Justice Salaries and Funds (as amended on consideration).
87. (I.) Public Accounts—Appendix to Reports.
318. Militia Regiments (Foreign Service)—Return.

Delivered on 21st July, 1869.

219. Bill—Railways Abandonment (amended).
220. ,, Railway Construction Facilities Act (1864) Amendment (amended).
221. ,, Metropolitan Commons Act (1866) Amendment (as amended by the Select Committee).
222. ,, Seeds Adulteration (as amended by the Select Committee).
224. ,, Basses Lights (Ceylon).
311. Fortifications—Accounts.
325. Colonial Governors—Return.
330. Fortifications—Statement.
332. East India (Progress and Condition)—Statement.
333. Metropolitan Commons Act (1866) Amendment Bill—Special Report.
336. Office of Works—Papers.
Public General Acts—Chap. 23 to 31.

Delivered on 22nd July, 1869.

223. Bill—Fortifications (Provision for Expenses).
337. (A.) Poor Rates and Pauperism—Return (A).
342. Pauperism (Metropolis)—Returns.

Session 1868.

433. (10) Endowed Charities (County of Leicester)—General Digest.

Delivered on 23rd July, 1869.

225. Bill—New Parishes and Church Building Acts Amendment.
226. ,, Contagious Diseases (Animals) (No. 2) (as amended on consideration of Bill as amended).
229. ,, Admiralty District Registries.
230. ,, Railway Construction Facilities Act (1864) Amendment (as amended in Committee, and on Re-commitment).
306. Contagious Diseases Act (1866)—Report.
321. Lunacy—Twenty-third Report of Commissioners.
324. Smoke Nuisance Abatement (Metropolis) Act, 1853—Return.
326. Education (Ireland)—Annual Report.
327. Public Income and Expenditure (30th June, 1869)—Account.
329. Chamber of London—Annual Accounts.

Patents.

From Commissioners of Patents' Journal, July 30.

Grants of Provisional Protection.

Agricultural implement for digging—1722—J. C. Norman.
Agricultural implements—2141—J. H. Johnson.
Æro-hydraulic engines—2126—V. Colne.
Bale ties—2214—M. Tildesley.
Bed-head bags, &c.—1972—R. Knowles and J. Lindley.
Bicycles, &c.—2154—B. Russ.

Billiards, &c., apparatus for indicating the points made and registering the number of games played at—2136—J. J. Cousins.
Blast furnaces—2149—J. W. Ormiston.
Boilers for marine purposes—2072—W. Allan and P. D. Nichol.
Boots and shoes, manufacturing and fastening the soles and heels of 2220—W. Currie.
Boots, &c., machinery for manufacturing upper leathers for—2132—W. W. H. Smith.
Brick buildings, waterproof facing for—2206—G. Follett.
Buttons and studs—1764—C. E. de Lorière.
Cables for the transmission of electric currents—2177—A. M. Clark.
Camping trunks—1959—C. L. V. Yon.
Canal boats, &c., propelling—2064—H. H. Murdoch.
Canal boats, &c., propelling—2147—W. R. Lake.
Cards for carding cotton, &c.—2086—J. Worth and W. Turner.
Cast iron rolls and shafts, &c., bearings for—2192—W. Rose.
Circular saw benches—2146—J. Grint.
Coiled springs, &c.—2138—C. D. Abel.
Combs—2234—J. Hayward.
Cotton, &c., spinning, &c.—2197—H. Higgins and T. S. Whitworth.
Cucumber frames, &c., apparatus for opening and closing the lights of—2150—G. Yates and J. R. Williams.
Disinfectants, supplying and distributing—2186—T. Holt.
Driving belts—2188—F. Fleming.
Dyeing and printing—2196—J. H. Johnson.
Electro-magnetic engines—2160—H. E. Newton.
Fecal and excremental matters, &c., disinfecting and deodorizing—815—J. Carter.
Feeding bottles—1980—W. Coleman and S. Turton.
Fire-arms, breech-loading—2159—H. E. Newton.
Fire-arms, breech-loading—2164—A. Ancion.
Fire-arms, breech-loading—2218—G. T. Abbey.
Fire-arms, &c., breech-loading—2107—T. Restell.
Flax, machinery for dressing and preparing—2131—G. Lowry.
Flax, &c., apparatus for preparing—2005—A. V. Newton.
Forge fires—1350—J. Conway.
Gas meters—2163—D. N. Defries.
Glass blowing—2182—J. B. Fondu.
Hoods for invalid perambulator and other vehicles—2230—J. Walsh.
Hops, obtaining extract from—2212—J. H. Johnson.
Horse boots, elastic—2184—W. Williams.
Horse rakes—2200—H. B. Clark.
Hydrochloric acid—2139—J. T. Way.
Knife-cleaning apparatus—2161—A. Simpson.
Letter boxes, &c.—2228—W. Dennis.
Liquids, apparatus for drawing—2151—F. G. Fleury.
Liquids, apparatus for evaporating—2144—W. Hosack.
Locomotives, &c.—2135—C. de Bergue.
Looms—2130—J. and J. Leeming.
Looms—2180—B. Hunt.
Manumotive apparatus—2181—R. Duerre.
Marline spikes—2204—W. R. Lake.
Matchets and cutlasses—2216—F. M. Mole.
Metallic surfaces, removing artificial coatings from—2053—W. R. Lake.
Mills for grinding and crushing corn, &c.—2183—T. Thomas.
Mosaic, &c.—2156—W. Pidding.
Nails, &c., machinery for making—2158—E. F. Jones.
Oxygen, apparatus for charging atmospheric air with—2137—J. T. A. Mallet.
Paper pulp, converting wood shavings, &c., into—2178—R. Schloesser and J. Irving.
Photographic apparatus—2193—D. Trevor.
Propelling apparatus, land or water—2194—A. Stansfeld.
Railroad cars, &c., springs for—2208—A. H. Brandon.
Railway carriages, buffing—2189—R. Saunders.
Railway carriages, seats of—2127—J. Crowther.
Railway crossings—2148—R. P. Williams.
Railway trains, communication in—2125—J. Leetch.
Roofs and floors, rafters for—2185—R. G. Fisher.
Rope, &c.—2199—J. Ellison.
Rope, &c.—2224—J. Green.
Sewing machines—2170—J. H. Johnson.
Sewing machines—2171—J. Imray and G. G. M. Hardingham.
Ships—2145—W. Hosack.
Ships—2202—J. Duke.
Smelting, obtaining and utilising heat in the operation of—2142—J. Bernard.
Smelting, &c.—2140—J. Bernard.
Sofa-bedsteads—2089—W. R. Lake.
Steam engines, mechanism for starting and working—2174—W. Macgeorge and A. Rigg, jun.
Steam generators—2176—W. E. Gedge.
Street-sweeping machines—1761—T. G. Greenstreet.
Traction engines, &c., carrying the steering or other road wheels of—2162—M. Eyth.
Transfer engraving—2175—R. Neale.
Umbrella handles, &c.—2168—J. Bernstein.
Velocipedes—2173—W. Leftwich.
Velocipedes—2226—W. Bull.
Velocipedes, &c.—2187—R. Olivier.
Washing machines, &c.—2236—W. Laing.
Water, apparatus for raising, forcing, and regulating the flow of—2152—R. B. Evered and R. Hurst.
Window sashes, &c., axle pulleys for suspending—2167—C. J. Harcourt.
Wire ropes, &c., securing the free ends of—2191—J. E. Holmes.
Yarn or thread, machinery for winding—2210—J. Boyd.

Inventions with Complete Specifications Filed.

Boilers and furnaces—2232—R. Boyd.
Looms, harness motion for power—2242—G. T. Bousfield.
Shearing or clipping apparatus—2279—W. R. Lake.
Water-measuring apparatus—2276—T. Parsons.

Patents Sealed.

324. V. Baker.
325. J. Slater.
331. F. Vauderaey.
334. W. Maddick.
335. R. R. Frohock.
352. H. Jones.
354. J. Jobson.
360. J. Taylor.
368. H. A. Dufrené.
425. W. R. Lake.
458. W. R. Lake.
468. W. Smartt.
483. J. Atkins.
561. B. W. Farey.
575. R. Morton.
634. J. Farrington.
849. J. D. Morrison.
1007. R. Allan.
1014. G. F. Griffin.
1077. W. A. Hunter.
1097. W. Ashton & J. H. Storey.
1572. W. H. Dupré.
1575. C. W. Siemens.
1642. J. Brönner & H. Gutzkow.
1660. J. Sturgeon.
1686. T. R. Clarke, W. Bywater, T. Lawson, and C. L. Lister.
1711. C. Ostlund.
1715. J. Lloyd.
1721. J. H. Johnson.
1797. W. R. Lake.

From Commissioners of Patents' Journal, August 3.

Patents Sealed.

356. W. Blundell.
357. J. Page.
367. C. S. Dawson.
369. J. S. Offord.
378. B. Walker and W. Tilson.
388. B. Hunt.
423. J. Carter.
445. W. Summers.
469. L. N. Legras.
500. T. H. Martin.
514. S. Myers.
530. H. W. Whitehead.
573. B. Hunt.
697. J. A. Jaques, J. T. Oakley, and J. A. Fanshawe.
730. W. R. Lake.
779. J. Thomas.
843. A. V. Newton.
858. W. H. Phillips.
1015. D. J. Hoare.
1021. W. Johnson.
1057. W. H. Douglas.
1153. J. G. Jennings.
1345. E. and T. Waltham.
1468. T. G. F. Dolby.
1583. R. Orley.
1589. S. Thomas, jun.
1811. G. W. Howe.
1847. B. Wartski.
1856. A. Destouy.

Patents on which the Stamp Duty of £50 has been paid.

2020. W. Smith.
1959. J. Adams.
1960. W. Richards.
1964. T. Greenwood & W. Keats.
1992. W. Furness and W. Bray.
1986. S. Chatwood and J. and T. Sturgeon.
2010. P. Murray.
2039. H. Holland.
2312. C. E. Brooman.
1963. J. McKenzie, T. Clunes, and W. Holland.
1970. J. J. Bodmer.
1994. J. T. H. Richardson.
2001. S. T. Armstrong.
1984. J. Parry and R. Morris.

Patents on which the Stamp Duty of £100 has been Paid.

2169. J. W. Woodford.
2175. A. V. Newton.
2181. G. A. Biddell.
2193. G. Coles, J. A. Jaques, and J. A. Fanshawe.

Registered Designs.

3030—June 9—An improved surface condenser—A. and R. Brown, Regent-road, Liverpool.
3031—June 14—Improved cloak or skirt—H. Nicoll, Regent-street, London.
3032—June 16—Combined despatch box and desk—John W. Allen, 37, Strand, London.
3033—June 17—Parts of a tobacco pipe—Underhill and Jones, New-street, Birmingham.
3034—July 1—Safe edge for cattle troughs and cisterns—Burney and Co., Millwall, London.
3035—July 6—Steer's registered ear wire—Henry Steer, Market-head, Derby.
3036—July 9—Manger and hay rack, with a self-cleaning water trough—H. R. Cottam, St. Pancras Ironworks, N.W.
3037—July 16—A boot and shoe upper—W. Harber, 25, Moseley-road, Birmingham.
3038—July 22—A new instrument for attaching papers and documents—Alex. Inglis, Highbury-hill-park, N.
3039—July 22—A socket for knobs—Samuel Heath, Leopold street, Birmingham.
3040—July 27—An apparatus for removing cigars from and replacing them in their boxes—John Jabez Stocken, 10, Gracechurch-street, London.
3041—July 29—An improved gum bottle—S. Maw and Son, Aldersgate-street, London.
3042—August 2—The registered type ribbon—Stephenson, Blake, and Co., Sheffield.

Journal of the Society of Arts.

FRIDAY, AUGUST 13, 1869.

Announcements by the Council.

National Elementary Training and Education.

The following letter, covering copy of the *Journal* of last week, has been addressed to Mr. J. C. Bennett, Chairman of the Board of Management of the District School at Anerley :—

Society for the Encouragement of Arts, Manufactures, and Commerce, John-street, Adelphi,
London, W.C., 6th August, 1869.

Sir,—I am directed by the Council of the Society of Arts to express to yourself and your colleagues, forming the Board of Management of the Anerley District School, their sincere thanks for the opportunities afforded them of inspecting the working of the school. The Council have derived great gratification from their two visits, and hope you will allow them to record their opinion that the extended knowledge of this and similar schools must be of immense importance to national education in the future. The Council find here conclusive evidence that children, from a low social and physical level, may be trained into health and activity, and taught the practice of different industries, upon a system which, at the same time, enables their intelligence to be cultivated with much less labour, and in a shorter period, than if they were kept entirely to book-learning, as in ordinary schools. With regard to the bodily training of the children, the Council would observe that their high appreciation of the advantages of the practice of the military drill is corroborated by the independent practical experience of distinguished members of the Society of Arts and others, extracts from whose evidence will be found at page 729 of the *Journal* of the Society, transmitted herewith. The Council have been deeply touched by the fact that poor children are, by means of these schools, rescued from that vice and neglect which would otherwise leave them to become a costly burden to the State, and are converted into useful members of the community, amply repaying the cost which the country has incurred on their behalf.

I have the honour to be
Your obedient servant,
P. Le Neve Foster, Secretary.

J. C. Bennett, Esq., Merton, S.W.

Examinations, 1870.

The Council have this year decided to remove from the Programme those subjects in which the Science and Art Department holds examinations, which, it appears, are now largely taken advantage of by the same class of persons (and very often by the same individuals) as those who sit at the Society's examinations. The following subjects will therefore not appear in the programme for 1870 :—

Algebra.	Light and Heat.
Geometry.	Chemistry.
Trigonometry.	Mining and Metallurgy.
Conic Sections.	Botany.
Navigation, &c.	Animal Physiology.
Principles of Mechanics.	Free-hand Drawing.
Practical Mechanics.	Practical Geometry.
Magnetism, Electricity, &c.	Mechanical Drawing.

Owing to a prize of £5 having been kindly offered by Earl Fortescue, President of the British Branch of the International Decimal Association, the subject of the Metrical System will be retained.

The programme is now in preparation, and will include some further modifications in the system, but the above, being by far the most important, are announced at the earliest opportunity.

Designs for Channel Steamers.

The very defective state of the accommodation afforded by the Channel steamers, plying between this country and the Continent, having been brought under the notice of the Council, they have determined to offer the Gold Medal of the Society, and the large Silver Medal of the Society, for the best and the second-best block model of a steamer, which shall afford the most convenient shelter and accommodation to passengers on the deck of the vessel crossing the Channel between France and England. The steamer is not to exceed in tonnage and draught the best vessels now in use between Folkestone and Boulogne, and the model must be on a scale of a quarter of an inch to a foot. The models, marked in cypher, are to be sent in to the Society of Arts' House, John-street, Adelphi, on or before the 1st November, 1869, with a sealed envelope, giving the name and address of the designer.

The Council reserve the right of withholding either or both medals, in case, in their opinion, the models sent in do not possess sufficient merit.

The following particulars of the South-Eastern Channel steamers, *Victoria, Albert Edward*, and *Alexandra*, are given for the convenience of competitors, but it is not intended to confine the designs to them, except as to tonnage and draught :—

Length between perpendiculars, 200 ft.
Breadth of beam, 24 ft.
Depth underside of deck amidships, 12 ft. 6 in.
Draught of water, 7 ft.
Bow, clipper.
Stern, elliptic.
Rig, polacca with two masts, lug foresail, gaff mainsail, staysail, and flying jib.
Engines, oscillating.
Paddle wheels, 17 ft. 6 in. diameter.
Tonnage, 568 tons.
Speed, 17 miles an hour.

Subscriptions.

The Midsummer subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Cantor Lectures.

ON APPLIED MECHANICS.

By John Anderson, Esq., C.E.

Lecture III.—Delivered Monday, April 26th.

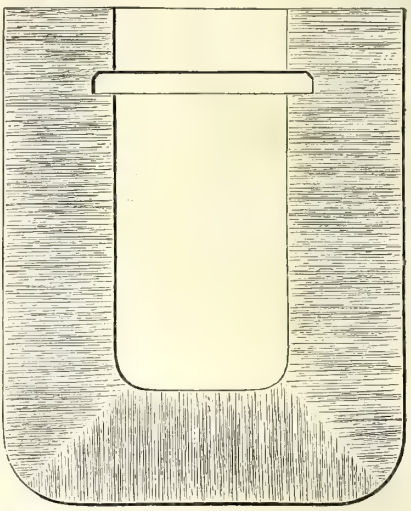
Applied Mechanics in Relation to Natural Laws in Processes.

In the last lecture I endeavoured to give a few examples of the advantage taken of some of the natural properties which govern materials. The subject selected for this lecture will refer chiefly to certain processes carried on in the workshops of applied mechanics, and to the natural laws by which they are governed, so far as I may know them.

The processes of art which have now to be considered are some of the more common in the engineering workshop, in connection with practical operations for changing the form or condition of metal, and especially iron, under its three states of cast-iron, wrought-iron, and steel, states or conditions so distinct as almost to constitute them into three different metals. Cast-iron, wrought-iron, and steel are all of a crystalline structure; these crystals are of various forms and dimensions, but their arrangement within the mass seems to be governed by fixed natural laws. Even in the case of fibrous wrought-iron, the collateral fibres are either crystals or were elongated from crystals. With cast-iron and steel, this condition is still more evident. Mr. Mallet was the first to draw attention to what appears to be the natural law which governs the order of crystallisation in cast-iron; and, whether right or wrong, and although such knowledge at the time may not have seemed of much value, yet in a few years we find that even such a small hint at nature is already beginning to influence the shape or form of mass which is now given to large castings by our foremost engineers; and if this law, even so far as it is yet known, is strictly obeyed, a higher result will be obtained with a given expenditure of metal than by following the rule of thumb, regardless of the natural law. Careful examination of many fractured castings goes to show that the direction and arrangement of the crystal formation of a cast-iron structure depends entirely on the outward form or shape of the casting, as governing the direction of cooling, the shape or form determining the nearest point into space at which the heat can escape from the melted metal, the formation of the long axis of the crystals being in the line of direction in which the waves of the heat current are passing from the interior mass to the nearest point of exit.

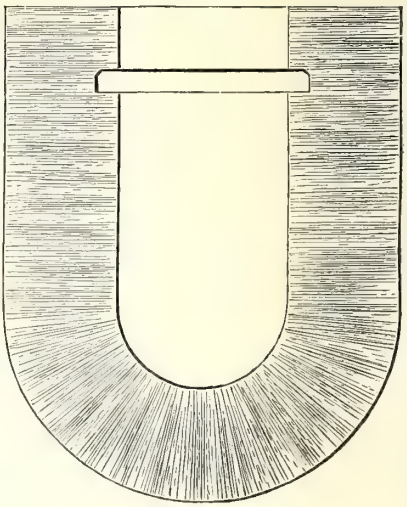
This being the case, a very important practical lesson is taught, namely, that much depends on form and the surroundings of the casting; that the outward shape or form of a casting really determines the direction of the heat motion outwards; and it points out that any sudden alteration of the outward shape introduces elements of discord in the order and direction of crystallisation, which again introduce points of weakness in the structure wherever the order of crystallisation is disturbed. This was clearly shown by the celebrated hydraulic cylinder accident which occurred in raising the Britannia Tubular Bridge. The accident arose from the form of the first cylinders being imperfect. The cylinders were made with a flat bottom, like that of a drinking-glass (as shown in Fig. 15); the cylindrical part of the casting had the crystals radial from the inside, but in the bottom part the crystals were perpendicular, and at the points where the two different arrangements of crystals come together at an angle, namely, at a line drawn from the inside to the outer corners, there were the lines of weakness; hence it was that, although considerably thicker, the cylinder failed at those points, much in the same manner as we

Fig. 15.



have seen too often in many other cylinders, castings, and guns which have gone before and since, and for the same reasons. The second or substitute cylinder was made with a hemispherical end (as in Fig. 16), and was so far

Fig 16.

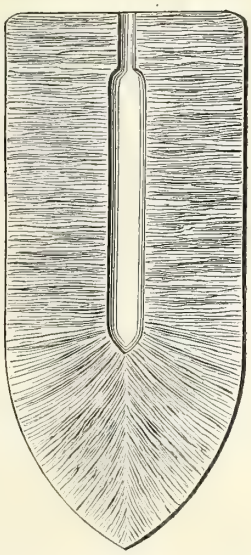


perfect, as in it the radiating crystals were all arranged in lines more nearly parallel, although, of course, not truly so. As thus made, it was found to be amply sufficient in strength, even with the same amount of metal in the mass. The foregoing accident was the means of drawing public attention to the subject. Many engineers found it to agree with their former experience, and many had previously been modifying their forms without knowing the precise law.

The subject is well illustrated by a singular phenomenon that occurs in the process of casting chilled shells, wherein, from the effect of the sudden deprivation of heat, the shells have the lines of crystals clearly marked, and, when broken, show the order of crystallisation most convincingly. In such shells there occurs an apparent in-

consistency with this reading of the law, namely at the point of the shell where, in every case, the crystals take a curved direction rather than straight out into space (as shown at Fig. 17), which I believe is entirely due to

Fig. 17.



the following reason:—The shell is cast on end, with the point downwards. When the liquid metal is poured into the mould, it is, as a matter of course, in contact all over; and during the period while it remains a liquid, it naturally follows the gradually expanding mould or vessel in which it is contained; but as it begins, from the effect of the chill, to form an exterior crust, the time arrives when the body of the casting may not be in actual contact, and, consequently, the rate of conduction of heat is thereby lessened, but not so with the point of the shell, which is kept at the bottom of the mould by the effect due to the gravity of the mass; hence the point of contact becomes a new line of direction, competing with the sides of the mould, and the effect of the two determines the curved form of the crystals, as shown in every instance.

The distinct knowledge of this law as affecting cast-iron, when it permeates the working world more completely, will in time affect all our shapes or forms, more especially in such cases as I have mentioned, but still more so in regard to cast-iron guns, where the highest conditions are required. If there be any truth in this reading of the natural law, almost all the forms which have been given to guns in former times were so far wrong. The exterior form of cast-iron guns in past times, with their numerous projections and irregularities of figure, were no doubt given to please the eye of the designer, and, by a rule-of-three process, the thickness of the mass at every point was determined by the presumed strain. This mode of treatment might have been nearer to correct proportions provided that the material had been of the homogeneous nature which it was then supposed to be, and which it is even now generally considered to be, but still it was wrong, because such forms introduce points of weakness at the junction of the crystals, especially at the breech and trunnions; and as the strength of anything is only that of the weakest part, and as the weakest part of the cast-iron structure is at that point where the greatest currents of heat have taken divergent directions in leaving the castings, it is a very suggestive consideration indeed. This is a subject which deserves the strictest attention, both from theoretical and practical men, and when it comes to be thoroughly known it will gradually lead to the use of cast-iron for many purposes where the more expensive and more reliable material of wrought-iron is now employed, for at the present time cast-iron is frequently considered uncertain for many purposes although this uncertainty arises in a great measure from man's own doings, perhaps as much from indifference as from ignorance; but disobedience to natural laws is punished whenever they are broken, whether men understand them or not; it is therefore satisfactory to find a little fresh light brought to bear on a subject hitherto rather obscure. The Americans are now constructing their cast-iron guns in form like a soda-water bottle, which is nearly in strict accordance with this law of crystallisation. The exterior surface is arranged so as to invite the heat outwards in a nearly uniform current in all directions; this, together with great attention paid to other details, affords a quality of guns almost as good as wrought-iron, which, however, has to a great extent been undone by a departure from compliance with another law in the matter of cooling, which will be referred to afterwards.

A considerable degree of popular error exists in regard to cast-iron, as determined from the colour, appearance, and size of the crystals when a mass is fractured. With any particular brand of cast-iron alloy, as consisting of uniform or of varied proportions of iron and carbon with other impurities, coming from one locality, it is, perhaps, possible for a man to become by long experience, so thoroughly familiar with its composition, behaviour, and quality, as to enable him to determine with some degree of accuracy its character from the appearance only; but in examining and dealing with iron in a general way, when consisting of all sorts of alloys, such a discrimination is fallacious, because the appearance which the fracture presents depends not only on the chemical compound, but also in some measure on the degree of heat given to the iron before casting, very much on the size of the mass into which it has been cast, and greatly on the time given to the heat to leave the casting, as well as on the direction of the conveyance of the waves of heat outwards. It thus becomes a very complicated problem. Most engineers who have studied the subject are aware that, by a process of slow cooling, or with a great mass of metal, the crystals may, and mostly always do, show a large and granular structure of a grey colour, while the same iron, if treated with more rapid cooling (and more especially if in a smaller mass), will invariably show a close white brittle appearance, with all the carbon apparently chemically combined as in fine steel; and with an intermediate rate of cooling and other conditions, the appearance is neither white nor grey, but mottled, showing the carbon to be partly combined and partly uncombined; this goes to show that the appearance must be an unreliable guide to judge from.

As the attainment of a high degree of goodness in most materials, but especially in cast-iron, depends on a great number of minute points in the workshop processes, which too frequently escape the notice of the busy worker, it may be worth while referring to some of the more prominent causes that affect goodness of quality, as depending on the process or other collateral conditions.

The nature or quality of cast-iron that may be termed goodness, depends on the object which is to be accomplished, because goodness for one purpose may be the reverse for another; that for a hydraulic cylinder is not necessarily the condition that would afford goodness for a gun. For the hydraulic cylinder, the quality of goodness depends on high tenacity combined with density, and with a moderate share of toughness; ductility here is not a virtue, but, on the contrary, it is a great disadvantage. The conditions of goodness for a gun are much of the same nature as the qualifications required for a large cog-wheel subjected to desultory working; high

tenacity is most desirable, but toughness, as depending on elasticity and ductility combined, are much higher considerations. As a general rule, it may be said that for all such purposes the best combination of all the good properties is attained the most readily by mixing a variety of good sorts, even when of the same character—and the greater the variety of natures of iron, so much the better result will be obtained—rather than by mixing opposite sorts in order to get the medium, which is sometimes done, such as mixing white with grey, to obtain a mottled. Re-melting several times adds to tenacity, but it tends towards brittleness. The effect of fluid pressure, as derived from a head of metal, is to increase both density and tenacity, and to some extent, ductility, but if carried too far it soon interferes with toughness; a "dead head" experiment of 30 to 40 feet produced hardness and tenacity, conditions suitable for the hydraulic cylinder, but which would be fatal to a gun at powder-proof. As a rule, in practice, the greatest toughness and ductility is obtained by a mixture of the stronger sorts, that give neither hardness nor softness, but something between the two, by which means toughness is secured, and the metal when subjected to the cutting instrument, as in a lathe, shows this condition when it cuts off in long massive shavings rather than in chips, which fact, together with the results of the testing machine in regard to tenacity and elasticity, afford the kind of information that will enable an opinion to be formed.

In America, with certain mixtures that afford elasticity, ductility, and toughness in a high degree, they have by this treatment been able to combine with those properties a tenacity above 13 tons per square inch, and with the limit of elasticity about one-third of the ultimate tenacity; a mixture which stretches before breaking ·003 to ·004 of its length. These are high results, and deserve our careful consideration. In this country, by mixing with a small portion of Titanic iron even higher results have been attained, up to the vicinity of 15 tons per inch, but this is exceptional.

Cast-iron and cast-steel very much resemble each other in several respects, with this difference, that the one is a coarse alloy of iron and carbon with other impurities, while the other is a much purer alloy of iron and carbon, but both are governed by the same laws to a great extent; both can be cast into moulds of any form; both can be made hard or soft, tough or brittle, and these changes can be effected in both by the same expedients. Cast-iron may be said to have scarcely any malleability—the slight amount shown in the softer varieties is almost inappreciable. In this respect there is a wide difference between the two, as well as in regard to their strength and elasticity and other properties.

The natural law that governs the molecular conditions of those two metals in affording hardness, softness, elasticity, brittleness, toughness, or tenacity, is not yet clearly understood; but this obscure subject is now being so closely investigated, and from the accumulated knowledge of facts which exist on every point, it is probable that the subtle chemical composition of cast-iron and steel may be more readily determined than it is at present, and that the various physical laws by which its strength and behaviour, as depending on composition and cooling, are regulated, will soon be better known. Whenever this is accomplished, and the precise knowledge of the laws has begun to bear fruit in the practical operations of the foundry, a complete revolution, in the applications of cast-iron especially, will be effected.

From my previous remarks, it will thus be inferred that we are yet groping in the dark after the precise knowledge of some of the conditions that will afford certain goodness, for each of the various requirements of peace and war.

As a rule, the hardness of all such cast-iron or steel is influenced by the rate of cooling. If they are made red-hot and suddenly deprived of heat, the crystallisation of the molecules is in a condition of rigidity with regard to each other; the particles are each fixed in their particular places with relation to their neighbouring particles; they require more time to arrange themselves comfortably, and thus establish a position of more friendly relationship, and hence they receive the appropriate name of being hard, and at the same time have an accompaniment of brittleness.

When the drinking-glass leaves the hands of the maker, it is so hard, rigid, and brittle as to be unfit for any useful purpose; but by subjecting it to a long-continued red heat, and then allowing it to cool down very slowly, the crystals have time to re-arrange themselves in an easy position, and the glass becomes what is termed soft, and not nearly so brittle.

This remarkable property of extreme hardness which cast-iron possesses when suddenly cooled is largely taken advantage of in the mechanical arts, and although considerable attention has been given to the subject, in order to arrive at the natural law, still there is some obscurity. One thing is clear, that the capability of hardness, both of cast-iron and steel, depends on the presence of carbon; and as cast-iron in the normal state contains such a large proportion of carbon, both combined and uncombined, the hurried cooling from the liquid state may combine with it the whole or a large proportion of the carbon, by not giving the necessary time for that which would otherwise be uncombined to separate from the iron, which it always does, more or less, when abundant; that is, when the mass is cooled more slowly, and thus there is an opportunity for the separation to take place; for time is an important element in nature.

Without being able to give the law by which the molecular change is effected to produce hardness, still sufficient is known to establish the general nature of its behaviour in practice, namely, that the hardness depends on the presence of combined carbon, and upon the rate at which the heat is conducted from the liquid and hot casting, and also upon the direction in which the crystals arrange themselves, as due to the direction of the heat-current outwards.

The mode of casting and cooling iron in moulds determines the condition when the property of hardness or softness of castings is wanted; those parts that are required to be soft have the mould-surface made of some slow-conducting material, such as sand or other earthy matter, in order to convey the heat slowly; while the parts that are required to be hard have generally a mould-surface of some metal, simply because the metal is a better conductor of heat. Any cause or condition that affects the rate of conduction or radiation tells upon the hardness and its opposite.

In this way the bush of a carriage wheel is usually made, with a soft exterior, accompanied with toughness from having been cast in a slow conducting sand-mould, while the interior of the bush, which moves on the carriage axle, is made as hard as glass by the use of a better conductor of heat, namely, a piece of steel to form the core interior, or by heating the steel beforehand, the hardness may be modified as desired. As the metal flows into the mould and surrounds it, it soon contracts, and grips the steel core; it is thus more quickly deprived of its heat by conduction than is the case with the opposite conditions, as in a shell where the mould does not grip, but, on the contrary, expands.

In America, the greater number of the railway wheels are made of a suitable cast-iron, with a hard exterior surface, so that it may last a long time, but the remainder of the wheel is left soft and tough, so that the wheel, as a structure, may not be brittle. This is accomplished by placing an iron ring to form a part of the mould, the ring being of the required shape, in order to form the hard rolling surface of the wheel, while the remainder of the mould is made of common moulding-sand. On the same principle the large cast-iron finishing-rolls, which are now used by the makers of plates and sheet-iron, are all made in an iron mould,

while the ends that form the axle are cast in sand; thus the axles are soft and tough, while the surface of the roll is extremely hard, and takes a smooth polish.

From the circumstance of one part of such a casting having one portion of the mass with its molecular structure thus rigidly under constraint, and another part adjoining in a state of liberty, conditions are set up which render them much more liable to spontaneous fracture than when the whole is under easier conditions; and, as a corrective, such castings are frequently put into a hot oven, and allowed to cool down gradually over a period of several days, thus giving the mass time for its molecules or crystals to come to a better arrangement. The American railway wheels are now treated in this manner, and with great advantage in point of safety.

Major Palliser's chilled shot and shells, as their name implies, depend for their hardness on the chilling effect of an iron mould, so as to carry off the heat of the liquid iron more rapidly, while the rear or middle part of the shot is left soft by the use of a sand-mould, or by warming the iron mould up to a temperature of 200°; both the hardness and depth of the chilling are increased, which at first sight may appear a paradox, but it will be seen, from previous remarks, that to pour metal into an exterior mould of metal, is very different from casting metal round a mandril or core; in the former case, so soon as a thin shell of liquid metal is formed from coming in contact with the cold mould, then the thin shell will hold the liquid metal, and, after all is solid, it contracts, while the mould, as the agent of conduction, expands, and at first leaves the thin newly-formed shell to be partially softened by the influence of the warmer liquid in the interior; whereas, if the mould had been warmer before casting, it would not have left it either so soon or so far; hence the advantage of raising the temperature. In the latter case, where the metal contracts on the core, and the core expands in the metal, an extremely hard chilling is effected thereby, as compared with the opposite conditions of the former case.

The important point to understand in regard to all these instances of hardening by a chill is, that hardness or softness does not depend on the sand mould or the iron-mould as such, except in so far as and simply that they differ in regard to the rates at which they severally convey heat from iron combined with carbon, thus affording a rigid or a more easy settlement of the particles. Any other substances fulfilling the conditions would answer the purpose equally well.

In making a comparison of cast-iron with steel, it has to be remembered that the former is an extremely impure substance or alloy, while steel is a pure combination of the finest iron with the finest carbon; hence it is, that notwithstanding the hardness and strength of chilled cast-iron, it is still unfit for good cutlery or other similar purposes; but its cheapness recommends it for such uses as have been enumerated, where fineness of quality is not of consequence, but where hardness, strength, and cost are the chief considerations. At the same time it is sometimes employed for inferior cutlery, even when the articles are not made merely to sell.

The same natural law that works such a change in the molecular condition of cast-iron also applies to steel, but in a less degree, as modified by the smaller quantity of carbon with which the iron is combined, probably from 1 per cent. in the higher quality, down to ·03 per cent. in the mild quality, which is only a stage removed from wrought-iron, but yet with sufficient carbon present to enable it to be melted, without which it is more refractory, indeed almost impracticable with ordinary means.

The rate of conduction, as determining the degree of hardness in steel, is clearly shown by the various modes of treating that material which have been resorted to. From its great value as well as from its purity, steel is treated with great care in all its processes, especially in regard to heating, so that it may not be over-heated, as fire is its great enemy, but also that there may be no impurities in the fuel to risk the injury of the molecular properties. When a piece of steel is heated to redness, and then dipped in liquid mercury, the sudden chill gives it a degree of hardness beyond any other liquid. A drill hardened in this metal, or by other means equally rapid, will drill into ordinary tempered steel with impunity. There are also other liquids that conduct heat more rapidly than water that are often resorted to in the arts, as, for example, in hardening the tool termed a file, which is required to be extremely hard. After the teeth are formed the file is made red-hot, and is then dipped into a liquid denser than water, either brine or other similar dense mixture; but the only virtue of the brine lies in its greater rate of conduction as compared with water. In the case of hardening what are termed half-round files we have an interesting illustration of the natural law. If the half-round file is dipped into the brine perpendicularly like other files, it is, as a rule, bent or curved thereby, from the larger extent of surface which it presents to the liquid upon the half-round side, thus contracting and fixing its particles sooner than on the other side; but it is found that by moving it in the brine, with the flat side to take the fluid pressure, the skilful workman manages to keep the file straight by this mode of cooling, and so fixing both sides uniformly. Ordinary articles of steel are cooled in water, and thus receive great hardness with brittleness. The former would not be objected to, but for the other accompaniment; it is therefore necessary, for most purposes, to temper the hardness by liberating the particles to some extent, which is done by subjecting them to a low gentle heat. Fortunately a piece of bright steel when so treated changes colour, first to yellow, and then from yellow through all shades, down to blue, and the workman, knowing the required amount of hardness to leave in the article, takes advantage of the changing hue as an index, and drops it into water when it has reached the exact shade of colour which indicates the measure of hardness or temper intended. For other articles various means either to cool rapidly or slowly are resorted to. Extremely small articles are heated in the flame of a lamp, and then pressed between two pieces of cold metal. The long fine steel wire used as mandrils for drawing fine tubular wire upon, is first heated to redness in a furnace, or rather in a red-hot oven; then, to ensure perfect straightness as well as hardness, it is laid on a cold iron plate, which has been planed to a flat surface; another similar plate is laid upon the red-hot wire, and is rolled backwards and forwards until it is cold, thus straightening the wire and hardening it at the same time. There is a remarkable property of steel not known so generally as it should be; it is in regard to the hardening and tempering of steel without reducing, which, in a certain sense, may appear to have some resemblance to the custom of warming the iron of a chilling-mould as before referred to, in order to modify the hardness and toughness of the cast-iron shell. It is found that, by subjecting the steel to a lower temperature than that which is required for high hardening in the usual manner, and then reducing by tempering, if instead thereof, before dipping, a lower heat is imparted and then chilled, the hardness and toughness are greatly modified for the better. Every piece of steel, as depending on the amount of carbon which it contains, has a certain definite degree of heat, and if this is carefully ascertained beforehand, and the steel is then skilfully brought up to it, then dipped in water or oil in the usual manner, it will thereby receive a degree of hardness combined with toughness, far exceeding the same combination of properties when arrived at by the common method of first over-hardening with a higher heat, and then restoring the toughness by setting the extreme hardness at liberty by reduction. Punches for forming holes in iron, when so made, will perform several times as much work as a punch made in the ordinary manner; but a greater degree of skill and attention is required

from the workman than by the other way, which is probably the cause of its being less frequently employed.

In considering the good qualities arrived at by the treatment here referred to, the effect depends on two conditions: first, the amount of carbon in the steel, and second, the rate of cooling. If the steel is not so steely, more heat is necessary; if, on the other hand, it is a high steel, then less heat is required. By keeping these two conditions steadily in view, some highly important practical results follow, which may be readily obtained by the skilful and observing workman.

In selecting water or oil as a cooling or tempering medium, due regard has to be paid to the purpose to be effected. If hardness with moderate toughness is wanted, then the rate of cooling has to be hastened, and water is used; if, on the other hand, toughness alone is the desideratum, then the slower conductor, oil, has to be chosen. It is supposed that the use of oil for tempering steel has been employed for twenty centuries, still it is only within the past few years that the principles here referred to have attracted sufficient attention to influence the use of steel in large masses, and to reduce it to a reliable working system for the attaining of toughness by a combination of the proportion of carbon, the temperature, and rate of cooling, as depending on the nature of the steel and the object to be secured.

The tables prepared from experiments made by Mr. Kirkcaldy were the first-published statement of the great increase of strength secured by tempering high steel in oil, but it was not generally known that this great increase of ultimate strength was combined with a doubling of the limit of elasticity in addition. This knowledge has led to important practical results, especially in regard to the construction of rifled cannon. In a cannon the whole strain of the explosion comes upon the interior surface in the first place, which has necessarily to be strained before any stress reaches the successive layers of matter lying beyond. Wrought-iron, being much exposed to small defects, is objectionable; hence there existed a craving for a steel interior, on account of its closeness and tenacity, but few were willing to venture on that material, because of its brittleness. The discovery that the elasticity, ductility, and toughness were both largely increased by the process of tempering in oil came most opportunely, and has been successfully turned to practical account at Woolwich and elsewhere, especially in the construction of an interior lining for guns, a purpose for which it is admirably adapted.

This great success is mostly attributable to the means adopted to know the relationship of the carbon in the steel to the most suitable temperature when cooled in oil that will afford the highest result. To accomplish this, two sets, of three specimens in every case, are cut from the steel block or barrel which is to form the interior part of a gun, both of which are tested; one set is to find the best heat for ultimate strength, ductility, and elasticity, the other is to find the best heat for toughness. For both purposes three pieces are cut from the mass, in each of which one piece is tested in its natural state; another piece after being tempered with a rather high heat and then a dip in the oil. Then the third piece brought to a rather low heat and a dip; all three are then pulled asunder, and their behaviour recorded as regards tenacity and limit of elasticity. A similar course is pursued in order to find the best heat for toughness; then the several specimens are bent to see the effect as regards this quality of toughness, after which the result of the whole is carefully summed up, and the heat determined upon to which the large block or band is to be subjected before dipping in oil. Had a less efficient system been adopted in the first instance, its value to the world might have gone unappreciated, as with overdone or underdone heating at the outset it would have ended in failure, and raised a groundless prejudice against the system.

The steel used for the lining of guns is what is termed mild; it contains a proportion of carbon in the vicinity of ·03 per cent. Its ultimate strength is in the vicinity of from 30 to 35 tons, but by tempering in oil at the proper heat it rises to from 40 to 50 tons; this, however important, is not to be compared with the advantage derived by its other property of elasticity. In the natural state, the limit of elasticity is from 13 to 15 tons, according to quality, but when tempered in oil this rises to from 28 to 32 tons. The peculiar virtue of this process consists in the combination of toughness with elasticity, by which the steel acquires the property of a spring in receiving the impact due to the blow from explosion, and then springs back into its normal state. According to quality, this mild-tempered steel is found to stretch from 15 to 25 per cent. of its length before breaking, showing a degree of ductility only excelled by the best Yorkshire or charcoal iron. It thus combines the good properties of steel with the good properties of the best wrought-iron, and without the defects of the latter, as before referred to.

After such facts are known, it seems rather surprising that our railway engineers are not more alive to their own interest, when secured at such a small cost; yet so it is with almost everything that is new; for, unless some interest is taken in pushing it forward into notice, it takes a long time to overcome what, in this case, may truly be called the *vis inertiæ* of mankind.

These combined properties of elasticity, toughness, and brittleness are well worth the closest investigation of those philosophers and scientific men who are now engaged on the study of molecular physics, for, notwithwithstanding the great accumulation of useful facts, the unerring laws of nature by which they are all controlled and combined have not reached the workshop, so as to give certainty in the carrying out of mechanical operations in regard to such matters. The existing knowledge is more derived from practical facts than from the philosophy of the process.

To take a piece of old steel-spring, which has no doubt done its elastic work for many a year in some old clock; here it is, a grand combination of elasticity and brittleness. How wonderful must be the relationship between its molecules in submitting to be so roughly handled, to bear the drawing out of the particles on one side, and the pushing in of the particles on the other side as we fold it up, and then unfold it, and that this may go on every day for more than a hundred years, and yet there the molecules hold on with all their pristine vigour. It is only by trying to realise the motion among its molecules that we are able to appreciate its extraordinary properties, which too frequently pass unheeded. The explanation that the hardness, brittleness, and elasticity of the spring are due to the constraint put upon its particles by the sudden cooling, or partial liberation by the after-heating for reduction, is not satisfactory; they are also due to the presence of carbon as well as other causes. Iron without the carbon, or the metal copper, is not affected in the same manner; by heating the copper and plunging it in water it still retains its softness, and it is only by hammering or rolling, or otherwise rendering its particles rigid, that we can impart to it the character even of an imperfect spring.

Coming back to cast iron, it is also affected by oil-tempering in a similar manner, although in a less degree. An interesting experiment was made by Mr. Parsons. Two massive blocks were cut off the same piece of cast iron, and carefully turned to the same dimensions, each with a deep nick in the middle, so as to determine the breaking point. One of the pieces was made red-hot and dipped in oil, the other was left in its natural state; both were subjected to the equal blows of the steam hammer; the natural piece broke with three blows, the other did not break until the fifteenth blow, and, most remarkable of all, it was considerably bent, thus showing that tenacity and toughness were both combined. Such a result opens up a large field for future investigation, and will, no doubt, in time lead to important changes, more especially in the construction of cannon. Recent

experiments point to many changes, and when men are able by some cheap process, such as the use of nitrate of soda, to take up the grosser impurities of cast iron, it will supersede wrought iron for many purposes. The Bessemer system is a first instalment. At present the interior of a gun is made of fine steel, tempered in oil, as before described, and is so far perfect, but the exterior is still made of wrought iron, either by building up in one mass or in successive layers, with each layer being put under a regulated but increasing tension. The latter affords the most perfect result of any system yet devised, but is accompanied with the great drawback that it is somewhat expensive.

What we require is a cheap exterior—a cast jacket to envelope the fine steel barrel—but which, at the same time, shall be as reliable as wrought-iron. A mixture of such cast metals as afford high tenacity combined with toughness in their natural state, and which, if submitted to the oil-tempering process, would probably be still further improved, and this will possibly lead to the utilisation of the old cast-iron guns, shot, and shell that are now in the service, at a comparative small cost for purification and re-casting. The recent result of experiments with the Heaton and other processes, all point in the direction now indicated.

There is another collateral subject which requires investigation in regard to the suitability of different oils for tempering alloys of iron and carbon, such as steel, in regard to their efficiency as depending on their constituents. The nitrogenous substances of hoofs and horns, which are now so successfully employed for converting the surface of wrought-iron into the steely condition termed case-hardened, probably owe a portion of their efficacy to the nitrogen as well as to the carbon. On the same principle, the probability is that the animal oils which contain nitrogen are the most effective in the oil-tempering process. Hitherto, vegetable oils have been employed, olive, and sea-cotton. It would be interesting to have reliable data in comparison with whale and neats'-foot oil, and likewise to determine whether the oil has any influence whatever beyond its power of conduction to a certain rate.

We shall now proceed to consider some of the leading principles which govern the processes of the very ancient art of founding, as they are affected, regulated, and controlled by the laws of nature. This is an art which has made great progress during the past fifty years. The controlling scientific laws are better understood and obeyed than formerly was the case, and in consequence much greater certainty now exists in regard to the production of sound castings, which is entirely due to increased knowledge, both theoretical and practical. Here we shall find ourselves in a region of clearer light, with a good natural reason for almost everything; and as my object at present has reference chiefly to the natural laws or principles, the technical terms of the workshop and the modes of manipulation, or even the apparatus of the founder's art, will be avoided as much as possible.

It may be stated at the outset, in a general way, that the modern founder invariably works from a model of the required article, and seldom or never originates the form in the foundry. From this model or pattern, the founder, by embedding it in the moulding material, obtains a correct form, or impression of the form, and when the copy is thus taken, and the model removed, the empty space is afterwards filled up with liquid metal, according to the laws of fluids. Even when mathematical forms are required, a species of model is used, as it is more convenient and economical to produce even such articles as cylinders or bells in this way. The founder, from choice, resorts to the principle of obtaining the required mathematical figure by transfer from a copy, as developed in a sort of lathe. With this lathe, together with a sweeping template or profile, the shape is given much on the same principle as a plasterer forms the cornice of a room. But all such art-arrangements are susceptible of endless modifications; the leading scientific principles of the art alone are unchangeable, although frequently unknown to the young founder, there being no schools or classes where such important knowledge can be acquired, and hence the wide sway of the rule-of-thumb. It is another general feature in the founding art that the founder, if possible, casts every article with the side which is most important undermost; this is done for two natural reasons, first, to have the benefit of the fluid pressure upon that side, and, in the next place, because any scoriæ that may pass into the mould, or gas bubbles that may happen to be generated and enclosed, shall, in virtue of their lightness, have the opportunity of rising to the top of the casting; hence it is that the upper side is frequently so imperfect when the skin is removed.

There is another general point of some importance, namely, that, as a rule, the best castings are seldom or never made in an open mould, because of the absence of fluid pressure, entire moulds are therefore employed. The pattern is thoroughly enveloped in the moulding material, and the mould is so constucted in parts that it can be taken asunder for the withdrawal of the pattern; the mould is afterwards reconstructed or closed, a small hole or holes being left in the upper part or otherwise to permit the entrance of the liquid metal, which flows in and fills up the space according to the laws of fluids. So far it is the same as water, for when metals such as iron or bronze are melted into the liquid state so as to be capable of flowing like water or other liquids, they are in this respect governed by the general laws of fluids, with pressure equal in every direction, and with pressure in proportion to their density; and when such liquid metal is poured into a mould of any form it finds its level, and fills up the vacant space. But, unlike water, plaster of Paris, or other cold liquids, the very high temperature of liquid iron or bronze involves other laws, and many other conditions are established in the mould which set all such appliances as are suitable for water at complete defiance.

The first effect of the molten metal is to destroy the substance of the mould, unless it is thoroughly refractory. The second immediate result is to generate gas from any decomposable substance in its vicinity, and suddenly to expand the air contained in the interior of the mould. The third contingency arises from the fluid pressure of such a dense liquid. A fourth set of conditions depends on the change due to contraction in cooling. The most of my remarks will have reference to some of these points as affecting the production of good sound castings.

Let us consider, in the first place, the nature of the substance of which the mould has to be composed, bearing in mind that the great essential property is that it must be thoroughly refractory, otherwise it would melt before the metal became a solid, and thus destroy the sharp form of the casting. Such substances are not so rare or limited as is generally supposed.

Until the middle of the 17th century, moulds for metal were made of clay, or clay with sand, forming a strong loam, afterwards well baked; but about the year 1700, the use of sand by itself was introduced into England from Holland, by Abraham Darby. Previously, pots and pans, and similar articles, had been cast in the old materials, but they were mostly so clumsy and so far inferior to those made by the Dutch in simple green sand, that every founder in the land was taken by surprise, and its introduction all over the country was immediate; and at the present time, the greater proportion of castings are made in that material. Under many modifications as regards the diversified mechanical details of art, the several reasons why sand met with such a hearty reception from practical men are manifest, so I shall enumerate them one by one. In the first place, pure sand is composed of one of the most refractory substances in nature, namely, silica; hence, if sand is really pure, it resists the action of the burning liquid most completely, as the heat of the metal has n chemical action upon it, and for this reason it can b

used over and over again. But pure sand by itself has no adhesion, and cannot retain a definite form; this is its great defect. To be fit for the foundry it must be adhesive, and so it requires a small portion of some other substance, such as alumina or clay—say from three to five per cent. of clay has to be added to it; provided it is not found naturally, which it generally is in this country. The silica requires just as much of the clay property as will render it suitable for standing up firmly in the mould, and so capable of resisting the flow of the metal, and at the same time the addition of clay is a great disadvantage in another direction, as it tends to make the mould too close, thus preventing the free and thorough ventilation which is absolutely necessary, and hence the effect of the clay has to be counteracted by mixing the sand with coke or coal dust, or other similar substance, in order to render it more porous for ventilation. Sand, again, from the loose nature of its particles, has another valuable property, in that it can be easily rammed around, and made to conform to the irregularities of the pattern which is embedded amongst it, and, in addition, it may easily be pricked full of small holes with a fine vent wire, so as to allow the air, steam, and the various gases to escape from its interior mould, and also from the wall structure of sand comprising it, which always takes place as the metal enters escape the mould.

The leading feature of pure sand is the invaluable property of not generating gas. Any dirt amongst its particles, or the moisture on the mould's surface, or even in the sand, are instantly converted into gas, but the sand itself remains intact; and this, next to the refractory property (and from which it naturally results), is one of the three most important requirements of a moulding material, and is of the utmost value in the production of sound castings.

The next essential feature of a mould is ventilation, free and unimpeded; that the substance of which it is made shall, besides holding the metal without flinching, be so constructed that all the aeriform fluids which are generated shall find an instant and ready means of escape outwards, yet without interrupting the flow of metal inwards, so that the metal may be allowed to run quickly into its place, to fill up every crevice, to cool down without disturbance, and as the metal becomes a solid, that the sand or other substance shall be firm enough to bear the first crush of the expanding metallic ice at the moment of solidifying, and yet be so accommodating as to then permit the after-contraction from cooling. These are the natural requirements which the founder has to meet, and which sand fulfils in an eminent degree.

When the liquid iron or bronze runs into the mould, the great heat of the metal rarefies the air within fully three-fold, which must find an outlet at once; then the moisture which is contained in the sand is instantly decomposed into its constituent gases; the red-hot iron seizes hold of the oxygen, setting the hydrogen free; for this inflammable gas also, immediate escape must be provided; then the water in the exterior body of the mould is immediately afterwards converted into steam, and for this provision must also be made; then the coal-dust, which is mixed with the sand in order to render it open, is also generating gas; and all this is taking place within a fragile sand mould—indeed, so fragile that a child could break it up during the moment that it contains a liquid nearly seven times heavier than water, and with a temperature of between 2,000° and 3000°, and yet the mould is not blown to pieces. How is this possible? It arises simply from the porosity of the mould structure. It is constructed like a sieve for the aeriform fluids to find their way through, and yet close enough to prevent the iron from entering the pores, but yet sufficiently strong to bear the flow and the after ice-forming squeeze as the metal passes from the liquid into the solid condition.

We are all familiar with the circumstance that when an iron casting is taken out of the mould, its surface is found covered with a hard skin or crust, different to the iron within. This arises in a great measure from the silica and oxygen with which the iron has combined, the hydrogen having passed away, and may be seen to burn on the outside of the mould with a bluish flame. It is different with bronze casting, because bronze does not decompose the moisture of the mould; hence in the brass foundry steam predominates instead of the hydrogen gas of an iron foundry. Another interesting natural effect arises from the presence of coal-dust when mixed with the sand, from which a coke surface would necessarily be left on the exterior of the casting if not prevented, but the founder provides against this by dusting a pure film of charcoal-powder over the mould's surface. This, when the metal is poured, burns, and at the same time generates carbonic acid gas, which in small castings prevents actual contact between the iron and the sand or coal-dust, thus giving a smoother surface to the casting. Another singular effect is produced when the sand contains too much coal-dust, or indeed even charcoal. The effect is twofold. In the first place, it generates more gas than can conveniently escape by the usual channels; hence it finds its way into any out-of-the-way corner or other place within the mould where it can find a lodgment, and then the metal does not fill up the entire mould, as there cannot be two things in the same place at the same time. This law is inexorable, and the same result is seen even in the compression of cold lead bullets within dies; for unless the dies are ventilated to allow the air to pass away, the points of the bullets are wanting on the same principle.

The second effect which is frequently produced by the presence of too much coal-dust in the sand, is the formation of a coating of coke upon the metal, which may be compared to the residue of the coke in the retorts of the gas-making process, and which forms all over the surface of the casting. This hard incrustation is often difficult to cut through, as it may well be, seeing that it is the diamond-dust of the knife sharpener.

The third essential feature of a mould is a paradoxical combination of strength and weakness—that it shall be strong enough to bear the pressure of the dense fluid, and yet sufficiently weak to be crushed so as to admit the metal to contract freely in cooling. This apparent paradox is met by the founding art very cleverly. In forming the exterior mould, the sand is rammed into open iron cases with a force or firmness equal to the coming strain from the fluid pressure, namely, 15 lbs. per square inch for every five feet of vertical height of fluid; and the interior part of the mould that is to be crushed as the casting cools, say the core of a long pipe or other enclosure, is either made of a friable sand, or of some material that will crush, or it is partly constructed of a material that will catch fire, and burn to ashes. In such a core the three great conditions are—first strength, then ventilation, and lastly, that it may be crushed with impunity. In the case of a pipe core, the strong portion of such a core mould is an iron tube, perforated with small holes all over its surface for ventilation; this tube is enveloped in straw, in order to burn, over which is placed the refractory sand or loam, and coated with charcoal. Thus all the natural laws are complied with, as the gases generated in the earthy matter, and in the straw all find an outlet through the perforated pipe or core-barrel, which catches fire, or is lighted at the outer extremity, in order to promote ventilation. The iron case or box, which is commonly employed to hold the sand in forming a mould, is a great convenience, and facilitates the practical operation of founding immensely, but it is not an essential, except for strength, in cases where the casting would burst a sand-mould without such support. In making light castings, some founders dispense with the box during the casting, merely using it as an agent to enable the mould to be formed, after which the whole outer fabric is then unhinged; by this means one set of boxes will suffice for several scores of

moulds, which are spread over the foundry floor, ready for the casting at the close of the day.

The natural laws that govern the founding art come into full play, even in casting the most simple forms. Take the case of a mould for a large plate, say, to be run into the required form in a mould formed on the floor of the foundry. To merely make such a receptacle for the metal in the sand, even if of the required dimensions, would be quite useless, as all the gas and steam generated under the liquid metal would have no way of escape, except by forcing an earthquake sort of passage through the liquid iron, or otherwise. It is therefore necessary, even in such a simple matter, to make the sand-bed thoroughly porous, either by horizontal pricking with a long wire, or by a substratum of coke or straw, or indeed, by any other means which will comply with the natural laws, so that all the aeriform fluids may pass quickly away from under the newly-cast plate, yet without disturbing the liquid metal, for that is the one great condition to secure, and the cheapest mode of doing it is the best. Here the founder shows his skill.

The contraction of metal in cooling, after it has become a solid, is governed by fixed laws, and each metal and every variety of a metal has its own law. That for bronze is nearly 1-60th of its length, while soft iron is considerably less, and varies from 1-90th to 1-120th, depending on the nature of the metal, and partly on the shape of the casting. Massive and even other castings are frequently larger than these rates would indicate, partly arising from the fluid pressure, bulging or otherwise enlarging the mould, or from the workman clumsily disturbing the mould in order to withdraw the model more easily, and the excessively hard iron has considerably greater contraction still. In that for chilled shells it is about double the ordinary amount of grey iron; hence the precise amount of contraction depends on many conditions.

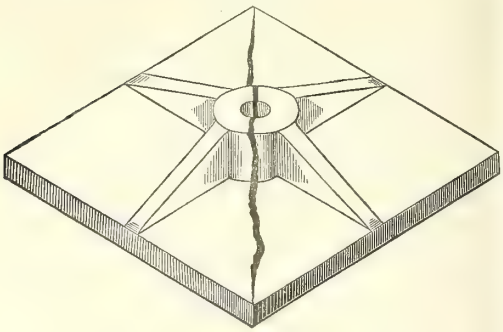
This law of contraction has to be looked at and considered from two different aspects; first, as regards the mould itself; and second, with reference to the casting. From the circumstance that metal contracts after solidifying, and that the casting is invariably smaller than the mould, unless the mould has expanded from the fluid pressure, or otherwise enlarged, the founder's model is made proportionately larger than the required castings so as to meet the case. Before going to work upon some difficult or unusual form of article, the skilful founder has carefully to study how the natural law is to be obeyed in several respects, as the casting will be a failure if he disobeys it in any particular. To take a simple case, supposing it to be a large pan, say fifteen feet long by eight feet broad, and a foot deep, and that it is determined to cast it with the bottom upwards, it is evident that with such a mould there will be an enormous quantity of aeriform fluid which will have to pass off from the interior core of the pan, and that the casting when cold will be nearly two inches shorter than when it was cast. How is such a case to be met? In many ways. One way is for the internal structure of the mould core to be composed chiefly of masses of coke, with a stratum of sand on the upper surface. This arrangement is simply to provide for ventilation; but to provide for the contraction between the sides and ends of the pan and the mass of coke there is interposed a thick matting of straw, the effect of which is that, when the metal flows into the mould, the heat gradually reaches the straw and sets it on fire, thus burning it, and giving freedom for the natural contraction which follows immediately afterwards. There is also to be provided a free passage from the great interior core to the exterior of the mould, so as to give the utmost freedom for the gases to escape. With such a broad casting, exposing so much surface, the total fluid pressure is enormous, the whole of which is exerted in floating the upper or covering portion of the mould, as the pressure is equal in every direction. In order to prevent this cover or upper part of the mould from rising, a proportionate weight has to be laid upon it. In the best-ordered foundries the roof is adapted to take the pressure; it is so arranged that adjustable pillars can be introduced between the mould-cover and the heavy roof, to which the fluid pressure of the metal is transferred at the moment of casting, thus avoiding the labour of putting on and removing the weights.

As an interesting example of the effect of contraction, let us take the familiar case of a heavy fly-wheel with a massive rim and centre, but with arms of the usual proportion. It is clear that, with such dissimilar dimensions, if no peculiar means are provided, the cooling and contraction of the several parts of the wheel would proceed at very different rates as regards time. First, the arms, on account of their slimness and consequent lightness, would be the first to cool and to shorten. Now, what will necessarily happen if such is the case (and which too often does happen when the contraction laws are disregarded), is, either the arms in cooling will draw themselves away from the outer rim by simple fracture, or, as another alternative, they will actually stretch between the rim and centre, and thus remain permanently longer than the normal length. If the former happens, then the wheel is of necessity destroyed; if the latter, which is the more likely, what will then happen? Why, the heavy rim of the wheel will be broken before it is cold by the abnormally extended arms preventing it from obeying the natural law. The law is inexorable, and demands that the wheel, or any other form of casting, shall cool uniformly in all its parts, no matter how it is to be accomplished—that the founder must find out, but it must be done, either by using means to keep the lighter parts hot, or else by hastening the cooling of the more massive parts, so that all may contract at the same rate, and so preserve the wheel intact, and the whole structure in a condition of equilibrium. This subject demands the closest study of the young founder who intends being master of his business, as it involves a principle that governs the soundness of many other forms of casting.

It is on account of these several contingencies that many large fly-wheels are made in separate parts and put together afterwards; or the law may be evaded, and is often evaded, by first making the spokes separately, either of cast or wrought-iron, then laying these spokes in the wheel-mould, and first casting the rim by itself, it being arranged to embrace the outer ends of the spokes, which, as it cools and contracts, gradually pushes the spokes inwards. When the rim has taken its normal dimension, then the centre part is cast around the inner ends of the spokes; thus the whole structure is approximately in equilibrium, and such wheels—but more especially those built-up afterwards—are more reliable to withstand the effect of jar and centrifugal force than when cast in a single piece at one casting, even when the utmost care has been taken to obtain uniform cooling.

Still more interesting is the case of massive solid castings, apparently of great strength, but afterwards breaking of their own accord. A case of spontaneous fracture occurred the other day. The article was in the form of a large massive plate, with an embossed part in the centre, and having strong radial ribs, as shown in the diagram (Fig. 18). It was duly delivered by the maker entire, but after lying for a day or two it suddenly split through the middle to within a few inches of the outer edges, showing unmistakably that the crystallisation was not previously in a state of rest or equilibrium. On inquiry it was found that the cooling of the mass had been hastened. The effect here produced was the reverse of the fly-wheel; the outer edge of the plate was of necessity the first part to cool and contract, but the contraction was prevented by the bulk of the still hot and expanded interior, hence the iron composing the outside had either to stretch or give way by tearing open. As it so happened, in this instance it stretched. When the interior metal became cooled it also contracted, and for

Fig. 18.



a time kept up its continuity with the outside, each resisting the natural law that regulated the other; the outside, from having been previously stretched, was determinedly unwilling to go inwards. The struggle for separation between the two had been going on for several days, and during the railway journey. At length peace was restored by the mutual parting, which at once destroyed their future usefulness for the intended purpose.

Referring again to the subject of mould-ventilation, it will have been observed how very much the process of casting would be simplified if the formation of gas could be entirely prevented. It will also be remembered how very much the molecular conditions of the metal are affected by the rate of cooling, the best result being obtained by slow cooling, thus giving time for that state or condition of crystallisation which gives elasticity and ductility, constituting toughness. Coupling these two questions will enable us to understand the principles of various other systems of moulding which have been resorted to by various founders in order to meet them. This is another point that the young founder should study closely.

It will be evident, from what has been said, if the surface of the sand-mould is thoroughly dried, either by fire or otherwise, before the liquid metal is poured in, that consequently there will not be so much decomposition of water, and therefore a less quantity of hydrogen gas to get rid of. Carrying this a step further, if the sand has had given to it an additional per-centage of clay in its composition, so that it will bear to be still more thoroughly baked, yet without losing coherence, by such a process a large share of the other gases will also be eliminated, and, besides that, the metal will have to enter a warm instead of a cold mould, which will of necessity, and to a considerable extent, protract its rate of cooling; or, if a still stronger mould is prepared by using loam instead of sand, that is to say, sand mixed with a still larger proportion of clay, and then thoroughly baked or burned, the two conditions will still further be met. Hence it is that for guns and other important castings, more especially where the expense of moulding is formidable, and goodness of quality indispensable, some one or other of these modifications is now generally resorted to, and either system is an improvement on the other, by thus affording a corresponding increase of quality in the casting, but, like most good things, the cost of production is increased.

The Americans have carried the art still further in these respects. Any gas emanating from the sides of the hard mould must enter the casting—possibly it may rise to the surface, but often (and more especially if the metal is as cold as can be poured, which is often desirable) it does not, and however carefully the loam or the baked sand may have been prepared, still dirt may exist in its composition, which will develop gas from the high temperature of the liquid metal even in its coldest liquid state, and so form vacant bubble-holes or specks in the casting.

These considerations have led to the introduction of two other systems which are employed in America. One of these was introduced by the late Mr. Babbit, of Boston, the other by Mr. Ames, of Chickopee, also in Massachusetts. For the former system, instead of sand or loam, old worn-out fire-bricks are selected, more especially those which have not changed their pale colour in the furnace of which they originally formed a part (those with any red in them are rejected, as indicating the presence of iron or other impurity). These old fire-bricks are then ground to a fine powder in a mill, and then as much pure pipe-clay water is added to the brick-dust as will give sufficient coherence to enable it to form the mould structure; this mould, after baking, is then painted over with a creamy liquid made of the same materials, and is then burned to redness, and the metal is poured into the mould while it is in that condition. By the other system, the material used is kaolin or decomposed granite, which is taken all the way from England, and is treated precisely in the same manner as the brickdust. By this means all the essential conditions are obtained in the highest degree, and, from the absence of porosity in such moulds, there is less waste of such valuable metals as bronze and the like, for which the more expensive materials are chiefly employed.

To show the earnestness of our Transatlantic competitors, there is yet another of their refinements in the art of casting guns which has not yet been practised in this country, so far as I am aware. It is the process of cooling a casting of such a large liquid mass as a gun or a mortar more directly from the interior, that is to say, the mass of metal, after it has been cast, is cooled from the core instead of from the outside. The object of such an apparently dangerous experiment is partly explained by what has been already said in reference to the fractured plate, which failed by the cooling process having been hastened from the outside; for when a mass cools from the outside, that part in cooling and contracting will necessarily have to stretch upon the hot and still expanded metal within, then another layer upon that which is within it again, and so on until the entire mass is cooled down to the temperature of the atmosphere, each layer endeavouring to pull itself away from that which surrounds it, hence the outer layers are not called upon to perform their proper share of the work at the moment of explosion; but by cooling a gun or mortar gently from the inside, either with a current of cold air or with water circulation, the conditions are entirely reversed, and each layer, as it cools, tends to grip the layer within it faster and firmer, thus approximately obtaining the advantages secured by building up wrought-iron guns on the system so successfully introduced by Sir William Armstrong, with the inner tube held fast in the grip of the second, and the second in the grip of the third, thus giving the whole mass some work to perform by the initial tension on the layers. From recent accounts it would appear that the rate of cooling from the inside, as adopted by the Americans, has been too rapid, thus throwing the mass into a condition ready for spontaneous fracture, in the opposite direction to the broken plate previously referred to, showing that the founder has to study the natural conditions with extreme care; but time and study will bring out the proper course to pursue, in order to arrive at the best result, for it is generally by failure that we reach perfection.

From the several references made to American founders, the great success which has attended the American gun recently brought to this country need excite no surprise. The close attention paid to the natural laws, in every detail of the founding art, by the American founders, is worthy of the highest praise.

With regard to the question of modifying iron, it has been already stated that when castings are required to be particularly solid or dense, they are generally made with what is termed a "dead head," so as to increase the fluid pressure on the casting; and, as a rule,

where density or rather closeness of structure is particularly wanted, the higher that the "dead head" is carried so much the better in that respect. And, still further to improve these conditions, it is found that by keeping the liquid metal in a state of gentle agitation so long as it remains a liquid, an advantage is gained thereby. This is accomplished by the use of an iron rod, which is worked up and down like a pump-rod, and then, from time to time, as the metal condenses and subsides, the empty mould is filled up by pouring in fresh metal again and again. The increasing condensation thus proceeds, and considerable benefit is thereby obtained in regard to the tenacity and general density of the casting, and more especially in the soundness of the interior.

The foregoing remarks apply more especially to iron castings. The casting of other metals differs in some respects; it is found advantageous, for example, to hasten, or rather not to delay, the cooling of bronze guns, at least not to protract the liquid condition longer than is necessary, as there is then a tendency for the tin to separate from the copper. When such groups of tin aggregate, the quality of the metal is much inferior to those other portions where the alloy is in the proper condition and mixture as intended.

This subject would be incomplete without a word of reference to the question of quality of iron or bronze castings, as depending on the principles of the melting processes. There are three courses open to the founder, and his selection depends on the object to be attained. These several systems are governed by natural principles, chiefly dependent on contact and contamination with fuel.

The best course to follow of all modes of melting, for casting small articles where goodness of quality is paramount, and where the expense is not a consideration, is the pot or crucible system, which is now generally employed for the trinket class of articles, or when an extremely liquid iron is necessary. The iron selected for such purposes is not only rich in uncombined carbon, but it is much preferred with an addition of phosphorus as well, which is mostly found in the iron made from the bog ores, and causes it to run like water. The advantage of the pot or crucible system is this, that the metal being melted in a covered pot, which is placed in the furnace, the metal by this means is not exposed to the evil contamination of the surrounding fuel. The great and only objection to the crucible system is the expense, as it requires some 15 cwt. of fuel per ton of iron melted, and hence it is seldom or never employed for the common or heavier class of iron castings, which will not bear the cost, but is frequently resorted to for the class of castings made of the finer kinds of cast-steel and bronze.

The system of melting iron which is mostly resorted to in engineering establishments is the vertical or upright furnace arrangement, usually termed a "cupola," in which the iron and fuel, with flux to suit, are thrown in together at the top of the furnace promiscuously. A blast of wind is forced into the burning fuel at some distance from the bottom, and as the metal melts it runs down in rivulets or large drops, and sinks to the bottom of the furnace in virtue of its density, and is there collected in what may, in point of fact, be considered as a crucible, with the fuel floating on its surface. There it remains until there is a sufficient quantity for the intended casting, when it is run out into a dam or ladle. The opening is made by tapping a hole at the bottom of the furnace, and is afterwards plugged up with clay.

The chief advantage derived from this method is the economy in fuel, which in round numbers may be stated as varying from 1¼ cwt. to 2 cwts. of coke to melt a ton of metal. The great defect is that due to the intimate acquaintanceship formed with bad company, namely, between the sulphur or pyrites in the fuel and the exposed metal as it filters downwards; it thus becomes frequently deteriorated to a great extent, especially if there are many impurities in the fuel, and, in consequence, the castings made in this way are, as a rule, not so strong as those made by either of the other two methods.

The cupola or upright furnace, besides being economical, has also the recommendation of bringing down the metal at a high temperature, which, for many purposes requiring extreme fluidity, is highly important (and with truth it may be said that the great majority of castings are not required to be particularly strong). Hence for all ornamental work, and for light machinery castings in general, the cupola is the usual means employed by the modern founder, and was a grand invention, which has saved millions sterling to the world, a virtue that covers many disadvantages.

When the highest degree of goodness is aimed at, for heavy castings such as guns, an entirely different system is resorted to, which is termed the air furnace, in which the iron is melted by a flame, proceeding from another part of what is called the reverberatory furnace, in which the flame from a fire strikes the roof first, and then re-acts on the crucible; hence the metal does not come so directly into contact with the fuel as it does in the cupola; and, even when the metal is actually melted, any impurities existing in the flame merely play upon the metallic surface, while at the same time it slightly tends to purify by its oxidising influence, for it is found that the metal thus subjected to the influence of the flame for a time is really improved by the action, and, taken as a whole, the air-furnace makes the strongest castings, even with the same sorts of iron. The chief disadvantage is the cost, as it requires four times as much fuel as the cupola, and about the half of that required by the crucible system; still, for a responsible duty, it is worth while paying a little extra price, it being so much more reliable.

The founder, in selecting a mode of melting for guns, or any similar class of articles, invariably chooses the air-furnace; he is also very particular in the selection and sorting of his mixtures of iron. It is seldom that less than ten varieties are selected, each the best of the sort. In this country, the strong cold-blast irons of Wales mostly predominate, but not entirely so, for if the strongest sorts were entirely selected and used, it might seem at first sight to be not very far wrong, but it would be a complete failure, notwithstanding; the gun would fail from the property of brittleness, or rather from the want of ductility and elasticity. The requisite conditions are slightly paradoxical, but it is found that a mixing of the stronger sorts with the softer and more ductile sorts gives the best result, by a kind of compromise. This knowledge is founded on the result of former dearly-bought experience, successes, and failures, spread over centuries.

Having thus endeavoured to refer to some of the leading natural principles upon which the art-processes of casting are founded, I had intended, when the title was given to my lecture, to have referred also to the numerous natural laws of the equally important smithing art, but have found it impossible to do so with any degree of justice, within the limits of a single lecture.

Taking a great interest in the prosperity of our national manufactures, in competition with that of other nations, it would seem to me that we require to teach our young men the principles of every subject in connection with practical art, rather than the apparatus or the machinery, which can more easily be acquired in the workshop, and very much better than in the school. We do not all require to know the mechanical details of all the branches of mechanical art, but all who are connected with applied mechanics should know the natural principles thoroughly, which in themselves, when understood, are extremely simple and even fascinating, and such teaching will render the varied machinery more easily understood by those whose business it is to know, and equally so by those who derive pleasure from the examination of technical subjects.

To take, for example, the case of some of our textile

manufactures. To any one not acquainted with a cotton-mill, the stranger, on entering, is at first appalled at the mystery of whirling mechanism which he sees around him, and is perfectly bewildered with it, as a something that no one could understand; but if anyone will take the trouble to explain the three simple objects to be accomplished, and the leading mechanical principles that are employed to effect the object, then it becomes as simple as *a*, *b*, *c*.

It is not necessary that every student in applied mechanics should know the *minutiæ* of every detail of the art of cotting spinning, but he should know the few leading principles upon which the manufacture is carried out. The cotton comes to England in bales, in a state of hard clotted masses of wool. The three first classes of machines are to render these lumps soft, open, and flocculent, which is accomplished by repeated beating, opening up, and spreading out. Then comes a second series of machines, first to card or comb the individual fibres, so that they may approximately be laid side by side, and then by a repetition of drawing out the fibre, and then doubling and drawing out again repeated many times by means of rollers moving at different velocities, the fibres are at length laid parallel with each other in a fine filament; then comes the third class of machines for still further drawing out the filament to the required fineness, and then the final imparting to it of a slight amount of twist, so that the element of friction may be introduced among the fibre, in order to give the thread of yarn strength. After this comes the action of the loom for weaving it into cloth, which is self-apparent.

It seems to me that, in our mechanical teaching, we make too much of the mechanism, which may be varied indefinitely, and too little of the natural principle. The consequence is that, by far too much, we copy each other's arrangements of mechanism; whereas, if we were taught the natural and mathematical principles, and shown that they could be applied in many different ways, setting each one to find his own mechanism, and letting it be considered wrong for a man to copy other men's mechanical forms and arrangements within a reasonable period, by so doing a great change would soon be experienced if our young men were sent out to explore in the boundless field of mechanism which lies open to all, instead of repeating the forms and arrangements that have been adopted by others. The design of a steam engine, or any other machine, so far as it depends on men, should in honour, for a reasonable period, be as sacred as a book or a picture. The natural law which the machine employs or applies can belong to no one in particular, and the machine can be constructed in thousands of different forms and arrangements of the mechanical alphabet, that is to say, if it is of sufficient importance.

The prominent consideration of the natural principles as thus associated with and determining working mechanism would impart a dignity to the mechanical art. For some reason, not easy to trace, the notion has arisen, that art-working is in some way antagonistic to theoretic thinking; my remarks on the founding art serve to show that, in that department at least, there is no ground for such a conclusion. The founder's practice, as derived from former experience of success or failure, is just as true philosophy as the inductive theory of the thinker. The working philosopher may be more conservative, and not so speculative; he has learned from financial experience not to venture too hurriedly nor too far out of the beaten track, until the field beyond has to some extent been explored and made certain. Practical men are frequently spoken of as if they had a contempt for theory. So far as my observation extends, such is not the case. On the contrary, where no money interest intervenes, there is generally evinced a craving for correct knowledge, so as to accomplish the object at the least expense. On the other hand, the men of learning who, from their pursuits, are more acquainted with theory than practice, are too frequently underrated by practical men; this is an equally great mistake; if properly understood, the tendency should lie the other way. There is no sound practice without true principles, come from where they may; and practical men are immensely indebted to those philosophers and men of science who, frequently without remuneration, take the trouble to investigate first principles and give them to the world freely and fully, whose labours have been, and are now, of incalculable value in reducing facts to order, and giving us simple yet comprehensive formulæ for the guidance of construction, and who investigate and lay open the mysterious laws of heat, and other natural agencies, and make plain to the more occupied and plodding busy workers the wonderful phenomena of the innumerable laws of nature. It will thus be seen that applied mechanics is a large field to cultivate, and requires many workers, and affords an abundant scope for all, both for head-workers and hand-workers, and the best result will be arrived at by each and all, theoretical and practical, or both combined, trying to do his own part well; and just as it is in the commercial or trade competition of two great rival manufactories, with each individual selected and thoroughly well trained to perform his allotted part, so it is the same with the united workshops of a country such as Great Britain in its competition with some of the foreign nations, who are now stealing a march upon us by training their school-boys and future workmen in the knowledge of first principles. We must, as a nation, do the same, or otherwise our workmen will be placed at such a disadvantage as no other national characteristics or amount of hard working can long withstand; for, next to an intimate individual acquaintance with the principles on which their own immediate branch of craft duties are founded (that being in every case the first consideration, for those who neglect themselves in this respect, will soon begin to find the world going past them, even in their own speciality), the addition of such simple natural knowledge as I am recommending will not only increase the usefulness of our young men, even in their own branch, but the extra pleasure which it will afford through life will be a rich reward, and help to raise our workmen above the grovelling and expensive habits in which so many are now found to indulge from the want of having their minds otherwise occupied, and will help to keep us right in the collateral questions of political economy, as connected with trade, manufacture, and commerce.

Proceedings of Institutions.

EXAMINATION PAPERS, 1869.

(*Continued from page 720.*)

The following are the Examination Papers set in the various subjects at the Final Examination held in April last:—

MENSURATION.

THREE HOURS ALLOWED.

1. Find the area in yards, feet, and inches of a room which is 17 ft. 3in. long, and 14 ft. 7 in. wide; and the cost of flooring it at 2s. 6d. a square foot.

2. Find the area of a triangle whose sides are 28, 45, and 53.

3. Show that the area of a four-sided figure of which two sides are parallel = base × average height.

The sides of a quadrilateral are 3, 4, 5 and 6, 3 and 6 being parallel to one another: find its area.

4. A wall measures 94 ft. 6in. in length, and 12 ft. 9in. in height, and is $2\frac{1}{2}$ bricks thick: how many square rods of brickwork does it contain?

5. What will be the expense of lining a cistern, 5 ft. 6 in. long, 3 ft. 4 in. wide, and 1 ft. 2 in. deep, with sheet lead of 12 lbs. to the square foot, the lead costing £2 per cwt.?

6. The areas of two concentric circles are 154 yards and 68 yards 4 feet: find the breadth of the annulus.

7. A semicircular protractor is 3 inches in diameter, and the rim (curved and straight) is half-an-inch wide: find the area of the hollow part.

8. The areas of three sides of a rectangular block of wood are 3 ft. 128 in., 18 ft. 48 in. and 6 ft. 60 in.: find its volume.

9. Find the diameter and height of the least circular cylinder from which the block in the preceding question can be cut.

10. Find the surface and solid content of a regular tetrahedron whose edge is ten feet, in feet and inches.

11. A circular vessel which is 7 inches in diameter at the top, and 6 inches at the bottom, is made to hold a pint: what must be its depth?

12. A circular plate, of an inch in thickness and a foot in diameter, is formed into a sphere: find its diameter.

13. Prove that the surface of a sphere is equal to 4π (rad.)^2

PLANE TRIGONOMETRY.

THREE HOURS ALLOWED.

1. A B C D is a quadrilateral inscribed in a circle. Show that A C sin. A = B D sin. B.

2. Find cos. A in terms of the sides of A B C, and thence prove that, if $2s = a + b + c$,

$$\tan.\ \frac{A}{2} = \sqrt{\frac{(s-b)\ (s-c)}{s\ (s-a)}}.$$

3. If $\tan.\ A = -(2 + \sqrt{3})$ prove that $A = \frac{\pi}{12}(12n + 7)$.

4. Prove that (1). Cos. (A + B) = cos. A cos. B — sin. A sin. B. (2.) Sin. (A + B) + cos. (A — B) = $2 \cos. \left(\frac{\pi}{4} - A\right). \cos. \left(\frac{\pi}{4} - B\right)$.

5. The perpendicular from the angle of a triangle on the base is an harmonic mean between the radii of the adjacent escribed circles.

6. Given $b = 15$, $a = 10$, log. sin. A = 9·5228787, log. 2 = ·3010300, log. 3 = ·4771213, find B.

7. Show that $\tan.\ A = \frac{\sin.\ A + \sin.\ 2A}{1 + \cos.\ A + \cos.\ 2A}$

8. And $(\cot.\ A)^2 - (\tan.\ A)^2 = 4\cot.\ 2A \cdot \operatorname{cosec.} 2A$

9. Find x when $(\tan.\ x)^3 = \tan.\ (x - a)$

10. A B C is a triangle inscribed in a circle, radius R; A D and B E are perpendiculars from A and B on the opposite sides, intersecting in F; prove that A F = 2R cos. A.

11. If the sides of a triangle be 7, 13, and 8 feet respectively, find the greatest angle.

12. If $(\operatorname{cosec.} A)^2 = m \tan.\ A$; and $(\sec.\ A)^2 = n \cot.\ A$, then, $(\sqrt{m} + \sqrt{n})^4 = (mn)^3$

13. One angle of a triangle is 60°, the sides including it are in the ratio of 3 : 2, show that the tangents of the other angles are $3\sqrt{3}$ and $\frac{1}{2}\sqrt{3}$

14. Find the angles between 0° and 360° which satisfy (1.) Tan. 2A = 1; (2.) Cos. A = 1 + cos. 2A

15. If cos. 7A + 7cos. A = 0; then shall cos. A = $\sqrt{\frac{7 + \sqrt{-7}}{2\sqrt{2}}}$

16. If θ be be a very small angle, $3\theta = 2(\sin.\ 2\theta - \theta) + (\tan.\ 2\theta - \theta)$ nearly.

CONIC SECTIONS.

THREE HOURS ALLOWED.

SECTION I.—GEOMETRICAL CONICS.

1. A focus and a directrix being given, define a conic and show that your definition leads to three species of curves, of which one is closed, the second is open in one direction, and the third is open in both directions.

2. Prove that the subnormal of a parabola is equal to half the latus rectum.

3. Tangents drawn to a parabola from any point in the directrix are at right angles to each other. Prove this.

4. Show that the area contained between a parabola and a chord parallel to the tangent at the vertex is two-thirds of the rectangle contained by the chord and the perpendicular on it from the vertex.

5. Assuming an ellipse to be defined, as in question 1, show that there are two foci; and that the sum of the distances of any point on the ellipse from them is constant.

6. Prove that in the ellipse

1. $SY \times S'Y' = BC^2$
2. $CP^2 + CD^2 = CA^2 + CB^2$.

7. Prove that in the ellipse and in the hyperbola the middle points of parallel chords lie in a straight line. Also prove the theorem projectively.

8. Define asymptotes; and prove that the portion of any tangent to a hyperbola intercepted between the asymptotes is bisected at the point of contact.

9. How far is it true that a straight line which meets a conic in one point also meets it in a second point, and never meets it in more than two points?

10. What are the relative positions of a circle, a parabola, and a point, so that the point being the centre of projection, the circle may be projected into a parabola?

SECTION II.—ANALYTICAL CONICS.

11. Explain the method of determining position and loci by means of rectangular and polar co-ordinates respectively.

12. Show that the equation of a straight line is an equation of the first degree in terms of x and y. Find the length of the perpendicular from (a, b) on the straight line $x \cos.\ \alpha + y \sin.\ \alpha - p = o$.

13. Define a tangent to a circle, and the length of the tangent from (a, b) to the circle whose equation is $x^2 + y^2 = c^2$; what is the geometrical meaning of the result when (a, b) is within the circle?

14. Prove analytically the theorems given in questions 2, 3, 5, 7, 8 of the preceding sections.

15. Show analytically that the angle between the focal radii vectores is bisected by the normal internally in the ellipse, and externally in the hyperbola.

16. Prove that generally three normals can be drawn to a parabola from given points.

(*To be continued.*)

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, 1869.

The thirty-ninth annual meeting of this association will commence on Wednesday next, August 18th, at Exeter, under the presidency of George G. Stokes, Esq., M.A., D.C.L., Sec. R.S., Lucasian Professor of Mathematics in the University of Cambridge.

The Executive Committee at Exeter will elect new members and associates, on the usual conditions, and after August 13th, personal application for tickets must be made at the reception-room, Exeter, which will be opened on Monday, August 16th.

Gentlemen who have in any former year been admitted members of the association may, on this occasion, renew their membership, without being called upon for arrears, on payment of £1.

In the reception-room there will be an office for supplying information regarding the proceedings of the meeting. The "Journal," containing announcements of the arrangements for each day, will be laid on the table on Wednesday, August 18th, and the following mornings, at 8 a.m., for gratuitous distribution. Lists of members present will be issued as soon as possible after the commencement of the meeting, and will be placed in the same room for distribution. The published

volumes of the British Association will be sold in this room, to members and associates only, at the reduced prices appointed by the Council. The members' ticket will contain a map of Exeter, and particulars as to the rooms appointed for sectional and other meetings.

For the convenience of members and associates, a branch post-office (which will be available also for communication between members attending the meeting) will be opened in the reception-room.

Members and associates may obtain information about local arrangements and facilities afforded by the railway companies, on application to the local secretaries at Exeter.

The first meeting of the General Committee will be held on Wednesday, August 18th, at 1 p.m., for the election of sectional officers, and the dispatch of business usually brought before that body. The General Committee will meet again on Monday, August 23rd, at 3 p.m., for the purpose of deciding on the place of meeting in 1870. The concluding meeting of this Committee will be held on Wednesday, August 25th, at 1 p.m., when the report of the Committee of Recommendations will be received.

The first General Meeting will be held in the Victoria Hall, on Wednesday, August 18th, at 8 p.m. precisely, when Joseph Dalton Hooker, M.D., D.C.L., F.R.S., &c., will resign the chair, and Professor Stokes, M.A., D.C.L., Sec. R.S., &c., will assume the presidency, and deliver an Address. On Thursday evening, Aug. 19, at 8 p.m., in the Albert Memorial Museum, a *soirée*. On Friday evening, Aug. 20, at 8.30 p.m., in the Victoria Hall, a Discourse will be delivered by Professor Phillips, LL.D., D.C.L., F.R.S., F.G.S., &c., on "Vesuvius." On Monday evening, Aug. 23, at 8.30 p.m., in the Victoria Hall, a discourse will be delivered by J. Norman Lockyer, Esq., F.R.S., F.R.A.S., on "The Sun." On Tuesday evening, Aug. 24, at 8 p.m., in the Albert Memorial Museum, a *soirée*. On Wednesday, Aug. 25, the concluding General Meeting will be held in the Victoria Hall, at 4.30 p.m.

The sections are as follows:—

A.—Mathematical and Physical Science.—(In the Grammar School.)—President—Professor J. J. Sylvester, M.A., LL.D., F.R.S. Vice-Presidents—Professor J. C. Adams, M.A., D.C.L., F.R.S.; William R. Grove, M.A., F.R.S. Secretaries—Professor G. C. Foster, M.A., F.R.S.; R. B. Hayward, M.A.; W. K. Clifford, B.A.

B.—Chemical Science.—(In the Albert Museum.)—President—Dr. H. Debus, F.R.S., F.C.S. Vice-Presidents—Professor W. Odling, F.R.S., F.C.S.; Professor A. W. Williamson, F.R.S., Pres. C.S. Secretaries—Professor A. Crum Brown, F.R.S.E., F.C.S.; Dr. W. J. Russell, F.C.S.; Dr. Atkinson.

C.—Geology.—(In the Temperance Hall, Friars'-walk.)—President—Professor R. Harkness, F.R.S., F.G.S. Vice-President—R. A. C. Godwin-Austen, F.R.S., F.G.S. Secretaries—W. Pengelly, F.R.S., F.G.S.; W. Boyd Dawkins, F.R.S., F.G.S.; Rev. H. H. Winwood, M.A., F.G.S.

D.—Biology.—(In the Episcopal Schools.)—President—George Busk, F.R.S., F.L.S., F.G.S. Vice-Presidents—C. Spence Bate, F.R.S., F.L.S.; Edward B. Tylor. Secretaries—Henry T. Stainton, F.R.S., F.L.S., F.G.S.; Professor Michael Foster, M.D.; Rev. H. B. Tristram, M.A., LL.D., F.R.S.; E. Ray Lankester.

E.—Geography.—(In the Victoria Hall.)—President—Sir Bartle Frere, F.R.G.S. Vice-Presidents—Sir G. Grey; A. G. Findlay, F.R.G.S. Secretaries—H. W. Bates, Assist. Sec. R.G.S.; Clements R. Markham, F.R.G.S.; R. H. Major, F.S.A., F.R.G.S.; J. H. Thomas, F.R.G.S.

F.—Economic Science and Statistics.—(In the Athenæum.)—President—The Right Hon. Sir Stafford H. Northcote, Bart., C.B., M.P. Vice-Presidents—Colonel W. H. Sykes, M.P., F.R.S.; T. D. Acland, M.A., D.C.L., M.P. Secretaries—Edmund Macrory, M.A.; Frederick Purdy, F.S.S.

G.—Mechanical Science.—(In St. John's Hospital.) President—C. W. Siemens, F.R.S. Vice-Presidents—G. P. Bidder, C.E.; C. Vignoles, C.E., F.R.S., F.R.A.S. Secretaries—P. Le Neve Foster, M.A.; W. Smith, C.E.

The different sections will assemble in the rooms appointed for them, for the reading and discussion of reports and other communications, on Thursday, August 19th; Friday, August 20th; Saturday, August 21st; Monday, August 23rd; and Tuesday, August 24th, at 11 a.m. precisely.

The Committees, consisting of officers of sections and members conversant with the several branches of science selected by them, will meet in rooms adjacent to the section rooms, at 2 p.m., on Wednesday, August 18th, and at 10 a.m. precisely, on the other days.

SCIENCE AND ART AND NATIONAL EDUCATION.

Among the notices of motion intended to be brought on in the next session of Parliament, there is the following very important one, to which the attention of the Institutions in Union with the Society and the friends of national education should be called:—

Dr. Lyon Playfair—"National Education—That, in any scheme for national education, the Revised Code should not limit State aid in elementary schools to the subjects of reading, writing, and arithmetic, but should also offer inducements for the study of such subjects of elementary science and art as bear upon the occupations of the people, and tend to the advancement of industry."

LECTURES ON THE MODE OF TEACHING SCIENCE.

Two courses of lectures have lately been delivered, the one in the lecture theatre of the Royal School of Mines, Jermyn-street, and the other in the new lecture theatre at South Kensington, which will have a most important result on the future teaching in the science schools and classes throughout the United Kingdom.

The lectures were addressed exclusively to teachers engaged, or those about to engage themselves, in giving instruction in animal physiology or experimental physics; and, by a liberal grant for travelling and personal allowance from the Science and Art Department, about two hundred teachers were collected from all parts of England, Scotland, and Ireland, in order to take advantage of the opportunity thus afforded.

The origin of the lectures was due to Prof. Huxley, to whom the public is indebted for many other valuable and practical suggestions. This gentleman has been the examiner of the Science and Art Department in animal physiology and zoology ever since the commencement, in 1861, of the present system of science examinations, and in a report to the Committee of Council on Education, dated 9th February, 1869, he made the following remarks:—"The examinations in physiology which I have conducted for the Science and Art Department have exhibited a great increase in the number of candidates, and a very considerable improvement in the quality of their knowledge during the last few years. It appears to me, however, that there is still far too much of mere bookwork; and as the special value of science, as an instrument of education, depends upon its bringing the mind into direct contact with the facts of nature, I think it is highly desirable that teachers of physiology should be made aware of the necessity of so doing, and be instructed in the methods by which, with very common and easily-acquired materials, they may bring the most important and fundamental facts of physiology under the direct apprehension of their pupils. I propose, therefore, that a course of (say) six lectures should be given on the "Method of Teaching Physiology," and that these lectures should be made accessible to all science teachers who may wish to profit by them." The Lords of the Committee of Council on Education at once adopted Prof. Huxley's valuable suggestion, and passed

a minute on the 11th March directing that two such courses should be given, the one on animal physiology, and the other on light, during the summer months, after the science classes had broken up.

To all teachers engaged under the Department in these subjects, and also to those who are qualified to teach, and who commence classes at once, second-class railway fare to and from their homes, and £5 for each one's expenses while in London, was offered on condition of their attending regularly. To such an offer it is hardly necessary to state that all who could possibly leave their occupations attended, and took advantage of the lectures and the opportunity of spending a pleasant fortnight in London.

The lectures on "Light" commenced on the evening of the 28th June, and the apparatus used in showing the phenomenon was chiefly that prepared by Dr. Tyndall. That gentleman was not able to deliver the lectures himself, but deputed Dr. Guthrie, who spared no pains or trouble in endeavouring to show the various phenomena, and in illustrating the method of demonstrating them to a class.

Professor Huxley, in introducing Dr. Michael Foster as the lecturer, delivered an inaugural address to the course "On the Method of Teaching Animal Physiology." He pointed out the motives which had led him to make this suggestion of delivering such a course, and sketched out a short history of what has been gradually done since 1861 for the assistance of teachers, in enabling them to know what to teach. He stated that he considered that the whole scheme depended on the way in which the examiners conducted their part of the work, inasmuch as they not only recommended what was required, but according to their awards the public money was paid. The professor concluded his remarks by saying that, inasmuch as now every facility had been given to the teachers, he should feel at liberty to be rigidly strict in demanding sound and intelligent instruction being given to the pupils, and he warned all that the plan of driving in to the examination whole flocks of pupils totally unfit to answer a single question, except by a few crammed definitions, would receive no mercy from him in future.

The course which was followed by Dr. Michael Foster was eminently successful, and it may be said that no such course of similar instruction in this subject has yet been given. During the first lecture he gave an outline of the general build of the animal body and its correspondent parts, its cavities and its tissues. From these he divided his subject into—1. The blood. 2. The circulation of the blood. 3. Respiration. 4. Food and its changes. 5. Motion and locomotion. 6. The nervous system. 7. The organs of sense.

The whole of the principles were exemplified by showing the actual organs themselves, either in the sheep, the rabbit, or the frog, care being taken to convince the hearers that all the examples required, even for an advanced course of study, may be obtained without difficulty, for a village butcher, particularly when the teacher was on sufficiently intimate terms with him, might be induced occasionally to cut up his sheep, in a somewhat more physiological manner than usual, in order to preserve certain parts entire.

Many of the mechanical contrivances for showing the action of different parts were highly suggestive to the teacher, and could not fail to be immensely useful to him in bringing home facts to the grasp of his understanding, which mere book-work under the most favourable circumstances could never do.

During his remarks, Dr. Foster touched on some mistakes which he had noticed in the examination papers, and in revising which he had assisted Professor Huxley, as for instance, the definition of the difference between warm and cold-blooded animals, a promising pupil had stated that a warm-blooded animal lived on land, but a cold-blooded in the sea; but thinking this somewhat sweeping, had added, "or near to the sea." He also pointed out the great confusion which exists in understanding the circulation of the blood, a complete grasping of which is necessarily the only foundation on which to build.

It is impossible but that any teacher who has attended this course will return with many valuable ideas of making his science teaching a reality to his class during the coming session.

In consequence of the visit of the science teachers for the purpose of hearing these lectures, Dr. Frankland proposed, in a most disinterested manner, that those of them who were willing should attend at the Royal College of Chemistry, Oxford-street, during the time that they were not engaged at their other duties, and receive some instruction in the system adopted in that college for teaching chemical analysis. On Wednesday, the 30th June, he delivered a most interesting address to all who presented themselves, viz., about 130, pointing out and explaining the glyptic method he uses in explaining chemical combination. He also gave them some suggestions on several points of detail for facilitating teaching, as, for instance, an easy mode of making indestructible diagrams and tables on calico. Those teachers who were sufficiently advanced in practical analysis then attended for several days each, and received a course of teaching from Dr. Frankland's assistants, while those who were not able to benefit thus received several lectures of a more elementary character.

On the whole, it may be asserted that these series of lectures will do more than anything which has yet been carried out to get rid of the cram system of science teaching, and to render it of practical use to the thousands who are now engaged in the five hundred schools and classes existing throughout the country.

Manufactures.

Industrial Arts in Italy. — The following information is afforded by the *Globe*: — "Commendatore Minghetti, the indefatigable Minister of Agriculture, Industry, and Commerce in the Italian Government, has just returned from Venice, where his visit has been hailed as of good augury for the trade of the old Republic. Accompanied by the principal authorities of the city, he visited the exhibition of the celebrated glass-works at Murano, and, after a three hours' examination, bore testimony to the extraordinary development of native industry of which these works give evidence. He afterwards, by command of the King, conferred on Signor Colleoni, the proprietor of the works, the Order of the Crown of Italy, congratulating him at the same time on the well-merited honour. Among other places visited were the Technical Institute and the Upper School of Commerce. Connected with the latter it is intended to found a commercial museum, which the Minister is disposed to aid by a handsome subsidy. Minghetti, it is known, has in view the establishment in Northern Italy of three great centres of professional education in arts and commerce:—Turin, for the strictly technical branches; Genoa, for naval engineering; and Venice, for commerce, strictly so-called, in all its multifarious departments. The Minister, it is also known, takes the warmest interest in the establishment of schools of design throughout the kingdom, and has just expressed to the English Foreign Secretary, Lord Clarendon, his obligations for a large collection of copies and reliefs from the South Kensington Museum, embracing every style of art; a gift which, he says, commands admiration for its beauty, and gratitude for its noble munificence."

The Lighting of Coal Mines.—Mr. Henry Bessemer, in a letter to the *Times*, says:—"The miner, enclosed all day between black masses of coal above and around him, requires a powerful light to see what he is doing—a light that never fails—that never goes out—that never requires trimming—and, above all, a light that effec-

tually prevents the mixture of air and gas, which pervades all coal-mines, from entering the flame and becoming ignited. Now, these are precisely the conditions obtained by combustion under pressure, which offers to the miner a source of the most brilliant light wholly inaccessible to the inflammable air of the mine. As a simple illustration of the fact, let us suppose a small iron box, a little larger than a policeman's lantern, having a thick plate-glass, or a bull's-eye, on one side of it; in the lower part is a common gas-burner supplied by a pipe from a gasometer above-ground; the supply of air to support combustion is arranged in a similar manner, and supplied under pressure from above-ground; a small aperture is made in the top of the lantern for the escape of the products of combustion. Now, if the air and gas is supplied to this light under a pressure of, say, 1lb. per square inch, the light would be brilliant, and the escape from the orifice at this pressure (or even far less) would prevent the possibility of any external gases entering and becoming ignited. In this way every gallery in a mine may be lighted like a workshop, to the great comfort and cheerfulness of those whose whole lives are spent in the cheerless gloom of these dangerous workings. The mode of advancing the light as the work progresses, and its direction by the use of reflectors, and other necessary details of the system are simple enough, and need not be here entered into."

Commerce.

The Duty on Spanish Wine.—In the House of Commons on Thursday, the 8th July, Mr. Akroyd asked the Under Secretary of State for Foreign Affairs if her Majesty's government had received any intimation that the Spanish government is willing to enter into negotiations for a Treaty of Commerce, to be based upon a reduction of their duty on British goods, accompanied by a modification of our duties on Spanish wines above 26 degrees of proof. Mr. Otway replied in the affirmative, and said that the matter was under consideration. The *Produce Markets Review* observes that "it is not likely that any modification can be carried out during the present session, but as our commercial treaty with France will expire in 1870, it seems probable that our whole system of taxing wine and spirits will be revised, and that the changes proposed by the government will form part of the Chancellor's next Budget. We may remind our readers that the subject in immediate consideration affords more than usual facilities for muddling by commercial treaty, and any special legislation requires, therefore, to be jealously watched. When last we wrote on the subject, we quoted one authority who, in reference to an agitation for obtaining an even duty on all wines, whether under or over 26 per cent. of alcoholic strength, remarked that it would be manifestly unfair to admit port wine, fortified up to 40 per cent., which is half the strength of ordinary gin, at a duty of 1s. per gallon, while gin is taxed at 10s. per proof gallon. It was also pointed out that the matter appeared to hinge upon the question, 'What is wine?' for if, as it is asserted, natural wine seldom attains a higher strength than 26 per cent., it followed that all wines exceeding this standard, must, to a certain extent, be fortified with alcohol, and therefore that any extension of the strength allowed to be imported at the 1s. duty, would lead to an increased importation of adulterated wines. Another authority, taking a different ground, seemed to think that the main objection to the present scale was that no medium existed between the 1s. duty, at which 26 degrees of strength are permitted, and the 2s. 6d. duty, which allows 42 degrees of strength. The task of reconciling the conflicting interests of the consumer and the importer, to say nothing of the distiller, with those of the revenue, is one that might well daunt any financier. Indeed, we can scarcely see how any arrangement, even approaching fairness, is likely to be made with our present management of Customs and Inland Revenue. It is possible that a scheme which included a searching reform of both would ensure a considerable amount of popularity, independent of any other merits it might possess, besides affording an able administrator an opportunity of effecting such a saving in expenditure as would make a very respectable addition to the surplus, which is considered essential to every successful budget. Without entering into the question of the advisability of commercial treaties with foreign countries, we will only remark that our bitter experience of the results of the Drawback Convention makes us sorely distrust these engagements, apart from the consideration of their evident opposition to the spirit of free trade."

Selling Sugar at a Loss.—The movement for putting an end to this practice continues in the trade. A meeting of grocers living on the Surrey side of the Thames was recently held, about 250 members of the trade being present. An animated discussion took place as to the best means of putting an end to what was held to be, on all sides, a most iniquitous and demoralising system, of selling sugar at less than cost price, and endeavouring to recoup the loss by excessive profit on other articles. It was unanimously felt that the time had arrived when a determined attempt should be made to abandon the vicious system, and further, that the present juncture was really a crisis, and that the future prosperity of the trade, and its ability to meet the new forms of competition, depended upon whether sugar should continue to be sold at a loss or bear a reasonable profit. A resolution was adopted—"That, from the present time sugar should not be exhibited in shop windows;" and a committee was appointed for carrying out the objects of the meeting.

Colonies.

The Mining Industry in Queensland is in a very satisfactory condition, and is rapidly acquiring increased importance, in consequence of the frequent discoveries of mineral wealth that are being made. This progress has made itself more especially felt within the last year. By the statement of imports and exports of the colony during 1868, it appears that the largest increase in the exports has been in the value of gold. In 1867, the amount was £189,248; last year it was £593,516, which shows an increase of £404,268 on last year's operations in this direction. The value of the exports of copper and copper ore has increased during the same time from £66,038 in 1867 to £72,136 in 1868.

Taranaki Steel.—A New Zealand paper says that several specimens of Taranaki steel have been taken to England, smelted from the Taranaki steel sand, which is said to contain 75 per cent. pure steel. Samples of both crude and manufactured have been sent.

Publications Issued.

Cassell's Popular Educator. (*Cassell, Petter, and Galpin.*) This work has now reached its twenty-first number. It contains articles on electricity, readings in Greek, lessons in botany, algebra, light, natural history, &c. Among other subjects is one of somewhat novel and considerable importance, especially interesting to artisans, viz., the "Natural History of Commerce," which is intended to be a reply to the questions—"Whence do we derive the raw materials which are the staple of our commerce and industry?" "Why do we find them in particular localities?" "What constitutes their true value?" "Are there yet no undeveloped regions or natural products?" A series of lessons on this head will appear, from time to time, in the numbers as they come out.

Correspondence.

National Musical Education.—Sir,—I read in the *Journal* that some steps are being taken towards the establishing of a system of musical education in this country. I presume you will not object to a few observations on this subject. I may say that I am correspondent to the Science and Art Department on behalf of the Eagley Institute; am also a manager of the British School at Eagley, and a leading director of a large Sunday-school; I am also a member of a large choir, and am intimately acquainted with music, and a tolerable performer on the violoncello. The expression of my opinion, therefore, on the subject of musical education I hope may be permitted. I have long been of opinion that music, as an art, has been shamefully neglected by the government of this country, and I think the time has now arrived when an attempt should be made to place musical matters on a better footing. At present it is a known fact that conductors of concerts, such as Mr. Charles Hallé, experience the greatest difficulty in finding solo singers fit to appear before a respectable audience, and this difficulty, I am informed, is yearly increasing. In towns, such as Bolton, the resident musical professors are woefully behind the age, in fact are little better than quacks, hold no certificate or diploma of any kind, as a general rule, and, instead of doing credit to the profession, only seem to sink it still deeper in the mire. I fancy the same opinion might safely be ventured respecting most of the provincial towns of England. In fact, music in this country, as a general rule, means strumming and thumping a few tunes on the piano, and nothing more. I think it would be a good thing if "music" could be added to the list of subjects encouraged as a branch of national education. Examinations in vocal music, and in the theory of music, might easily be got up, and some uniform system of teaching singing, &c., might be adopted officially. If some system of the same kind could be extended to schools under the inspection of the Committee of Council on Education, I think the results thereof would be good. The whole subject, in my opinion, is an important one in a national point of view—important as bearing upon the health, the morals, and the intellect of the people, and I should rejoice exceedingly to see something done in the direction I have pointed out.—I am, &c., Gervase Marson.

Eagley Mills, near Bolton, July 28, 1869.

Patents and Patent Laws.—Sir,—The paper upon this subject that appeared in your issue of the 30th ult., by Mr. W. Bridges Adams, is the most elaborate and talented specimen of special pleading that has been produced for some time past. That gentleman condemns the argument of the opponents of those laws as mere assertions; but what are the writer's own arguments other than mere assertions, which are contradicted by the history of the world; for have not all the millions upon millions of the appliances of civilised life, which we have enjoyed from the Creation to this day, been the produce of inventive genius ages before such laws were thought of, much less put in practice? The "monopoly" of the patent laws was first devised in barbarous times, when men, women, and children were burnt alive for witchcraft or creeds, and talented and learned men were searching after the philosopher's stone, the elixir of life, and the transmutation of metals. The translation of the term "patent" as open, is invidious, for the so-called open specifications of a patent are locked-up from the public for fourteen years; and, long before the expiration of that period, either the fashion has changed, or the invention has been superseded by other methods or improvements. Of what use then to the public is the open specification? The argument that the patent law is a benefit to the poor man, is controverted by the notorious fact that the only benefit, if any, falls to the rich and powerful, especially to the professors of the law, to whom it affords a very plentiful harvest. The poor man cannot afford the expense of a patent; and if he could accomplish that object, he cannot stand that of a suit in Chancery, which, according to the opinions of some, is indispensable to confirm the validity of any patent. The possible benefit to the patentee in the aggregate, is contradicted by the fact that ninety-nine out of every 100 patents obtained produce no remuneration whatever; especially, as in most cases, a large succession of riders to the original are required to ensure the first, and many patentees are ruined in the process. It is true that patent rights offer a glorious advertisement to rich tradesmen, with their heading "Her most gracious Majesty has been pleased to grant Royal Letters patent for the manufacture of our improved patent needle-case," &c., implying, thereby, that the Royal Letters Patent prove the superiority of the invention to any other. It must always, however, be borne in mind, that every expense incurred for letters patent, advertisements, or other matters, must eventually come out of the pocket of the consumer, not out of that of the tradesman. The writer truly states that manufacturers will not accept any improvement or novelty unless already protected by patent right; but it is the very existence of such laws that cause this state of things; and if they had not existed, or were now abolished, the manufacturer would be compelled, by public competition, to adopt new inventions, from whatever source they might spring. Again, he says, that the abolition would cause all new inventions to be carried over to those countries where patent laws still exist. But what possible harm could befall us if such proceedings really did take place? We should freely enjoy the benefit of those inventions, because they could not be patented in this country. Mr. Adams pins his faith upon the possibility of obtaining good patent laws, but the whole drift of his paper tends to show the impracticability of any such being enacted. If all applications for exclusive rights are to be judged by a committee of scientific men, both the expense and the delay would become intolerable; especially seeing that a first specification is usually very imperfect, obscure, and replete with errors. The public must be the judge, but it will be impossible to obtain that judgment until the invention shall be brought out and in use. Also the proposal to raise the cost of patent rights to an enormous sum, or to reduce it to the means of a poor man, are both equally absurd. In fact, the patent laws are neither more nor less than an authorised ruinous lottery. That every intending patentee should, as some say, be bound to make himself acquainted with every previous patent, is an impossibility, for his whole life might perhaps be insufficient to go through the process. For these and a hundred other incontrovertible arguments, I advocate the total repeal of the patent laws, either immediate or prospective, as may be deemed advisable upon mature consideration.—I am, &c., Henry W. Reveley.

1, Baker-street, Reading.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb.

Delivered on 24th July, 1869.

231. Bill—Irish Church (Lords Amendments, &c.).
232. ,, Irish Church (Commons Amendments, &c.).
233. ,, Telegraph (as amended by the Select Committee).
234. ,, Heritable Rights (amended).
235. ,, Nitro-glycerine (amended).
237. ,, Zanzibar (Jurisdiction of Consul).
319. Drunkenness, &c.—Return.
339. Lunacy (Ireland)—Return.

Public Petitions—Thirtieth Report.

Delivered on 26th July, 1869.

236. Bill—Volunteer Act (1863) Amendment.
293. Reserve Squadron—Extracts from Report.
306. Contagious Diseases Act (1866)—Report.
348. Telegraph Bill—Report.

Customs—Thirteenth Report of the Commissioners.

Delivered on 27th July, 1869.

228. Bill—Militia (Ireland).
238. ,, Metropolitan Board of Works (Loans) (as amended by the Select Committee).

303. Public Accounts—Third Report and Evidence.
328. Ecclesiastical Commission (Ireland)—Annual Report and Account.
341. Fines, &c. (Ireland)—Abstract of Accounts.
333. Metropolitan Commons Act (1866) Amendment Bill—Special Report.
Post Office—Fifteenth Report.
China (No. 12, 1869)—Correspondence.
China and Japan—Reports of Journeys by Mr. Alabaster, &c.

Delivered on 28th July, 1869.

239. Bill—Charity Commissioners.
240. ,, Accounts, &c., Presentation.
241. ,, Bishops' Resignation.
242. ,, Seamen's Clothing.
243. ,, Queen Anne's Bounty (Superannuation Allowances).
312. East India (Army)—Return.
340. Merchant Shipping—Accounts.
353. England and France (Channel Passage)—Report by Captain Tyler.

Delivered on 29th July, 1869.

227. Bill—Hackney and Stage Carriages Law Amendment.
2. (8) Railways Abandonment—Warrant.
277. Savings Banks—Return.
352. Parliamentary and Municipal Elections—Report.
354. Dockyard Emigrants to Canada—Extracts from Reports.
364. Greenwich Hospital—Estimate.
Cape of Good Hope and Natal—Despatches.
Public General Acts—Chap. 32 to 42.

Delivered on 30th July, 1869.

244. Bill—Sanitary Act (1866) Amendment.
46. (v.) Trade and Navigation Accounts (30th June, 1869).
351. East India Railways—Despatch.
355. Civil Services—Supplementary Estimate.
363. Revenue Departments—Supplementary Estimate.

Delivered on 31st July, 1869.

245. Bill—Expiring Laws Continuance.
249. ,, Bankruptcy (Lords Amendments).
289. East India (Cotton)—Report.
303. (1) Public Accounts—Supplement and Appendix to Third Report.
323. Grand Jury Presentments (Ireland)—Abstract of Accounts.
335. Seeds Adulteration Bill—Report and Evidence.
Public Petitions—Thirty-first Report.

Delivered on 2nd August, 1869.

246. Bill—Offices Abolition.
247. ,, Dividends on Public Stocks.
250. ,, Harbour of Galle Loan.
251. ,, East India Loan.
334. Distillers, &c.—Return.
338. County Voters (Scotland)—Return.
350. Dogs Regulation (Ireland) Act, 1865—Account.
368. Dividends on Public Stocks—Correspondence.

Delivered on 3rd August, 1869.

73. (A.) Bill—Habitual Criminals (Amendments by Mr. Bruce).
248. Bill—Prevention of Gaming (Scotland).
252. ,, Imprisonment for Debt (Lords Amendments).
253. ,, Canada (Rupert's Land) Loan.

Delivered on 4th August, 1869.

255. Bill—Contagious Diseases.
256. ,, Presentation of Benefices belonging to Roman Catholics, &c.
257. ,, Contagious Diseases (Animals) (Lords Amendments).
358. Magistrates (County Palatine of Lancaster)—Return.
359. Friendly Societies—Return.
365. Marylebone (Southall Schools)—Correspondence.
381. New Law Courts—Report from the Select Committee.
Public Petitions—Thirty-second Report.

Patents.

From Commissioners of Patents' Journal, August 6.

Grants of Provisional Protection.

Alcohol and paraffin, purifying—2241—J. H. Johnson.
Artificial marble or stone—2238—W. Lincolne and E. Chafer.
Bale ties—2201—J. W. Larmuth.
Boilers—2209—G. Allibon and A. Manbré.
Candles and soap, treating tallow used in the manufacture of—2059—W. Davis.
Carded wool, spinning on small cops—2205—W. Brookes.
Carding engines—2215—A. M. Clark.
Carding engines—2270—R. Shaw and R. Lakin.
Carriages, machinery for propelling—2248—W. Dredge and A. Stein.
Cartridges, &c.—2257—D. H. Brandon.
Cask stands—2079—T. D. Waller.
Coal, removing sulphur compounds contained in—2233—T. Barnes.
Collars and false collars for horses, &c.—2251—C. L. Caldesi.
Compasses—2271—J. Miller.
Cooking, and the means and articles employed—2239—E. Stevens.
Dry earth closets—2277—D. T. Bostel.
Fabrics, apparatus employed in the manufacture of looped or knitted—2263—E. Attenborough.
Feed-water, &c., apparatus for heating—2254—T. Auchincloss.
Files and rasps, cutting—2169—W. Furness.
Fire-arms, breech-loading—2267—E. Ginder.
Flax, &c., machinery for hackling—2244—S. Cotton.
Furnaces, &c.—2256—W. Tongue.
Girders—2272—C. Henderson.
Hats, &c.—2246—I. Frankenburg and S. Phillips.
Heat, apparatus for abstracting—2211—A. C. Kirk.
Hoists, working—2128—J. Crowther.
Hops, preserving the aromatic principle of—2227—W. A. Gilbee.
Horses, &c., apparatus for clipping—2217—H. Knight.
Iron, &c., coating with tin—2268—W. E. Tilley.
Iron ores, preparing for smelting—2265—C. Cochrane.
Lamps—2243—S. Bishop.
Lithographic and zincographic cylinder printing machines—1489—C. H. Gardner and J. Bickerton.
Medicaments for internal and external use—2274—J. Winship.
Metals, apparatus for annealing—2133—B. J. B. Mills.
Metals, preventing from rusting—2284—F. Crossley.
Mortising machines—2252—G. N. Blane.
Night soil, &c., treating—2269—J. H. Johnson.
Paper, manufacturing—2282—D. A. Fyfe.
Pillars for straining and supporting wires for fences, &c.—2255—C. Y. Michie and G. W. Murray.
Pipe and tube joints—2240—J. H. Johnson.
Pumps—2249—R. Pictet.
Railways, &c.—2247—H. Greaves.
Reaping and mowing machines combined—2261—J. G. Rollins.
Reeds, machinery for combing—2259—T. Winter.
Refrigerating and freezing apparatus—2245—W. Mort.
Rotary engines—2207—G. H. Ellis.
Sewing machines—2221—W. H. Gosling.
Ships' anchors—2225—W. Warren.
Shuttles—2258—W. Crossley and J. W. Swithenbank.
Spades and shovels, coffered—2275—I. Barker.
Sugar, manufacturing and refining—2280—A. M. Clark.
Tap and filter combined—2203—J. Ogden.
Teetotums, &c.—2113—R. Whitaker.
Telegraph wire insulators—2235—W. R. Lake.
Tramways, points or switches for—2237—W. Morris.
Tyres of iron or steel—2278—J. Windle.
Valves—2264—B. Hunt.
Velocipedes—2129—J. Crowther.
Velocipedes—2231—J. G. Wilson.
Votes by ballot, apparatus for taking, &c.—2223—W. H. Stone.
Watches, &c., winding up—2286—A. Burdess.

Inventions with Complete Specifications Filed.

Looms—2287—H. A. Bonneville.
Looms, &c.—2288—H. A. Bonneville.
Railway breaks—2310—J. Beckett.
Steam engines—2311—W. R. Lake.
Wool, &c., mechanism for spinning—2329—J. Bapty and A. Hall.

Patents Sealed.

380. T. Nichols and J. Parr.
385. O. Sarony.
395. J. and G. W. Dennell.
396. J. Wilkinson and W. Scott.
407. G. Gros.
410. J. Stuart.
412. W. Lever.
414. C. T. E. Lascelles.
416. J. F. Bentley.
420. J. Clayton.
427. P. J., F. W., and H. G. Smith and A. Pappenberger.
438. W. H. Hayhurst.
492. J. Darlington.
1253. W. B. Dick.
1504. D. Hitchen.
1581. W. Morris.
1868. W. R. Lake.
1869. W. R. Lake.

From Commissioners of Patents' Journal, August 10.

Patents Sealed.

434. H. Edwards.
437. F. J. Vandenvinne.
440. T. V. Trew.
441. G. H. Morgan.
446. C. Gordon.
448. J. Holmes.
451. E. G. Brewer.
476. J. Fletcher.
479. J. W. Yates.
499. J. A. Wade and J. Cherry.
539. J. and W. Weems.
599. J. T. H. Richardson.
602. J. Reap and W. H. Michelmore.
607. W. Thomas and W. Davis.
767. J. Cooke.
918. T. Sowden and J. Newton.
922. H. Downie and I. B. Harris.
934. J. W. Girdlestone.
944. A. Clark.
1011. J. Howden.
1180. J. H. Johnson.
1289. R. Sterne.
1526. E. C. Warburton.
1574. J. Platt.
1691. H. Browning.
1739. H. Downie and I. B. Harris
1756. J. G. McKirdy.
1871. T. Bourne.
1917. D. B. Park.

Patents on which the Stamp Duty of £50 has been paid.

2059. C. F. Cotterill.
2113. W. Tranter.

Patents on which the Stamp Duty of £100 has been Paid.

2198. J. Townsend.
2227. J. Tatham.
2311. S. A. Bell and T. Higgins.
2448. H. L. Emery.

Journal of the Society of Arts.

FRIDAY, AUGUST 20, 1869.

Announcements by the Council.

Examinations, 1870.

The Council have this year decided to remove from the Programme those subjects in which the Science and Art Department holds examinations, which, it appears, are now largely taken advantage of by the same class of persons (and very often by the same individuals) as those who sit at the Society's examinations. The following subjects will therefore not appear in the programme for 1870 :—

Algebra.	Light and Heat.
Geometry.	Chemistry.
Trigonometry.	Mining and Metallurgy.
Conic Sections.	Botany.
Navigation, &c.	Animal Physiology.
Principles of Mechanics.	Free-hand Drawing.
Practical Mechanics.	Practical Geometry.
Magnetism, Electricity, &c.	Mechanical Drawing.

Owing to a prize of £5 having been kindly offered by Earl Fortescue, President of the British Branch of the International Decimal Association, the subject of the Metrical System will be retained.

The programme is now in preparation, and will include some further modifications in the system, but the above, being by far the most important, are announced at the earliest opportunity.

Improved Cabs.

The Council of the Society of Arts offer the following medals for improved hackney carriages specially suited to the metropolis :—

The Society's Gold Medal for the best and most convenient open hackney carriage for two persons.

The Society's Silver Medal for the second-best ditto.

The Society's Gold Medal for the best and most convenient closed hackney carriage for two persons.

The Society's Silver Medal for the second-best ditto.

The Society's Gold Medal for the best and most convenient hackney carriage for four persons, either open or closed, or both.

The Society's Silver Medal for the second-best ditto.

Lightness of construction, combined with adequate strength and durability, will be especially considered in making the awards.

The awards will be made after actual trials of the carriages extending over a certain period.

Communications describing the carriages must be sent to the Secretary of the Society of Arts before the 1st January, 1870, the carriages to be sent to a place hereafter to be appointed.

The Council also offer the Society's Silver Medal for the best instrument, to be affixed to a cab or other hackney carriage, for indicating the fare as between the passenger and the driver, whether by registering the distance travelled or otherwise, and which instrument shall also indicate, for the convenience of the cab-owner and of the driver, the total distance travelled during the day and the total amount earned. The instruments competing, with full descriptions of their construction, to be sent to the Society's House before the 1st January, 1870.

Competitors may, at their option, sign their communications, or may forward with them sealed letters containing the name and address of the writer.

The Council reserve to themselves the right of withholding all or any of the medals, in case none of the carriages or instruments possess, in their opinion, sufficient merit.

Subscriptions.

The Midsummer subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Cantor Lectures.

ON APPLIED MECHANICS.

By John Anderson, Esq., C.E.

Lecture IV.—Delivered Monday, May 3rd.

Applied Mechanics in relation to Natural Power.

This lecture will relate to that part of the subject of applied mechanics concerning motion, as derived from the power or force in nature, which comes within the province of the mechanical engineer—more especially to the natural mechanical force which is stored up for him to take advantage of, and turn to practical account.

Although the science of mechanics, both theoretical and practical, is founded on the recondite and unalterable laws of motion, still, in the present lecture, in order to make this part of the subject intelligible to a general audience, all reference to the numerous laws of matter in motion will be avoided, except where necessary for reference or explanation of the part of the subject in hand.

The numerous mathematical discoveries and philosophical investigations of the laws of motion which have been made in past ages, and which are still being made at the present time, have so thoroughly laid bare the fundamental principles by which all the movements in applied mechanics are produced and governed, and so many excellent books have been written thereon, that, in the practical applications of mechanical science, many of us are scarcely conscious of the assistance rendered in the daily routine of the busy workshop. Men are apt to forget from whence all this invaluable knowledge has come for our guidance, and although simple as some of them may appear, from our every-day familiarity with them, yet every one of those grand truths was the result of deep thinking, and due to the closest study of some learned philosopher, and the discovery of each, one after the other, marked a new stage in the progress of practical as well as theoretical science.

For similar reasons, it will neither be necessary nor expedient to refer to the innumerable detail of mechanism by which the power of nature is applied and turned into mechanical work, yet it would be extremely interesting to some if we could trace the gradual invention of many of our most familiar appliances, step by step, such as those gearing contrivances for receiving force or motion, for accumulating force for expending force, for regulating force and such like. Simple inventions such as toothed-wheels, a revolving shaft, or a spindle, or a clutch, the fast and loose pulleys, a cam, a pair of rollers, or the fly-wheel, have each been of great value to the industrial world, and all of them, together with such small inventions as the bolt and nut, have severally produced a much greater effect upon the world's destiny than many things with a more sounding title.

Placed as we are on the surface of this wonderful little world, and from the limited nature of our senses, we are prone to consider everything that we see around us as though they were naturally in a state of absolute rest, but in reality there is no such condition as positive rest in this part of the universe. Not only are suns and planetary systems in a condition of whirling motion, but air and water, and indeed everything upon the earth's surface is also in a state of restless activity. An iron bridge, or even a machine in a factory, when the steam-engine is not working, may both seem to be at rest; but the close investigation of physics tells us that it is the contrary—that gravitation and heat are always at work, either amongst the atoms or molecules, or in disturbing the condition of larger bodies. The bridge is always on the move, and if such a condition as rest should exist for a moment, it is because the forces at work are in an accidental condition of equilibrium.

As to what the real and ultimate nature of force is, we know not; but in considering the sensible motion of bodies in the operations of applied mechanics, or those with which we have to deal and are familiar, it will be found that all motion is the result of some extraneous but mysterious force disturbing equilibrium, and a close examination only goes to show that almost all the force which the engineer has to deal with and apply is, so far as we are concerned, primarily derived from the heat of the glorious sun; but we are not able to trace it farther, or to say what it is, beyond the effect which it produces.

When any single force acts upon a body, motion in a straight line is produced; such is the action of gravitation through space. The steam-hammer is lifted in a straight line by the force of heat in the condition of steam, and, when left to itself, by the natural law of gravitation the hammer falls in a straight line towards the centre of the earth. The single force of heat or steam introduced to raise the hammer has to be stronger than gravity *plus* the friction; therefore, it overcomes the lesser force, and raises the hammer until the steam is permitted to escape from under the piston, when it thus sets the hammer free to fall, unimpeded by gravitation; or the falling hammer force may be increased by applying extra steam-force on the upper side of the piston. In such a case gravity and steam act in unison as if they were a single force, by thus uniting their force and increasing the velocity of descent, both are acting in the same direction.

Motion, in a straight line, however, is not so convenient a condition for the greater number of man's mechanical purposes as the condition of circular motion, which is so generally employed. To produce circular motion, two distinct forces are required which are not in the same direction; this may be explained by the pendulum before us. Gravity would pull in a straight line if the string did not interfere, but its presence constitutes a second force which confines the ball to a centre, and so compels it to move in a circle. Thus all circular motion is made up of these two forces, the one moving it in a straight line, the other restraining it to a centre; and if the latter is overcome, as in cutting the string, or in the breaking of the fly-wheel of a steam-engine, it then obeys the natural law by flying off at a tangent, like a stone from a sling, and in a straight line but for the interference of gravitation.

In the varied operations of applied mechanics, an immense number of different kinds of motion are necessary; yet the universal experience of mankind seems to concur in the selection of circular motion as the preferable and most convenient for man to deal with and control, to receive, to store up, and convey force in motion; and although it may seem to be evident and natural to us now, still it may have taken man thousands of years to find it out, and when he did find it out, it was one of the grandest mechanical discoveries which he has ever made, because it fits in so conveniently with the nature of things existing in the world.

Before proceeding to the consideration of natural power, as applied to produce motion, there are a few elementary matters which had better be understood in order to avoid explanation afterwards. In the application of natural force to produce motion, it is necessary to know its amount or quantity. All mechanical power or force of any kind, when considered as an agent to produce motion or to accomplish some performance of mechanical duty of whatever nature, is technically called "work;" such "work" is reckoned by certain units, made up of matter and motion. A single unit of work is 1lb. of weight, or pressure, or force, raised or exerted in any direction, through the space of one foot; thus there are two elements, force and space, passed through. The plumb-ball before us weighs 1 lb. If it is lifted through the space of one foot, then one unit of work has been performed. If it is raised through 100 feet, then 100 units of work or force are necessary; or 100 lbs. through one foot would equal 100 units; or 10 lbs. through ten feet would equal 100 units; the weight, or force, or pressure in pounds, multiplied by the distance or number of feet raised or exerted through, is equal to the units of mechanical work. This simple method of reckoning force, or power, or "work," is employed in every kind of mechanical operation, as every force or pressure can be expressed in pounds, and any nature of resistance overcome, such as water rising or falling, the motion of a piston and railway train moved, or anything else done, of whatever nature, all are easily expressed in pounds and feet; so multiplying the pounds of pressure exerted by the space in feet exerted over, gives the units of mechanical work required or performed.

In dealing with large quantities of mechanical force or power, it is often, indeed generally found convenient to use a larger unit, say a horse-power or a man's power. The larger unit which is now agreed to is the measure of a horse's work, which is about 33,000 units or foot-pounds, as performed in one minute of time; and a man's power is usually considered as about one-tenth of the above, or equal to 3,300 units or foot-pounds performed per minute. By means of these units, together with the time addition, every kind of ordinary calculation respecting mechanical work done, or power required, is thereby rendered so simple that a boy may be made to understand the subject without any trouble.

A man working ten hours a day is capable of exerting 15 lbs. constant pressure on a crane handle, at the rate of 220 feet per minute, which is equal to 3,300 units, or the tenth of a horse power; by doing more than this he loses weight. In the case of a horse which is capable of pulling with a force of 150 lbs. at the rate of 220 feet in a minute, the force is equal to 33,000 units, or in other words, a "horse-power," which is about the average of what an ordinary horse can continue to do.

The average pressure of the wind exerted upon the sails of the windmill may be reduced to pounds, this force moving the sails at a certain rate per minute; the average pressure multiplied by the distance travelled in that time, and divided by one horse-power, namely, 33,000, will give the strength of the windmill in horse-power, but including friction and other hindrances. In the same way a certain weight of water expressed in pounds

falling through a certain distance in feet, as performed per minute, these multiplied and then divided by 33,000, will give the nominal power in horses, or the average pressure exerted on the piston of a steam engine when moving through a certain number of feet in a minute, divided by 33,000 units, gives the power of the engine in round numbers; but the result of all such mechanical calculations does not give the actual or useful work which may be derived from those weights or pressures in pounds multiplied by the number of feet passed over, it only indicates the natural power at disposal, because anything that man does in applied mechanics is imperfect, more or less. The full advantage of the wind or water, or the steam, is not entirely secured in passing; then friction and many other sources of loss step in to still further reduce the available remainder, but the full measure of the force to be applied, or the work required to be done, is not depending on men. This depends entirely on nature. The amount of work secured, or lost, or wasted, depends on our arrangements, and hence it is that one man's imperfect arranging may and does constantly waste more force or power than another man's. For instance, to take the simple case of a water-wheel, to which I shall have to refer again, if the power is taken from the opposite side to that upon which the water is admitted, the friction upon the axle will be the weight of the water-wheel added to twice the water-weight or pressure. If, on the other hand, the more skilful engineer takes the power from the same side on which the water is admitted, then the friction remaining is only that which is due to the weight of the wheel; thus it is in everything relating to mechanism, manifested in thousands of different ways, but the majority of mankind do not sufficiently appreciate or discriminate between the two. Notwithstanding the increased knowledge of mechanical principles, there is still remaining a vast amount of misconception in regard to power; and, in looking back to the early days of applied mechanics, still more numerous were the popular errors existing in regard to power and motion. It was supposed that the force or power could actually be increased, in other words, created, by combinations of wheels and pinions in machinery, or that a regulating fly-wheel, by some means or other, really augmented the entire effect of the force, and such delusions still linger, to some extent, even in our own day, although we now begin to see the good result which is derived from the clearer light which is breaking through the past haze of ignorance.

A striking example of recent times was afforded, when Mr. Fairbairn first conveyed the motion of a steam-engine direct from the periphery of the fly-wheel. Before his time, it was invariably taken from a point nearer the axle, under the notion or belief that a greater ultimate effect could thereby be exerted, and the innovation made by Mr. Fairbairn was considered by the greater number of mankind as wrong in principle, forgetful of the well-known law that a given quantity of force or power could be expended in any condition, either as slow motion or quick motion, on the simple principle of the lever; that a small weight on the long end of the arm is equal to the heavy weight on the short end; that 10 lbs. at a distance of ten feet is equal to 100 lbs. at one foot; both are expressed by 100, both are in equilibrium, and, if motion is given, one has ten times the velocity of the other; both are the same as regards mechanical work, and the office of the engineer is to use the force or motion in any condition which best suits the immediate purpose; and he shows his ingenuity by its expenditure in actual useful work with the least loss by friction, not by the introduction of complicated and unnecessary moving parts.

A quantity of mechanical force in motion, equal to 100 horses' power, may be distributed over a cotton-mill. In this distribution, possibly 25 per cent. is spent before leaving the engine-room; and in friction, a large portion is spent in giving motion to the intermediate mechanism by which it is made to ramify to the various working points of beating, scutching, spreading, carding, drawing, roving, spinning, reeling, weaving, washing, pressing, and so forth; and the remainder only is the useful work that really cards, spins, and weaves the cotton into cloth; but these items, all united, make up the total 100 horses' power at disposal. But the whole of the 100 horses' power could be expended under any other conditions; it might be conveyed through a small endless cord, providing it were driven at a sufficiently high velocity, say 50 miles per hour, as in the telodynamic cord of M. Hirn, to which I shall again refer; or the 100 horses' power might be expended in simply drawing a single chain cable at a proportionately slower speed, and pulling with a corresponding greater force. If the one moves 1,000 times faster than the other, it can only exert the 1,000th part of the force, or it may be expended in any intermediate condition; but whichever way it is employed, it always comes to the same thing, namely, so many units of work, 3,300,000 performed in a minute, or equal to 100 horses' power, including friction and waste.

The using of natural force to perform work, although more prominent in our day, is not a new subject. Man's first efforts in the application of natural power for the purpose of assisting in the performance of the drudgery of his daily life, lie far beyond the reach of history or even tradition. It was an old art long before "Romulus or Remus had been suckled," even far beyond the time when the Egyptian Pyramids were erected; those grand works, the Pyramids, were not made by the "prentice hand" of man. Its introduction took place a long way farther back, away up in our own old fatherland, the home of the Aryan race, somewhere in Central or Western Asia, and it existed long before the Aryan swarms were sent off to people India, Persia, Greece, and Rome, and the whole of Europe. It is interesting to read that the words relating to peace and industry, to the domestic animals, to the weaving of cloth, and the working of metals, common in all these nations, have the same root; but that the words relating to war were afterwards originated separately by the several branches, after the great Aryan family had been broken up, showing that the arts of industry had been long established, or the nomenclature could not have been so firmly rooted in the whole stock as to be retained by the several colonies, when they, one by one, found a resting-place in other lands. Beyond such ethnological evidence as may be derived from language, there is no trace nor tradition bearing on the time when nature's power was first turned to account by man.

It may reasonably be inferred that man had long been familiar with mechanical art, and with the use of his own muscular strength in various ways, and had even learned to train animals to assist him in the drudgery of his work, before he was able to apply the mechanical powers of the lever, or the wheel-and-axle and the screw, and a long time must have elapsed before the ingenious millwrights of Persia had the mechanical knowledge to construct the interesting water-raising mechanism which are still used for watering the gardens of that sunny land.

As compared with those early days, we seem to come down almost to modern times when we mention the great and honoured names of Euclid and Archimedes, although they lived centuries before the Christian era. Now, we find mathematics, mechanics, and especially geometry, greatly advanced, and even applied mechanics in no mean condition. Some of the mechanical powers were clearly understood and reasoned upon. Machinery for raising water was constructed on various arrangements, and Hero, of Alexandria, shortly after invented his steam-engine, and applied an air vessel to produce a continuous stream for his fountain apparatus. Still, with all this knowledge and experience, it was yet a long time before we find water-power set to work to turn a mill for grinding corn; for, simple as such a thing may

appear to us now, man had to go through centuries of experience, with apparatus still more simple before the human mind could clearly realise the mechanism that would enable falling or running water to give continuous motion, and thus allow the natural power to release the two women from the hard work of "grinding at the mill;" and it was not until the lapse of seven centuries that the windmill was invented, and, great as may be the contrast between the engineering of those times and the present day, still we have every reason to suppose that it may not be so great as the contrast between our present mechanical arrangements and those of some distant and future generation, as far as regards the application of science to make the best of the natural power which is contained in the world.

We are now to consider a little more closely the application of natural power by the applied mechanics of modern times.

It is only of late years that the heat of the sun has been recognised, so far as we are concerned, as the only source of natural power in the world, with the one exception, perhaps, of the great tidal wave, as pointed out by Mr. Mallet. At the present time this great subject is occupying the closest attention of the foremost thinkers, and the matter has already been so well investigated that it is now agreed upon by all that heat and force are convertible terms, and that either may be converted into or derived from the other; to know this as a fact is a great step forward in the march of mechanics.

The invaluable experiments of Dr. Joule and others show most conclusively the exact relation which exists between them, namely, that the amount of heat required to raise one pound of water one degree of temperature, as shown by Fahrenheit's thermometer, is exactly equal to the mechanical work of raising 772 lbs. one foot, or one pound 772 feet; in other words, 772 units of work, or 772 pounds-foot; that one pound falling through 772 feet, if suddenly stopped in its course, such as when a cannon ball strikes an armour plate, the amount of heat developed amongst its particles, if all collected, will be sufficient to raise a pound of water one degree.

Such precise knowledge as this affords is about to work great changes in all our mechanical arrangements for converting heat into motive power. From this definite data the engineer has a reliable standard wherewith to compare the results which he manages to obtain from the expenditure of a given quantity of fuel or heat, and instead of the feeling of self-satisfaction which has hitherto existed in regard to the amount of real work done by our steam-engines, there is now amongst engineers a growing sense of extreme dissatisfaction. It was a surprise when we came to learn that not one-tenth of the actual heat to be obtained from the fuel is turned to good account in the exertion of the mechanical force to do actual work, in raising water, or cutting iron, or weaving cloth; that fully-nine-tenths is lost in various ways, between the development in the furnace and the point of action in the engine-room. This is a matter which concerns our most vital calculations, and the feeling of uneasiness which it has created is immensely to be preferred to the opposite condition of self-satisfaction in which the world has hitherto been reposing.

Until recently (and even now for convenience) such machines as windmills, water-wheels, and steam-engines, were called "prime movers." It only shows the rapid change which is taking place, that such a term could not be given now. The possibility of such an expressive name being given to the mere mechanism, implies views which could only have originated at a time when men were narrowly restricted in their ideas of the wonderful system of nature. To realize freely and fully that heat and force are convertible, is the great modern task set before our young students, and calls for fresh thought and closer study, so that by the well-directed thinking of many minds, there may be less waste of the natural power than now exists with our present imperfect arrangements, vastly superior as they are, when compared with the mechanism of 150 years ago.

It is scarcely necessary to refer to the force or power of man or animals, as derived from the heat of the sun which shines alike upon all, and universally recognised as the agent, under a Higher Power, which causeth "the pastures to be clothed with flocks," and "the valleys to be covered over with corn, providing food for man and beast." Nor is it necessary to refer to the sun-agency in connection with the mechanical power which is derived from the wind in motion, in propelling ships and turning windmills, as the motion of the atmosphere in the wonderful economy of the universe is entirely due to the heat of the sun. The air that is immediately resting on the warmer part of the earth's surface is thereby heated, expanded, and rendered lighter than the cold air which is above and more distant; consequently the heated air rises in virtue of its lightness in the same manner and on the same principle that water circulates in a steam boiler, or that hot air rises in a chimney. Thus, the warm air rises to a higher stratum in the atmosphere, and a circulation of air is set up from the colder regions to supply the void, and these currents of air, every foot weighing an ounce and a quarter, are made to perform a little work in passing, by expending their force upon the ship's sails, or the vanes of the windmill; and strange although it may appear at first sight, it is thus the same prime mover, namely, the sun, that forces the sailing ships along as that which propels the steam vessel, the only difference being that, in the case of the sailing ship, it is the effect of the sun's heat as performed from day to day, whereas in the steam vessel it is the effect of the sun's heat, emanating, probably, millions of years ago, and treasured up in our coal-fields, in a concentrated form, for the benefit of future ages. What a wonderful little world we live in, and still more wonderful is the grand universe of which it forms a fractional part.

Even the circulation of water upon the earth's surface is also due and clearly traceable to the heat of the sun. There is no substance on our little earth which is so generally diffused as the precious liquid water. There is no other substance in nature that has so many important and such varied offices to perform, in every condition of existence. Now, it is a solid frozen mass; with a little heat, it gradually becomes the liquid water; and with a little more heat, it assumes the expanded aeriform state of steam. Now it is covering the ocean as a liquid, upon the surface of which the heat of the radiant sun is constantly at work, pumping the water upwards into the condition of clouds of vapour, all rising from the sea, and lakes, and rivers, or other bodies of water, in ceaseless evaporation. For a time it is suspended as an invisible vapour in the atmosphere; by-and-bye, from coming into collision with nature's surface condensers, the chilling hill-tops or other cooling influences, it is then condensed into fogs and mists, and drizzly rain; then falling by gravity upon the earth-surface, gravitation still bringing it downwards by channel and rill, and burn and beck, by lake and loch, and river, never resting, but still downwards, until it finds its way back to the ocean, from whence it came. Again, in time it is raised up once more by the sun's action to repeat its varied course of perpetual motion, round and round, never ending, and thus supplying the wants of plants and animals in its circulation, and always again restored to its native ocean for a holiday, to be rested, sweetened, and purified for further duty.

It is from this never-failing action of the sun that the water-power of applied mechanics is derived; the sun raises the water, gravitation simply carries it back again. It has been computed that 13,000 cubic miles of water is evaporated every year, the same quantity necessarily falling down again. Man now steps in, and by his ingenuity arrests some of the passing water in its downward course, and so takes advantage of a small portion of its force or power to give motion to his water-

wheels, engines, and turbines, and then, by some simple mechanism which he has devised, controls the force so as to make it perform the drudgery of grinding the corn for his daily bread, or even to spin and weave the materials for his clothing, and many such like purposes. But no power whatever is derived from the water-wheel or the turbine, or anything that man does; it all comes from the sun which first raises the water, thus giving gravitation the opportunity to carry it downwards, and man merely presents a wheel for the gravity or weight of the water to turn it round, by the catching of a small portion of the natural force in passing along its course.

From the long period which has elapsed since water was first employed to give motion to machinery, and owing to the subject having passed through the hands of so many of our modern great men, from the time of Smeaton down to that of Fairbairn and Fourneyron, the subject of water-wheels has been almost exhausted. Water-wheels or turbines, when considered as machines contrived to take advantage of the natural power which is applied to them, are much more perfect in their way than the more recondite steam-engine; still, even with the best of the water-wheel or turbine class of machines, they scarcely absorb 75 per cent. of the power at our disposal, that is to say, more than 25 per cent. is wasted or lost in its passage through the apparatus.

A cubic foot of water weighs 1,000 ounces, or 62½ lbs.; hence, by ascertaining the number of feet delivered per minute, this weight multiplied by the height in feet through which it falls, and divided by 33,000 units (which is a horse-power nominally) would indicate the actual power; but as will be seen by a close examination of the section of a water-wheel, even of the most modern and improved construction, many sources of loss and leakage will still be apparent, even after everything has been done to practically make the best of it, and to close up all waste of effect, so far as present knowledge will permit.

To make the most of water-power, the modern practice is, to dam up the head-water disposable until it is almost in a state of rest, so as to raise it up to the highest possible level at the point where it is to enter on the water-wheel, and thus to use only the cream of the water, in order, if possible, to make every inch of the water-fall available, the height of fall being equally as important as the quantity or weight. These two conditions alone determine the actual power; the adaptation and skilful construction of the machine determine the amount of effective power which is made available.

Theoretically, the impulse of running water as derived from gravity, ought to afford the same per-centage of duty as by taking advantage of the gravity in a more direct manner; but in this country, engineers generally have, of late years, settled down to follow Mr. Fairbairn in the construction of what are termed breast-wheels, similar to that shown in the diagram on the wall. In France, the other principle is more frequently preferred, the practical effect of both is nearly alike.

When a machine has been a long time in use, and passed through the minds of many, man gradually closes up the sources of waste. This refining process has gone on for a long time with water-wheels, until at length certain general rules are agreed to as affording the best result. The size of a water-wheel may be from that of a donkey-power to several hundred horses, that being determined entirely by the situation, the quantity of water available, and the height of water-fall; but the speed at which a gravity-wheel yields the largest per-centage of duty is determined by Newton's great law of attraction, as determining the rate of falling bodies. The water, if left to itself, would fall at the rate of all falling bodies, or about 16 feet per second; yet, if it were allowed to do so on a water-wheel, evidently it could do no work besides; but the retardation of the wheel thus interrupts the descent to a much slower pace.

It has been found that the best result is obtained by allowing the outside of the wheel to move at about three and a half to four feet per second, that is, about the velocity of water when falling about seven or eight inches; hence the water falling over the sluice upon the buckets of the wheel, a distance of seven or eight inches, gives little or no shock. This rate of motion gives a speed to the periphery of the wheel of 210 feet per minute, or thereabout, whether large or small.

Another nice point which has been well considered in connection with modern water-wheels, so as to make the most of the water-fall, is to lower the sluice in order to admit the water, instead of raising it, as in older descriptions of water-wheel, for the water to pass under. By this simple means an increase of effect equal to the depth of the sluice is added to the fall, and thus, so to speak, the cream of the water only falls over the upper edge as it descends, and hence the most of the height of the water-fall is made to perform work.

A water-wheel for cotton-spinning, like a clock, has to work at a uniform speed; and the same means, namely, a modification of pendulum, is employed in both cases. To the water-wheel a species of revolving pendulum, termed a governor, is employed. All are familiar with the action of the same governor in the steam-engine. In that machine its office is to open and close a so-called throttle-valve, which regulates the admission of the steam according to the work or rate of motion of the engine; but the office of the water-wheel governor is of a more refined and dignified nature; it is more a consulting governor, to give advice when wanted, rather than a governor to really perform the hard work of moderating the water supply, as the engine governor does the steam. The sluice of a large water-wheel is an immense iron shutter, which, although counterbalanced by a weight, is still a ponderous apparatus to adjust, and cause to slide up and down, as the varying water supply, or even the changing work to be done in the factory, may require.

This laborious duty of moving the sluice is assigned to the water-wheel itself to perform; and the office of the governor is merely to suggest to the unreasoning-wheel which way to move its own sluice, so as to feed itself properly and regularly. This is accomplished by a very familiar combination of two bevil-wheels running loose upon a shaft, with a clutch between them, and working into a third, the third being the wheel that communicates with the sluice. Each of the two wheels, when giving motion, necessarily turn the third wheel in opposite directions, and as the governor rises or falls by change of velocity, it reminds the third wheel, by means of the clutch being made to slide or move either to the one bevil-wheel or to the other, in order that the proper wheel may have the motion which is suitable for the necessary movement; and during the periods when the required speed of the water-wheel is maintained both of the bevil-wheels are at rest, the governor being always sensitive, and on the alert to jog the one or the other.

With these explanations, and the assistance of the diagram on the wall, the leading features of the water-wheel will be understood. The curved plates (or buckets as they are termed) that receive the water, are arranged in such a manner as to allow the air to escape freely and without splashing the water, and are so formed as to enable them to retain hold of the water the longest possible period. During its descent, the wheel revolves in close contact with a corresponding arc or curve, and is enclosed by segments at the ends of the buckets, in order to prevent the water from escaping; but, as will be seen by an inspection of the diagram, a considerable portion of the water is still unavoidably wasted, by resting on the surface of the arc and otherwise. From these causes, and from the prejudicial effect of the water leaving the wheel with too much velocity, and from the wheel having to rise out of the tail-water, together with the friction of the wheel upon its bearings and other

resistances, not far from 35 per cent. of the power is thus wasted, or at least not available for duty, in the greater number even of the better class of water-wheels.

Another great modern improvement in connection with water-wheel mechanism, consists in the manner of conveying the motive-power from the water-wheel to the factory. In former times, the motion was taken from the axle, consequently the water-wheel had to be sufficiently strong and heavy to bear the transmission of the power; but in modern wheels, the axle and arms have merely to keep the great outer ring of the wheel that carries the buckets in its proper place, thus giving a light skeleton wheel, with the waste from friction reduced in proportion.

It will also be observed that the toothed-gear for imparting the motion and power is upon the ring, and thus the motion is taken off the wheel at the point where the water is most effective; hence the weight of the water comes almost direct upon the spur-wheel to be driven, and, comparatively, scarcely any strain comes upon the water-wheel as a structure. In the second place, it absorbs the weight of water in a direct manner, and thus removes the double friction that would otherwise be entailed, that is to say, the conditions would be entirely reversed if the motion were conveyed from the other side of the water-wheel. And a third great advantage of this arrangement arises from the high speed which is at once given to the driving-shaft, thus avoiding the necessity for intermediate gearing that would otherwise be required if the power was taken from a smaller diameter. From this, also, two other important considerations follow, first, a reduction of the first cost of gearing; and secondly, a diminished friction, as the strength required and the weight of shafting diminish with the increase of the velocity.

Although the venerable water-wheel has been the most frequently employed in this country, still it is not by any means the only machine for taking advantage of water-power.

For situations where the quantity of water is limited, but where the fall is considerable, water-pressure engines, with cylinders and pistons like steam-engines, are sometimes resorted to, and yield a per-centage of duty fully equal to the water-wheel, but they are more expensive and complicated, and only used for very high falls.

But there is another class of water-mill now coming into extensive use, called turbines; they are more simple than the water-engines, and less expensive than water-wheels. Turbines are made in many different ways, but in almost all the power is derived from the confined fluid pressure of water rather than from the mere weight of falling water, the pressure in the turbine, however, being due to the gravity resulting from the vertical height. On this account, the turbine is more accommodating and better adapted than the water-wheel for any varying range or height of water-fall, and may be used for 400 feet, or, with a slight modification, for a fall of only a few feet, the power being in proportion to the height of fall and quantity of water passing through the machine in a given time. This is a great recommendation in their favour for most practical purposes.

From careful experiments made with turbines, the per-centage of duty is found to be slightly higher than with water-wheels, arising chiefly from their not being affected so much with tail or back-water, and likewise from their peculiar fitness for running at a high speed. It seems probable that, in the engineering of the future, they will ultimately supersede the water-wheel, except for special situations.

The diagrams on the wall show that the turbine is made on many different plans of arrangement, so that it is impossible to describe them in this lecture. As a rule, the rush or flow of water under pressure is guided in a certain direction, and thus made to impinge on the curved vanes of a kind of small water-wheel, as shown on the diagram. Frequently they are arranged as a small water-wheel with a vertical axis, the water passing either from the inside through the buckets, or from the outside to the interior; and in those of the best construction the turbine is balanced, that is to say, the machine is so contrived that the pressure of the water is equal in both directions, so that from being in a state of equilibrium, the friction which would otherwise exist is thereby avoided, thus increasing the effective duty.

A disadvantage which sometimes accompanies the possession of water-power arises from circumstances, in which it may not be in the best situation for being turned to practical account, such as in driving a factory, or otherwise, as may be desired. To overcome this difficulty canals are most frequently resorted to, in order to convey the body of water to the spot where the power is to be used, which is obviously both cumbrous and expensive. Within the last few years, M. Hirn has contrived an exceedingly clever mechanical arrangement, by means of which the power, spirit, or essence of the water, rather than the gross weight, is transmitted for several miles by means of a small steel wire rope, which is driven at a correspondingly high velocity; this is on the well-known mechanical principle that a small weight or pressure at a high velocity may be equal to a very great weight or pressure at a proportionately slow rate of motion. He erects a water-wheel or turbine in the most convenient place beside the water-fall, and, by means of a toothed-wheel work, gives motion to a large driving-pulley some ten or twelve feet in diameter, which is whirled up to a speed of 6,000 feet per minute, and over this pulley he passes the endless cord, which transmits the motion to a similar pulley on the other side of a valley, perhaps some four or five miles distant, the cord being supported at intervals by other suitable pulleys, in order to prevent it from touching the ground. In this way a force equal to 100 horses is readily conveyed for a distance of five miles, and is said to yield fully 75 per cent. of duty. In the earlier experiments considerable difficulty was experienced, chiefly arising from the repeated fractures of the small wire rope or cord, owing to its extreme velocity, of some 50 miles an hour. This deterioration of the cord was found to arise from its having to work over the groove of hard pulleys, but, by providing a cushion of gutta percha which lines the bottom and sides of the grooves of the pulleys, the difficulty has been entirely surmounted; and by means of this admirable combination the great force of the water-fall, by being thus changed into the condition of a small force at a high speed, is conveniently dealt with, and the living principle of the natural water-power is thus transmitted without incurring the expense of transferring the dead weight of water over the intervening country, which in many cases would be impossible.

The great success which has attended this invention of M. Hirn will soon lead to a further application of the principle in many different ways. Indeed, during the last few months, an apparatus of an analogous character, but differing in principle, being arranged with a thicker rope and slower motion, has been established near Leicester, for the conveyance of stones. It consists of an endless rope passing over pullies on a series of poles, for a distance of three miles; the stones are contained in boxes suspended from the rope, and are delivered at the rate of ten tons per hour; the whole apparatus being worked by a small portable steam-engine, and it is said to be eminently successful, and satisfactory in its working in every respect; doubtless other applications of this mode of conveyance will yet be developed, as determined by circumstances.

The knowledge of the simple fact which has been developed by M. Hirn, that any reasonable amount of mechanical force or power may be transmitted through a small cord, when it is driven at a sufficiently high velocity, will yet work many changes in the future arrangements of the world, but which cannot be foreseen nor imagined at the present time. The study of

each recurring century will lay bare the hidden stores that are laid up in nature.

We now come to consider the class of mechanical power engines which act by the effect of heat in a more direct manner than in those for wind and water power. These heat-engines admit of endless variety of construction, and already assume many forms, and employ different agencies for the heat to act upon, such as steam, air, or even gas, but all depend for their effect on the natural expansion of volume by heat, and the natural contraction of volume by its withdrawal. Up to the present time, for practical purposes at least, every one of these heat-engines depends for its efficacy on the reproduction of the heat of the sun, either past or present, especially the former, which has been treasured up for us, stowed away in the vast coal-cellars of the earth, probably for millions of years before our time.

George Stephenson generally gets the credit for having been the first to recognise this natural fact, but the same idea was thrown out in one of the early editions of "Herschel's Astronomy." Such a truthful statement was calculated to take the mind by surprise, as mankind were scarcely prepared to believe that light and heat, as absorbed by the plants of far-off ages, had been thus condensed, and now made to give back the light and heat, and that these plants are actually liberating the same carbon and the same hydrogen which was then absorbed, and that the old carbon and hydrogen are now being set to work in our factories, being the prime agent affording the motive power to give motion to the screws and paddles for the various means of conveyance, as required by man, both in ships and railways.

With wind and water power, as formerly stated, it is the effect due to the sun's work of the present time that we are using, and which will last "so long as the sun and moon endureth;" but with the natural power of the sun in the olden time, in the condition of coal, it is a limited quantity only which is placed at our disposal; hence, as a generation, we are not warranted in wasting the rich patrimony which, as a nation, we have so bountifully inherited; and it is the special province of the engineer, like a good steward, so to contrive his mechanism as to make the best of our mineral resources without either waste or extravagance, so far as present knowledge will enable him. In the past, and even now to some extent, we have been and are by far too apt to congratulate ourselves in regard to the perfection of our heat-engines, and especially the steam-engine, yet the sad fact remains that only a small portion of the effect of the heat is turned into useful work. As compared with Hero's steam-engine of 2,000 years ago, or Savory's steam-engine of 200 years ago, or even of Newcomen's steam-engine of 100 years, the duty is increased nearly ten-fold, but, as compared with the standard of Dr. Joule, of 772 foot-pounds to be derived from the small quantity of heat required to raise one pound of water one degree, we are still in a woful condition, yet not without good reason to hope and believe that many other Watts and Stephensons will arise during the next 2,000 years to carry the work forward.

In the case of the steam-engine as now existing, probably one-half is wasted in the furnace, the flues, the boiler, and chimney. Heat is wasted in the engine, and all heat escaping as warm water from the condenser, or as steam from the chimney of the locomotive; even after a small portion only of the heat of the coal in the furnace has become converted into real mechanical force, in order to give motion, say to a factory, of this small remainder a large fraction is wasted in friction, sometimes to such an extent as to increase the temperature and become sensible to the touch. All motion involves the waste of heat, and all heat not converted into the real work to be accomplished is heat lost. How careful, then, ought we to be in the perfecting, lightening, and simplifying of our mechanical constructions, and what a boundless field opens up to the students of the future. It is only such considerations as these that will serve to stir us up to an endeavour for improving our machinery to the very utmost, and, for its own sake, we must become more refined in our ideas of construction, and more parsimonious of power, and so economise in every direction; to have as few moving parts as may be practicable, and those as light and correctly fitted as possible, as every unnecessary squeeze, or rub, or friction of any description involves a waste of the precious power which has been so carefully laid up for man to use, but certainly not to abuse in the manner which we constantly see, and students will find it a healthy exercise to study applied mechanics from this point of view.

The nearest approach to perfection in the primary use of heat has been made with hot-air engines, in which the cold air, passing inwards to the engine, takes up the heat of the hot air in passing outwards, after having done its elastic work; but such engines hitherto have chiefly failed through practical difficulties, which may, and no doubt will yet be overcome, especially from the circumstance that so many ardent minds are now fastened on to this subject, and all are impressed with the waste of existing arrangements; indeed the subject is ripe for the earnest and continued study of our young engineer; and man's work will not be done, even with the well-worn steam-engine until a much larger percentage of duty is derived from a pound of coal than is now obtained.

The highest duty yet performed by a steam-engine, so far as I have been able to verify, is a small fraction under 1,000,000 lb. raised through one foot by a single pound of coal, and some are reported even higher, but immense as this may seem, it is scarcely the tenth of what the pound of coal is equal to, provided that it be wholly converted into useful effect. Possibly, in the very nature of practical things, man may never be able to reach even half-way to the full measure of perfection; still, if all our students strive to do their utmost with every detail (for in that alone, with existing principles, lies hope), much will yet be effected; and, reasoning from the condition of the Newcomen engine when first put into Watt's hands, and what it has since become by Watt, Stephenson, Fairbairn, Penn, Napier, Hick, and many others, and from the high standard of mechanical construction which may now be obtained by modern tools, and from the fresh knowledge of scientific principles throwing light upon every subject, more especially in regard to the wonderful phenomena of heat by the investigations of such men as Professor Tyndall, there is good reason to hope that many points of leakage of force which now exist in the steam-engine will be closed up one by one, although some of them, so far as we can see at present, may now be deemed impossible, when judged by the experience of this period in the history of applied mechanics.

In this commercial age everything, including natural power, narrows itself down into a pounds-shillings-and-pence question, and hence the most successful engineering, judged by modern notions, is that which will give the best return in useful work for a given expenditure, considered not only in reference to first cost for the mechanical apparatus itself, but of that likewise taken into account along with the future working cost for fuel and other expenses, and without reckoning the power required to work the engine itself as part of the work. If some such mode of buying heat power were introduced, even approximately, so as to put all constructors of heat-engines upon their mettle in this direction, it would soon lead to a great economy in many important respects that now pass unheeded.

The system of selling or buying steam-engines at so much per nominal horse-power is so very far wrong that probably few will now be found to defend the practice. There can be no equitable transaction or fair competition until that which is bought and sold is reduced to work performed in foot-pounds, or some better or more convenient unit, if any such can be devised; some definite quantity for a given expenditure, with the cost of fuel

and expenses of every nature being taken into the calculation.

In considering the subject of heat-power, the actual and effective heat to be developed from the coal is one of the chief questions. Heat itself is the only grand agent; the steam, air, or gas are the mere subordinate instruments for transmitting the effects of heat to pistons or other mechanism. The subject therefore divides itself into three distinct parts; first, how are we to obtain the whole heat from the fuel; secondly, having obtained the whole heat, how are we turn it to the best practical account as a producer of steam or heated air; and then, thirdly, comes the consideration of the mechanism to be employed for converting the force of the heat-agents, steam or air, into mechanical power.

We may regard a furnace under a steam boiler as a chemical laboratory on a large scale, in which the object is to mix coal and atmospheric air in the best proportion, so that the carbon of the coal shall be converted into carbonic acid gas, and the hydrogen into water, and that the changes shall be effected in such a manner as will develop the full heat of the fuel, and that as much as possible of this heat shall be communicated to the water in the surrounding boiler, and as little as possible shall be wasted either by radiation or conduction, or by cooling through any cause, or by passing up the chimney, or otherwise.

When all this is done by the chemist with the utmost care, we read that a pound of good coal in his hands will evaporate 14 lbs. of water, but in our practice, even with the very best arrangements yet devised, 12 lbs. is rarely if ever reached, even 10 lbs. is extremely exceptional, 8 lbs. is reckoned very passable duty, and down even to 4 lbs. is not uncommon. A great part of this waste is mostly due to small causes, many of which could, in a great measure, be obviated if we had more thrifty notions.

The attainment of perfect combustion is as much a matter of oxygen or atmospheric air supply as of fuel. The air consists of one of oxygen with four of nitrogen; the main constituents of ordinary coal are about 80 per cent. of carbon, and 5½ per cent. of hydrogen, in varying proportions according to the sort, the remainder consisting of oxygen, ashes, and other matter. In coal the carbon and hydrogen are both united and in the solid state, but each of these constituents has its own way of entering into combustion, and neither of these will commence burning until they are separate, and then they begin to burn each in their own order, and in that way only. This version of the process is quite different to the usual notion. It is generally supposed that when coals are thrown into a fire they begin to burn all over as a matter of course; but this is not the natural law that we have to comply with in the burning of coal, the breaking of which law involves not only waste of heat, but causes smoke as well.

The combustion process in a furnace is well explained by that which takes place in gas-making, the chief, indeed, the only difference that exists being this, that in the furnace the gas is consumed as fast as it is made, while the gas-maker stores up the carburetted hydrogen gas in holders, after passing it through lime in order to purify it from sulphur and ammonia; then he sends it out to the public to be used for light and heat. The gas, when it reaches the consumer, if it is supplied with its proper quantity of air, namely, ten times its own volume, will burn brightly without smoke, and give up all its light and heat. The residue of coke, which is left in the retort of the gas-maker after the gas has been expelled, is then withdrawn to be otherwise used as fuel, whereas the engineer consumes it in the furnace as the principal source of heat.

Now, the first duty to be performed by the engineer in burning a ton of coal in a furnace is shown by the gas-making process. The ton of coal gives off from nine to ten thousand cubic feet of gas, and requires about 100,000 cubic feet of air to produce perfect combustion. In one important respect the two processes are unlike, as, in a furnace, the fuel may be, and generally is, in all stages of combustion, but every individual particle of the coal, large or small, burns in one way only. The hydrogen has first to part company from the carbon before it combines with the oxygen, and the carbon portion does not commence to burn until the whole of the hydrogen has gone off, and if the engineer has done his duty in giving the gas which he produces the ten volumes of air which it requires, it will then burn as brightly as the gas of the gas-maker, providing the temperature is sufficient for its ignition. When the hydrogen has quite gone off, then the carbon commences to burn, but not till then, and it will continue burning to the end, if a proper allowance of air is supplied.

On the other hand, it is not only necessary to give a sufficient supply of air both to the carburetted hydrogen and to the carbon as they severally need it, but it is almost equally bad in another direction to give too much, as any cold air passing through the furnace without taking its full share of the work is a robber of the heat produced by other air, besides damaging the boiler and producing smoke. Hence it is that the combustion of fuel will seem, and does really seem to many, to be a rather complicated matter, and a law difficult—almost impossible—to obey, but whether difficult or not, this is what the furnace has to do, and in nature there is no allowance made. There is the law, and our duty is simply to find it out and to obey it, and if we fail in any particular, either by excess or shortcoming of air, an £ s. d. fine will be inflicted as certainly as two and two make four, much more so than the fine which is inflicted by the magistrate for the nuisance of smoke.

Fortunately, however, it is not so difficult to comply with the natural law, if we only take the trouble. When coals are thrown upon a furnace, the first effect is to lower the temperature by the quantity of heat absorbed by the fuel in expelling the water. The next stage is separation and departure of the hydrogen, carrying along with it a portion of the vapour of carbon, and this will require its share of ten feet of air to every foot of gas, not vitiated air which has passed through the fire, but pure air containing two feet of oxygen, and some, indeed the whole, of this air must be supplied to the gas, either by the furnace-door, bridge, or sides, or in any other better way that can be devised, except through the fire-bars, and it must be given in a varying quantity to suit the ever-changing quantity of gas that may be evolved for the time being, which at first is gradually increasing, and then gradually diminishing.

The next demand for air is to supply the remaining carbon which is lying on the fire-grate, and the quantity of air necessary to be supplied through the fire-bars, for that constituent for a ton of coals is about 240,000 cubic feet; thus, with that required for the carburetted hydrogen, making altogether 340,000 cubic feet, and if the gas and the carbon cannot (from any cause) get their proper quantities of air to yield the necessary oxygen, then they are compelled to go without, and the full heat is not evolved, and it ends in smoke; or if there is too much cold air admitted, smoke will be the result, because it requires temperature as well as oxygen to give perfect combustion. The apparent difficulty of securing perfect combustion when a furnace is replenished by manual stoking, where the fuel is of necessity introduced in large quantities from time to time, has led to many ingenious attempts for supplying fuel by some mechanical arrangement which shall be constant, thus enabling the engineer to provide a certain measured quantity of air to meet the respective wants of the gas and the carbon. Of the more recent applications in this respect is the system of reducing the fuel to gas before it is introduced into the furnace, and, by another arrangement, the coal is reduced to a fine powder, which, with the proper allowance of air, are together wafted into the burning chamber, thus giving each atom of hydrogen and carbon the opportunity of selecting their partner of oxygen,

and in an instant producing their full light and heat, and no doubt the furnaces of the future will be in this direction rather than on the present system.

If we had time to follow the heat which is thus developed in a furnace through the chimney, the boiler, the water, the steam, and the engine, an opportunity for wasting it would present itself at every turn. To take the case of the chimney in connection with Dr. Joule's equivalent of 772 lbs. raised one foot, by the heat required to raise a pound of water one degree. From a course of experiments which were made recently at Woolwich, it was found that the gases from an ordinary furnace may be drawn downwards through a tubular vessel containing cold water, and made to give up the whole of the heat in the gas to the cold water which entered at the bottom, and the amount of heat which was thus saved, was considerably beyond the theoretical value necessary to create the draft by mechanical means. This is a matter well deserving the attention of our young students, to devise convenient modes of adaptation to fit in with existing arrangements.

That the chimney is the cheapest or best mode of obtaining a draft of 340,000 cubic feet of air for the combustion of every ton of coal is exceedingly doubtful. This prodigious quantity of air, besides the immense volume of gas or steam from the fuel, weighing together about thirteen tons, and passing away at a temperature never under 300°, and generally considerably higher, even up to 500° or 750°, implies such a waste of natural power as is altogether unwarrantable, more especially as the coal mines of Great Britain are not inexhaustible, and the whole question opens up a tempting field for future investigation.

Although heat is the grand primary agent in all heat engines, still it requires to be employed in connection with some material substance. In the case of the steam-engine it is water, in air-engines it is the atmosphere; but so far, when practically considered, steam is found as yet to be the most convenient medium for conveying the power of heat to the piston of an engine, at least so far as the present systems of construction and mode of using materials have determined.

As regards the mechanism of the working steam-engine, we are on the eve of great changes. During the past few years new ideas have sprung up in regard to the pressure at which steam can be safely worked, and the speed at which a piston may be driven. The old notion of 220 feet per minute is now being abandoned, and engines are already working at a velocity of 800 feet. By this means the power of a given size of engine-mechanism is increased nearly fourfold, that is to say, a given pressure on the piston travelling nearly four times as fast as it used to do, like the telodynamic cord, will transmit mechanical work in proportion, of course requiring an increased volume of steam. But such increased velocity demands sounder and more refined workmanship, larger bearing surfaces, and every moving part as light as possible; and the mechanical world has to be gradually educated to a higher level, in order to make good the position already achieved.

Another modern feature is, the various attempts that are being made to economise steam when it reaches the engine. In past times, as a general rule, this most important point has not received sufficiently close attention; too much steam is lost in the passages; valves do not open and shut with the absolute precision which is necessary to produce the greatest effect; due advantage has not been taken of the expansive property of steam after it has entered the cylinder. The office of the governor has been confined to cutting off the supply when the engine went too fast, or to admit more steam when it went too slow. All this is being altered in the foremost class of engines; the steam passages are being shortened; several arrangements of value are being introduced whereby the steam is admitted at the precise moment, then closed again as promptly, and the time of closing, together with the degree of expansion to be given to the steam as depending on the work to be done for the moment, are determined by the governor at every stroke of the piston. The escape of the steam after doing its work is also being put upon a better footing; it is now arranged so that, at the precise moment of time, the way of exit is full open, and remains full open during the whole stroke, and then instantly closes.

Another fertile source for future economy lies in the direction of increased steam-pressure, and along with that an increased expansion in the cylinder of the engine. During the past hundred years it has gradually risen from a pressure about equal to the atmosphere or a little over, to that of 150 lbs. on the square inch, and no barrier has yet presented itself which would indicate a limit beyond the strength and goodness of the materials and the size of the apparatus; and, so far as can be seen at present, 500 lbs. per inch does not seem beyond the bounds of possibility. This, however, is a matter "which time will develop and bring to maturity, like the acorn in reference to the oak." Our present duty is to creep warily in dealing with such enormous pressures, when bottled-up in boilers as at present constructed.

Perhaps these several changes may not seem much in themselves, when individually considered, but collectively they are important, and all are in the right direction, and point still farther. Other nations also are equally active in the earnest endeavour to make their steam-engines more economical, especially France and America; possibly, the higher price of coal in those countries may have impelled them to a study of these points, in order to meet the commercial competition of the world; but, if we are not equally determined to improve our steam-engines, it would be throwing away our only advantage, namely, that of having cheaper fuel.

The simple statement that some modern engines are really performing four times as much work, in foot-pounds, from a pound of coal, as some other engines of inferior construction, requires no comment. The blame does not lie so much upon engineers as upon the purchasers and employers of engines, who are too often content with a rude and less costly engine, extravagant in fuel, compared to an engine of more refinement. Now, however, that attention is aroused and concentrated on increased economy, by Mr. Scott Russell and many others, there is no doubt but that we shall have our engines as good and as economical as any in the world; but if we do not, the blame will certainly lie at our own door, as, from the nature of steam, it will submit to any mode of treatment; it will follow a piston in a cylinder many times faster than any reciprocating piston made of existing materials will bear to be driven, or, in imagination, even the still higher velocity of some future revolving helical wheel, a modification after the plan of Hero of Alexandria, of 2,000 years ago.

To see a locomotive engine running past at a speed of 30 miles an hour, and to watch the motion of the engine-piston, it might appear as though the steam could not follow so rapidly and yet retain its full force. Such however, is the case, for although a single revolution of the driving-wheel upon the rail, passing the train over a space of 15 feet, involves the twice filling and emptying of each of the two cylinders with steam, or four cylinders full of steam altogether for one revolution of the engine, or 1,400 cylinders full of steam in the course of a mile; still the limit of the speed is not with the steam as a natural agency, but depends on the generative power of the boiler to supply the quantity, and on the sound construction of the reciprocating parts to sustain the velocity.

The great success which has attended the introduction of the railway system is due to the action of the locomotive wheel upon the smooth rail. At the commencement of this lecture, reference was made to the selection of circular motion as the most convenient for the requirements of man; there is no better illustration of its manifest advantage, than in its adaptation and fitness, as shown in the driving-wheel of a locomotive engine as it

runs along upon the rail. At first we are scarcely willing to believe that its lower side is always in a state of rest upon the rail, that the wheel is an endless rolling fulcrum of a lever, continually advancing, but still at rest, with the centre of the wheel only moving at the velocity of the train, and with the upper side of the wheel advancing with twice the velocity through space, it being twice the distance from the centre of motion.

If time permitted, I would have referred to some of the different modes of dispensing or conveying mechanical work after it is realised, by gearing, by endless bands, by compressed air, by water pressure, by means of a vacuum, or otherwise; but enough has been said to show that the natural power of applied mechanics is a great field open for closer investigation, and one which, if followed up in earnest, will not go unrewarded.

We sometimes hear desponding remarks made in regard to the future of applied mechanics, but let no one assume that the field of discovery and invention has become narrowed in any degree, or that scarcely anything but the refuse of the past remains for our young men or for the men of the future. On the contrary, so many fresh ideas pour in upon us from day to day, that the prospect is continually widening, every new idea seems to form a clue to an endless chain of other ideas; and, as the tide of civilisation rolls along in its ever-advancing course, it gradually ameliorates the condition of our race, and will continue to do so until all the drudgery of work shall be done by machinery, leaving to man only to guide and to direct by his growing intelligence, thus in time removing the sting from the primeval doom; and it will be found, so long as any of nature's secret laws remain unexplored, that well-directed irrepressible thought will alight on new discoveries one after the other, and to the endless variation of mechanical combinations there is practically no limit.

Proceedings of Institutions.

EXAMINATION PAPERS, 1869.

(*Continued from page 757.*)

The following are the Examination Papers set in the various subjects at the Final Examination held in April last:—

NAVIGATION AND NAUTICAL ASTRONOMY.

THREE HOURS ALLOWED.

Section I.

1. Define a side and an angle of a spherical triangle, and show that the greater angle is opposite to the greater side.

2. Define the polar triangle, and show that the angular points of the original triangle are the poles of the opposite sides of the polar triangle; and that an angle of the original triangle and a side of the polar triangle are supplementary.

3. Prove that in any spherical triangle the sines of the angles are proportional to the sines of the opposite sides, and assuming the expression for an angle in terms of the sides, that cot. a. sin. b. = cos. b. cos. c. + sin. C. cot. A.

Section II.

1. Write down the rules for the solution of a quadrantal triangle. Find an expression for the hour of sunrise on a given day in a given latitude.

2. Given two sides of a spherical triangle, and the angle opposite to one of them,—solve the triangle.

3. State and prove Napier's Analogies.

Section III.

1. A ship in latitude 37° 40′ N., longitude 3° 18′ W, sails due south 135 miles. Required the *compass course* and *latitude in*. Variation 23° W., deviation 3° 20′ W. leeway 1 point, wind W. b. N.

2. Required the compass course and distance from A to B.—

Lat. A 14° 18′ N. { Var. of compass 15° E. } Long. A 75° 28′ E.
Lat. B 12° 33′ N. Dev. 8° 14′ E. Long. B 94° 45′ E.

3. June 15, 1869, at noon, Lisbon, lat. 38° 42′ N., long. 9° 8′ W., bore by compass N.N.E. distant 25 miles. Ship's head N.E., deviation 11° 20′ E., variation of compass 28° W. Afterwards sailed during the next 24 hours as follows:—

K.	$\frac{1}{16}$	Courses.	Wind.	Leeway.	Deviation.
37	8	W.N.W.$\frac{1}{4}$E.	W.S.W.	2	11° 25′ W.
51	4	S.$\frac{3}{4}$W.	E. b. S.	$1\frac{1}{4}$	5° 30′ W.
37	7	N.N.E.$\frac{3}{4}$E.	N.N.W.	$1\frac{1}{2}$	8° 45′ E.
21	9	N.W.$\frac{1}{4}$N.	S.	$\frac{1}{4}$	4° 30′ W.

A current set the ship the last four hours by the compass S.W. at the rate of $3\frac{1}{4}$ miles per hour. Required the latitude and longitude in on June 16th at noon.

Section IV.

1. Define *departure*, and show accurately by a diagram how it is measured. Write down and prove the distinctive formula for middle latitude sailing.

2. What is the principle of Mercator's projection? Prove that—

$$(1.)\ \frac{\text{Diff. long.}}{\text{Mer. diff. lat.}} = \frac{\text{Dep.}}{\text{Tr. diff. lat.}}$$

$$(2.)\ \text{Tan. course} = \frac{\text{Diff. long.}}{\text{Mer. diff. lat.}}$$

$$(3.)\ \text{Distance} = \frac{\text{Tr. diff. lat.} \times \text{diff. long.}}{\text{Mer. diff. lat.}} \times \text{cosec. course.}$$

3. Obtain expressions for the latitude and longitude of the vertex of the great circle joining two places on the earth's surface.

What is the distance on a great circle between Lisbon, lat. 38° 42′ N., long. 9° 8′ W., and Cape Clear, lat. 49° 58′ N. long. 5° 11′ W.?

Section V.

1. Jan. 7, 1869, at a place in long. 87° 30′ W. the observed mer. alt. moon's L.L. was 25° 18′ 12″ (zenith N. of moon). Index cor. + 1′ 35″; height of the eye, 24 feet. Required the latitude.

2. Jan. 20, 1869, at 8h. 5m. a.m. mean time nearly, in lat. 52° 29′ N. and long. 15° 10′ W. the sun rose by compasss E. 56° 38′ S. Required the variation of the compass, the deviation being 7° 20′ E.

Section VI.

1. Define *equinoctial*, *ecliptic*, *obliquity of ecliptic*, *equation of time*, *amplitude*, *latitude*, and *longitude* of a heavenly body.

Illustrate by a projection on the horizon.

2. Shew how to compute the altitude of a heavenly body at a given place at a given time.

Ex.—Lat. 51° 30′ N. long. 3° 15′ W. Required the true alt. of the sun at 7h. 40m. a.m. on April 18, 1869. Required also the observed alt. given index cor.—3′ 20″; height of the eye 24 feet.

3. Show that the error in time arising from a small error in the observed alt. of the sun is least when the sun is on the prime vertical.

Section VII.

1. Feb. 20, 1869, at 5h. 30m. p.m. mean time nearly, the following set of sights was taken for determining the longitude, in lat. 26° 25′ S., long. by account 87° E:—

Time by chron.	Obs. alt: sun's L.L.	
1h. 4m. 56s.	12° 52′ 0″	Index cor. + 1′ 20″
1h. 5m. 14s.	12° 49′ 10″	Height of eye 30 ft.
1h. 5m. 32s.	12° 46′ 20″	

On Feb. 1, at Greenwich, noon, the chronometer was fast on G. M. T. 1h. 15m. 30s., and its rate was 2·8s. gaining.

2. March 4, 1869, in lat. by account 51° N., long. 33° W. the following double alt. of sun was observed:—

Mean time nearly.	Chron. time.	Alt. sun's L.L.	True bear.
10h. 50m. a.m.	11h. 15m. 20s.	30° 16′ 20″	S.S.E.
1h. 40m. p.m.	2h. 5m. 50s.	28° 26′ 10″	S.W.

The run of the ship in the interval was E. by S. 16 miles, the index cor. + 2′ 30″; height of the eye 30 feet. Required the true lat. at the second observation.

3. Aug. 14, 1869, at 6 p.m. mean time nearly, in lat. 38° 48′ N. long. 134° W., the height of the eye 17 feet, the following observations were taken:—

Obs. alt. sun's L.L.	Obs. alt. moon's L.L.	Obs. dist.
12° 16′ 45″	15° 16′ 50″	97° 12′ 40″
Index cor.—3′ 55″	+ 1′ 15″	+ 1′ 25″

Required the longitude.

SECTION VIII.

1. Describe the instrument by which the distance run at sea is obtained. How is the log line divided? What is the patent log?

If the glass runs out in 28s., what should be the length of the knot on the line?

2. Describe the azimuth compass. How is the bearing read off?

3. How do you ascertain that the index glass and horizon glass of a sextant are perpendicular to the plane of the instrument? The limb of a sextant contains 73°; what angle may be read off by it? Prove the property of the sextant on which this depends.

PRINCIPLES OF MECHANICS.

THREE HOURS ALLOWED.

1. What is the distinction between those forces to which the names *pressure*, *tension*, and *attraction* are respectively applied?

What is the English standard of weight, and how is it defined?

2. Explain what is meant by the transmission of force and give any illustrations of it which occur to you.

3. State the theorem which is commonly called the parallelogram of forces, and prove that it it is true for the *direction* of the resultant force.

Two forces act at an angle of 60°; the smaller one is 4. What must be the larger one, in order that the resultant may form with it an angle of 15°?

4. Define the moment of a force, and show that the sum of the moments of two forces acting in a plane about any point in that plane is equal to the moment of their resultant.

When the moment of the resultant vanishes, what conclusions do we draw?

5. What is the experimental law with regard to the extension of elastic strings?

An India-rubber string, 6 feet in length, is stretched by a weight of 50 lbs.; the quantity which measures the elasticity of the string is also 50 lbs. What will be the extension of the string?

6. What is the principle of the screw? Find the ratio between the power and weight—(1) if the screw be smooth; (2) if the screw be rough.

The length of a screw is $1\frac{1}{2}$ feet, in which space it makes 36 turns: the radius of the cylinder is $1\frac{1}{2}$ inches; find the length of the thread.

7. Define moving force, and show that it is proportional to the statical efficiency of the same force.

A body weighing 100 lbs. is moved by a constant force which generates a velocity of 5 feet in one second. Find what weight the force would statically support.

8. A ball impinges upon a smooth horizontal plane; Find the motion of the ball afterwards.

A ball which is inelastic rolls down an inclined plane 120 feet long, whose slope makes an angle of 45° with a smooth horizontal plane. What will be its motion on this plane?

9. State and prove the three usual equations for the motion of a projected particle, acted on by an accelerating force in the direction of its motion.

A ball is thrown downwards with a certain velocity, on a horizontal plane, from a height of thirty feet; it rebounds 12 feet, then falls and rebounds 8 feet. Required the velocity with which it was thrown down.

10. Describe a diving bell; mention any contrivances for increasing its usefulness; what is the cause of the painful sensations which are experienced by those who are within it?

Find the height to which water would, if not otherwise expelled, rise in a diving bell, 8 feet high, whose lower lip is 100 feet below the surface of the water.

11. Prove that the surface of a fluid contained in a vessel which revolves uniformly around a vertical axis is a paraboloid.

A cylinder is 4 feet high, and its base has a diameter of 1 foot; it is filled to the depth of 3 feet with water. What will be the rate of revolution when the water just begins to be spilled?

12. Find the horizontal distance to which water will spout, through a small hole in the vertical side of a vessel. Example.—Let the vessel be 4 feet high, and the orifice half-way.

13. State D'Alembert's principle, and apply it to form the equations of motion of a rigid system.

(*To be continued.*)

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, 1870.

The thirty-ninth meeting of the Association was opened on Wednesday last, the 18th instant, at Exeter. The first meeting was one of the general committee, under the chairmanship of Dr. Hooker, the President of the last year's meeting. Reports were presented from the Council, from the Treasurer, and from the Kew Committee of the Association. The sectional officers and a committee of recommendation were appointed. Mr. Webster, Q.C., gave notice that, at the next meeting of the committee, he would move a resolution to the effect that towns which the Association decided to visit should have a voice in the election of President for the year. In certain neighbourhoods (he said) there were men of high position in the State whom it might be desired by the local hosts and others to have as President. He did not think it was right that such claims should be overlooked. In the case of Liverpool, for instance, to which place the Association was likely to go next year, the Earl of Derby and Lord Stanley were held in high esteem, and ought, one or other, to be considered. The Presidency (Mr. Webster declared) ought not always to be confined to men of science.

At eight o'clock in the evening, in the Victoria-hall, Dr. Hooker resigned the chair which he had held during the past year, and the new President, Dr. G. G. Stokes, Lucasian Professor of Mathematics at Cambridge, proceeded to deliver his opening address, of which the following is an abstract:—He began by explaining the objects for which the Association was instituted, its main feature being that it aims at giving a more systematic direction to scientific inquiry, and that in various ways. "It has, at various times, induced individuals who were more specially conversant with particular departments of science, to draw

up reports on the present state of our knowledge in, or on the recent progress of, special branches. By thus ascertaining thoroughly what we already had, what we still wanted was made more clear; and, indeed, it was one special object of the reports I have mentioned to point out what were the more prominent desiderata in the various subjects to which they related. The Association was thus the better enabled to fulfil another of its functions, that of organising means for the prosecution of researches which require co-operation. An important part of the business of the Association is to organise committees for the prosecution of special researches, which are published at length. The Association also makes grants of money to individuals or committees for defraying the expenses of such researches. It appears from the report which is just published that, reckoning up to the year 1867 inclusive, the sum of £29,312 4s. 1d. has been voted by the Association for various scientific objects." In giving an account of the most recent progress of science, the President begun with astronomy, and referred to the fact that though "the motions and the masses of the heavenly bodies are revealed to us more or less fully by astronomical observations, we could not thus become acquainted with the chemical nature of these distant objects. Yet, by the application of the spectroscope to the scrutiny of the heavenly bodies, evidence has been obtained of the existence therein of various elements known to us by the chemical examination of the materials of which our own earth is composed; and not only so, but light is thrown on the state in which matter is there existing, which, in the case of nebulæ especially, led to the formation of new ideas respecting their constitution, and the rectification of astonomical speculations previously entertained." He then referred to observations for determining the motions of the stars commonly known as "fixed," but of which the fixity is not quite absolute. He explained how the science of optics had here come to the aid of astronomy, and he referred at considerable length to the observations of Mr. Huggins, especially upon the motion of Sirius, from which it appeared that that star and our sun are mutually receding from each other at the rate of 29·4 miles per second. He then spoke of the important results of the careful observations of the total eclipse of the sun on August 17th, 1868, especially those made with the spectroscope on "the remarkable mountain-like or cloud-like objects seen outside the dark disc of the moon," but which the study of the photographs obtained by Mr. Warren De La Rue proved to belong to the sun. Further spectroscopic observations of the sun, made by Mr. Lockyer with an instrument constructed for him by the late eminent optician, Mr. Cooke, were then described. "The prominences were thus shown to be merely elevated portions of an extensive luminous stratum of the same general character, which, now that the necessity of the interposition of the moon was dispensed with, could be traced completely round the sun. Meanwhile the same thing had been independently observed in another part of the world. After having observed the remarkable spectrum of the prominences during the total eclipse, it occurred to M. Janssen that the same method might allow the prominences to be detected at any time; and on trial he succeeded in detecting them the very day after the eclipse. The results of his observations were received shortly after the account of Mr. Lockyer's discovery had been communicated by Mr. De La Rue to the French Academy." . . . "One of the most striking results of the habitual study of these prominences is the evidence they afford of the stupendous changes which are going on in the central body of our system. Prominences, the heights of which are to be measured by thousands and tens of thousands of miles, appear and disappear in the course of some minutes. Moreover, these exhibitions of intense action are frequently found to be intimately connected with the spots, and can hardly fail to throw light on the disputed question of their formation. . . . I cannot leave the subject of astronomy without congratulating the Association on the accomplishment of an object which originated with it, and in the promotion of which it formerly took an active part. It was at the meeting of the Association at Birmingham in 1849, under the presidency of the Rev. Dr. Robinson, that a resolution was passed for making an application to Her Majesty's Government to establish a reflector, of not less than three feet aperture, at the Cape of Good Hope, and to make such additions to the staff of that observatory as might be necessary for its effectual working. Though the Association failed in its immediate object, its action in this matter has not remained fruitless. The subject has been warmly taken up at Melbourne, and after preliminary correspondence between the Board of Visitors of the Melbourne Observatory and the President and Council of the Royal Society, and the appointment by the latter body of a committee to consider and report on the subject, in April, 1864, a proposition was made to the Colonial Legislature for a grant of £5,000 for the construction of a telescope, and was acceded to. The telescope has been constructed by Mr. Grubb, of Dublin, and is now erected at Melbourne, and in the hands of Mr. Le Sueur, who has been appointed to use it. It is a reflector of four feet aperture, of the Cassegrain construction, equatorially mounted, and provided with a clock-movement. We may expect, before long, to get a first instalment of the results obtained by a scrutiny of the southern heavens with an instrument far more powerful than any that has hitherto been applied to them—results which will at the same time add to our existing knowledge, and redound to the honour of the colony, by whose liberality this long-cherished object has at last been effected." The president referred to the report of the committee, appointed at the meeting of the Association in 1862, consisting of representatives of the mechanical and chemical sections, for the purpose of investigating the application of gun-cotton to warlike purposes, and expressed his opinion that, "even with our present experience, there are some purposes for which gun-cotton can advantageously replace gunpowder, while its manufacture and storage can be effected with comparative safety, since it is in a wet state during the process of manufacture, and is not at all injured by being kept permanently in water, but merely requires to be dried for use. Even should it be required to store it in the dry state, it is doubtful whether, with the precautions indicated by the chemical investigations of Mr. Abel, any greater risk is incurred than in the case of gunpowder. In the blasting of hard rocks it is found to be highly efficient, while the remarkable results recently obtained by Mr. Abel leave no doubt of its value for explosions such as are frequently required in warfare. General Hay speaks highly of the promise of its value for small arms; but many more experiments are required, especially as a change in the arm and mode of ignition require a change in the construction of the cartridge. In heavy ordnance, the due control of the rapidity of combustion of the substance is a matter of greater difficulty; and, though considerable progress has been made, much remains to be done before the three conditions of safety to the gun, high velocity of projection, and uniformity of result, are satisfactorily combined. . . Last year Dr. Carpenter and Professor Wyville Thomson represented to the Royal Society the great importance to zoology and palæontology of obtaining soundings from great depths in the ocean, and suggested to them to use their influence with the Admiralty to induce them to place a gun-boat, or other suitable vessel, at the disposal of those gentlemen, and any other naturalists who might be willing to accompany them, for the purpose of carrying on a systematic course of deep-sea dredging. This application was acceded to. Dredging was successfully accomplished at a depth of 650 fathoms; and the existence was established of a varied and abundant submarine fauna, at depths which had generally been supposed to be either azoic, or occupied by animals of a very low type; and the character of the fauna and of the mud brought up was such as to point to a chalk formation

actually going on. It seemed desirable to carry the soundings to still greater depths, and to examine more fully the changes of temperature which had been met with in the descent. Another application was accordingly made to the Admiralty in the present year, and was no less readily acceded to than the former; and a larger vessel than that used last year is now on her cruise. I am informed by Dr. Carpenter that dredging has been successfully carried down to more than 2,400 fathoms (nearly the height of Mont Blanc), and that animal life has been found, even at that depth, in considerable variety, though its amount and kind are obviously influenced by the reduction of temperature to Arctic coldness." The President then mentioned the movement that had been set on foot at a public meeting, presided over by H.R.H. the Prince of Wales, to erect a monument to Faraday. In chemistry, he referred to one or two discoveries which are extremely curious, and some of which may prove of considerable practical importance. "The Turaco or plantain-eater of the Cape of Good Hope has a portion of its wings of a fine red colour. This red colouring-matter has been investigated by Professor Church, who finds it to contain nearly six per cent. of copper, which cannot be distinguished by the ordinary tests, nor removed from the colouring-matter without destroying it. The colouring-matter is, in fact, a natural organic compound of which copper is one of the essential constituents. In the very same feather, partly red and partly black, copper was found in abundance in the red parts, but none, or only the merest trace in the black. . . . . In studying the transformations of alizarine under the action of chemical reagents, MM. Craebe and Liebermann were led to connect it with anthracene, one of the coal-tar series of bodies, and to devise a mode of forming it artificially. The discovery is still too recent to allow us to judge of the cost at which it can be obtained by artificial formation, which must decide the question of its commercial employment. But assuming it to be thus obtained at a sufficiently-cheap rate, what a remarkable example does the discovery afford of the way in which the philosopher, quietly working in his laboratory, may obtain results which revolutionise the industry of nations! . . ." "Another example of the way in which practical applications unexpectedly turn up, when science is pursued for its own sake, is afforded by a result recently obtained by Dr. Matthiessen, in his investigation of the constitution of the opium bases. He found that by the action of hydrochloric acid on morphia a new base was produced, which as to composition differed from the former merely by the removal of one equivalent of water. But the physiological action of the new base was utterly different from that of the original one. While morphia is a powerful narcotic, the use of which is apt to be followed by subsequent depression, the new base was found to be free from narcotic properties, but to be a powerful emetic, the action of which was unattended by injurious after-effects. It seems likely to become a valuable remedial agent. In relation to mechanism, this year is remarkable as being the centenary of the great invention of our countryman, James Watt. It was in the year 1769, that he took out his patent involving the invention of separate condensation, which is justly regarded as forming the birth of the steam-engine. Little could even his inventive mind have foreseen the magnitude of the gift he was conferring on mankind in general, and on his own country more particularly. In these days of steamers, power-looms, and railways, it requires no small effort to place ourselves, in imagination, in the condition we should be in without the steam-engine."

The President concluded as follows:—

"With reference to those branches of science in which we are more or less concerned with the phenomena of life, my own studies give me no right to address you. I regret this the less because my predecessor and my probable successor in the presidential chair are both of well-known eminence in this department. But I hope I may be permitted as a physicist, and viewing the question from the physical side, to express to you my views as to the relation which the physical bear to the biological sciences.

"No other physical science has been brought to such perfection as mechanics; and in mechanics we have long been familiar with the idea of the perfect generality of its laws, of their applicability to bodies organic as well as inorganic, living as well as dead. Thus, in a railway collision, when a train is suddenly arrested, the passengers are thrown forward, by virtue of the inertia of their bodies, precisely according to the laws which regulate the motion of dead matter. So trite has the idea become that the reference to it may seem childish; but from mechanics let us pass on to chemistry, and the case will be found by no means so clear. When chemists ceased to be content with the mere ultimate analysis of organic substances, and set themselves to study their proximate constituents, a great number of definite chemical compounds were obtained which could not be formed artificially. I do not know what may have been the usual opinion at that time among chemists as to their mode of formation. Probably it may have been imagined that chemical affinities were indeed concerned in their formation, but controlled and modified by an assumed vital force. But as the science progressed, many of these organic substances were formed artificially, in some cases from other and perfectly distinct organic substances, in other cases actually from their elements. This statement must indeed be accepted with one qualification. It was stated several years ago, by M. Pasteur, and I believe the statement still remains true, that no substance the solution of which possesses the property of rotating the plane of polarisation of polarised light had been formed artificially from substances not possessing that property. Now several of the natural substances which are deemed to have been produced artificially are active, in the sense of rotating the plane of polarisation; and therefore in these cases the inactive, artificial substances cannot be absolutely identical with the natural ones. But the inactivity of the artificial substance is readily explained, on the supposition that the artificial substance bears to the natural the same relation as racemic acid bears to tartaric,—that it is, so to speak, a mixture of the natural substance with its image in a mirror. And when we remember by what a peculiar and troublesome process M. Pasteur succeeded in separating racemic acid into the right-handed and left-handed tartaric acids, it will be at at once understood how easily the fact, if it be a fact, of the existence in the natural substance of a mixture of two substances, one right-handed and the other left-handed, but otherwise identical, may have escaped detection. This is a curious point, to the clearing up of which it is desirable that chemists should direct their attention. Waiving then the difference of activity or inactivity, which, as we have seen, admits of a simple physical explanation, though the correctness of that explanation remains to be investigated, we may say that, at the present time, a considerable number of what used to be regarded as essentially natural organic substances have been formed in the laboratory. That being the case, it seems most reasonable to suppose that in the plant or animal from which those organic substances were obtained, they were formed by the play of ordinary chemical affinity, not necessarily nor probably by the same series of reactions by which they were formed in the laboratory, where a high temperature is commonly employed, but still by chemical reactions of some kind, under the agency, in many cases, of light, an agency sometimes employed by the chemist in his laboratory. And since the boundary line between the natural substances which have and those which have not been formed artificially is one which, so far as we know, simply depends upon the amount of our knowledge, and is continually changing as new processes are discovered, we are led to

extend the same reasoning to the various chemical substances of which organic structures are made up.

"But do the laws of chemical affinity, to which, as I have endeavoured to infer, living beings, whether vegetable or animal, are in absolute subjection, together with those of capillary attraction, of diffusion, and so forth, account for the formation of an organic structure, as distinguished from the elaboration of the chemical substances of which it is composed? No more, it seems to me, than the laws of motion account for the union of oxygen and hydrogen to form water, though the ponderable matter so uniting is subject to the laws of motion during the act of union just as well as before and after. In the various processes of crystallisation, of precipitation, and so forth, which we witness in dead matter, I cannot see the faintest shadow of an approach to the formation of an organic structure, still less to the wonderful series of changes which are concerned in the growth and perpetuation of even the lowliest plant. Admitting to the full as highly probable, though not completely demonstrated, the applicability to living beings of the laws which have been ascertained with reference to dead matter, I feel constrained at the same time to admit the existence of a mysterious something lying beyond—a something *sui generis*, which I regard, not as balancing and suspending the ordinary physical laws, but as working with them and through them to the attainment of a designed end.

"What this something, which we call life, may be, is a profound mystery. We know not how many links in the chain of secondary causation may yet remain behind; we know not how few. It would be presumptuous indeed to assume in any case that we had already reached the last link, and to charge with irreverence a fellow-worker who attempted to push his investigations yet one step further back. On the other hand, if a thick darkness enshrouds all beyond, we have no right to assume it to be impossible that we should have reached even the last link of the chain; a stage where further progress is unattainable, and we can only refer the highest law at which we stopped to the fiat of an Almighty Power. To assume the contrary, as a matter of necessity, is practically to remove the first cause of all to an infinite distance from us. The boundary, however, between what is clearly known and what is veiled in impenetrable darkness is not ordinarily thus sharply defined. Between the two there lies a misty region, in which loom the ill-discerned forms of links of the chain which are yet beyond us. But the general principle is not affected thereby. Let us fearlessly trace the dependence of link on link, as far as it may be given us to trace it, but let us take heed that in thus studying second causes we forget not the First Cause, nor shut our eyes to the wonderful proofs of design which, in the study of organised beings especially, meet us at every turn.

"Truth, we know, must be self-consistent, nor can one truth contradict another, even though the two may have been arrived at by totally different processes, in the one case, suppose, obtained by sound scientific investigation, in the other case taken on trust from duly authenticated witnesses. Misinterpretations of course there may be on the one side or on the other, causing apparent contradictions. Every mathematician knows that in his private work he will occasionally, by two different trains of reasoning, arrive at discordant conclusions. He is at once aware that there must be a slip somewhere, and sets himself to detect and correct it. When conclusions rest on probable evidence, the reconciling of apparent contradictions is not so simple or certain. It requires the exercise of a calm, unbiassed judgment, capable of looking at both sides of the question; and oftentimes we have long to suspend our decision, and seek for further evidence. None need fear the effect of scientific inquiry carried on in an honest, truth-loving, humble spirit, which makes us no less ready frankly to avow our ignorance of what we cannot explain than to accept conclusions based on sound evidence. The slow but sure path of induction is open to us. Let us frame hypotheses if we will; most useful are they when kept in their proper place, as stimulating inquiry. Let us seek to confront them with observation and experiment, thereby confirming or upsetting them as the result may prove; but let us beware of placing them prematurely in the rank of ascertained truths, and building further conclusions on them as if they were.

"When from the phenomena of life we pass on to those of mind, we enter a region still more profoundly mysterious. We can readily imagine that we may here be dealing with phenomena altogether transcending those of mere life, in some such way as those of life transcend, as I have endeavoured to infer, those of chemistry and molecular attractions, or as the laws of chemical affinity in their turn transcend those of mere mechanics. Science can be expected to do but little to aid us here, since the instrument of research is itself the object of investigation. It can but enlighten us as to the depth of our ignorance, and lead us to look to a higher aid for that which most nearly concerns our wellbeing."

The Earl of Devon moved a cordial vote of thanks to Professor Stokes, for his able address, which was seconded by Sir Stafford Northcote, and carried by acclamation. The Mayor of Exeter welcomed the society to the city. The Secretary stated that the number of tickets sold amounted to 1,583.

EDUCATION IN HOLLAND.

The *Times* correspondent, in describing the portion of the Amsterdam Exhibition illustrative of education, says:—"Class 6, that of instruction, is extensively represented, and gives a good idea of the results of Dutch middle-class education, the system of which appears very complete, and is not, apparently, hampered by political prejudices or religious intolerance. A large aisle of the building is completely filled with plans, sections, models, drawings, straw plaitings, and other works from the Amsterdam "Ambacht," or trade schools, and the communal schools of the different towns. The *élèves* of the Zaandam and the Zutphen Burg-Avond schools appear to excel in clay modellings for house decorations, such as friezes and cornices. Deventer sends particularly good wood carving; Rotterdam, sections and building plans; Breda, graceful models in red clay. All the Holland towns are represented, though it is needless to specify the name of each. Education is not compulsory, although the practical results prove that it has reached everybody, and small facts show how deeply the love of knowledge is rooted in the people. The lad in the billiard *café*, who attends to the wants of the players, may be seen, in the intervals of fetching beer and coffee, at his writing lesson; and in the national collection of paintings at the Trippenhuis no inconsiderable portion of the visitors are young boys, who may be noticed deeply engrossed in the pictures and the descriptive explanations given in the catalogues. While government in Holland provides that education shall knock at the doors of everybody, it does not in the least seek to compete or interfere with private undertakings, except that they are obliged to be classified and inspected as primary or middle schools, according to the grade of education they offer. Dutch education has been mostly the growth of the present century, and is principally owing to the establishment, in 1784, by a Baptist minister, of the Society for the Promotion of the Public Weal (*Maatschappi Tot Nut van't Algemeen*), which, commencing on a very humble scale, now numbers 200 branch societies and 14,000 members. Some excellent work in straw and wool is shown by one of their industrial schools for young girls, who for 15 florins a year (£2 1s. 8d.) are taught, during the course of three years, a thoroughly sound education, followed by a special one for any particular branch, such

as drawing, dressmaking, engraving, or even pharmacy. The "Ambacht" schools for boys are founded much upon the same system. Each lad choses his trade and is taught it, and after the expiration of a certain time is apprenticed and helped out. The first great educational law of Holland was passed in 1806, and principally took in hand primary education. In 1857, this law was much extended, and, in 1863, was applied to middle instruction. Very great success attended the foundation of these secondary schools, which were established especially for artisans, who, after going through their educational course in them, were enabled to ascend a step higher and enter the Ecole Polytechnique of Delft.

"With regard to the educational display of other countries, England shows various official documents connected with past exhibitions. Mr. Davidson has a collection of drawing models and educational books for workmen, and Mr. Dean an infinite variety of picture-books for young ideas. It is a curious fact that, notwithstanding the literary activity of Amsterdam, a great portion of these children's books are printed in the Dutch language by Mr. Dean, and largely circulated in Holland. From Belgium, the Ecoles Professionelles des Jeunes Filles at Brussels have a goodly exhibit of drawings, models, and ornamental work; while there is a still more interesting show from the Crèche Ecole Gardienne at Antwerp. It is a most significant fact to note how these little ones, varying in age from six months to six years, are taught to be useful on the Froibel system, and we cannot but regret that some such institution is not attempted in this country."

Fine Arts.

Paris Exhibition of Applied Art.—The Exhibition of the Union Centrale of the Fine Arts Applied to Industry opened, as announced, on the 10th inst.; and although there are some vacancies to be filled up, and some arrangements yet to be made, the exhibition is highly important and interesting. The number of exhibitors in the first division of the collection, namely, that of manufactured products, is about four hundred, but that number does not express the value of the exhibition. Nearly all the exhibitors are of the first class; and the collections are generally large as well as choice. Furniture forms, naturally, a prominent subdivision, and most of the examples shown belong to the purer styles which have of late years become fashionable in France. Elaborately inlaid work of all kinds is becoming rare. Amongst the novelties may be noticed some painted bed-room furniture, simple and elegant in form, and very pleasing in colour— a greyish blue picked out with white. The collection of china *faïences* and terra-cotta work is large and good, the most remarkable being imitations or variations of Chinese ware, which has been quite the rage in France of late; and as the models selected are generally of the best kind, this fashion is doing good service to ceramic manufacture. The collection of mosaic and other kinds of paving is also good, especially as regards the colouring, which is generally unobtrusive and agreeable to the eye. There are also some very well executed wall-tiles, after Eastern types—a reflection of the Great Exhibition of 1867. The Baccarat Works contribute two immense moulded glass vases, about five feet high, of good colour and admirable workmanship; and there are some specimens of enamelled glass vases, by M. Brocard, which are well deserving of attention. The works in bronze, real and imitation, and the ornamental productions generally are well worthy of the reputation of the Parisian artists and manufacturers. The exhibition of the works of the schools of art, mostly shown in competition for prizes offered by the Society, bears evidence to the great attention paid to drawing all over the country; while the original models and designs for manufactured articles show the results of such teaching. Many of the flower designs for fabrics are of great beauty. The retrospective portion of the exhibition consists, on the present occasion, of oriental productions of all kinds and of all ages, and is the first exhibition of the kind attempted. The collection is very large, nearly as large as that of the china, *faïences*, and enamels shown by the same society in 1865, and is particularly rich in Persian, Broussa, Indian, Chinese, and Japanese works. We shall have to return again to the subject, but we desire, at the outset, to draw the special attention of English designers and students to this important collection of the works of their neighbours, which well deserves study.

Commerce.

Indian Tea.—The *Produce Markets' Review* says that the Chinese teas "have now to encounter a formidable rival in the production of India, which has made vast strides both in the quantity of tea produced, and in the improvement of its manufacture. Some two or three years ago, it was comparatively rare to find a grocer using Indian tea to any extent, but during the last twelve months, owing mostly to the inferiority of China teas, the grocer has been compelled to use it largely, and it would appear that the public are so satisfied with the change that, in some parts of the kingdom, more than two-thirds of Indian tea are used to one of China, and it is doubtful if the public, having once been accustomed to the peculiarly rich flavour and pungency of Indian teas, will ever be satisfied with the comparatively negative quality of China teas. In other parts of the country the taste is spreading, much, we are assured, to the benefit of the grocery trade."

Colonies.

Agriculture in South Australia.—The agricultural statistics for the harvest 1868-9, published by the government statist, prove very disappointing. In the early part of the season confident expectations were put forth that the average yield must be at least twelve bushels per acre. The crops, however, did not turn out so well as they promised, and the actual average was only 9⅔ bushels per acre. This is very much below the average of the five years prior to last year, which was about twelve bushels per acre. The following table shows the average under wheat, the total produce and average price during the year for five years:—

	Acreage.	Produce.	Average price for the year.
1863-4	335,758	4,691,919	4s. 10d.
1864-5	390,836	4,252,949	7s. 10d.
1865-6	410,608	3,587,800	8s. 7d.
1866-7	457,628	6,561,415	6s. 2d.
1867-8	550,056	2,571,894	4s. 5d.

This year the number of acres under wheat cultivation is 532,654, or 17,802 acres less than the previous year. This fact supports the theory that after a good harvest the average of wheat sown is higher, and after a bad harvest, less.

Notes.

Registration and Insurance of Letters containing Bills, &c., between France and Belgium.—An imperial decree has recently appeared in the *Journal Officiel de France*, announcing an arrangement by which letters containing bills and other valuable documents passing between Belgium, France, and Algeria, may be

registered, and their value insured to the amount of two thousand francs, in case of loss or robbery. The contents of the letter must be declared by the sender, who, in addition to a fixed charge of fifty centimes and the postage of the letter, pays a tax of twenty centimes on every hundred francs or fraction of a hundred francs insured.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb. *Delivered on 5th August*, 1869.

154. Bill—Endowed Schools (No. 2) (as amended on Re-commitment).
254. ,, Broughty Ferry Provisional Order Confirmation.
258. ,, Millbank Prison.
259. ,, Straits Settlements.
261. ,, Sanitary Act (1866) Amendment (Ireland).
316. Transits of Venus (1874 and 1882)—Correspondence.
349. Bank Notes—Return.
367. Hypothec (Scotland)—Report from the Select Committee of the House of Lords.
388. Constabulary (Ireland) Firearms—General Instructions.
Public General Acts—Chap. 43 to 57.

Session 1868.

464. Civil Service—Return.

Delivered on 6th August, 1869.

260. Bill—Attorneys and Solicitors' Remuneration.
344. Naval Prize Money, &c.—Account.
347. Vessels—Return.
359. (I.) Friendly Societies—Return.
374. Military Savings Banks—Account.
Standards Commission—Second Report.

Delivered on 7th August, 1869.

262. Bill—Benefit Building Societies Regulation.
263. ,, Bishops Resignation (amended).
264. ,, Habitual Criminals (amended).
343. Naval Hospitals—Report.
367. (I.) Law of Hypothec in Scotland—Supplementary Appendix to Report.
386. Despatch of Business in Parliament—Report.
389. Lunatics, &c. (Irish Asylums)—Returns.

Delivered on 9th August, 1869.

265. Bill—Parochial Schools (Scotland) (as amended on Consideration).
46. (V.) Trade and Navigation Accounts (corrected pages).
337. (A I) Poor Rates and Pauperism—Return (A).
400. Roehampton Gate (Richmond Park)—Further Correspondence.
381. New Law Courts—Report and Evidence.

Patents.

From Commissioners of Patents' Journal, August 13.

Grants of Provisional Protection.

Agricultural implements—2122—M. Jack.
Ammonia, &c., extracting—2153—A. Rollason.
Animal fatty bodies, preparing and producing certain new—2157—H. Mège.
Artificial fuel, machinery for manufacturing—2317—F. A. Yeo and H. Hanna.
Block calendars, &c.—2297—W. R. Lake.
Bottles, apparatus for stoppering—2324—T. Grace.
Brads, apparatus for holding and driving—2213—H. E. Newton.
Bricks, &c., machinery for making—2063—W. Hutchinson.
Buckles for articles of dress—2305—C. N. Eyland.
Carriage axles—2273—M. J. Frisbie.
Chairs, &c., applying springs to—2292—D. R. Kilpatrick.
Coal tar products, manufacturing certain—2222—J. Rowley.
Curry combs—2325—W. E. Gedge.
Dyes—2075—J. Walker and P. A. Godefroy.
Electro-telegraphic apparatus—2281—W. A. Lyttle.
Engravings, reproducing on wood through aqua fortis—2299—A. Paténe, F. Bardoux, and G. Jurie.
Fabric, new textile—2336—J. Booth and R. W. Morrell.
Fabrics, dyeing certain textile—2412—S. M. Smith.
Fabrics, fixing colours on textile—2295—J. S. Kipping.
Fabrics, fluted, &c.—1735—G. E. King.
Flax and hemp, utilising the waste of—2289—H. S. Heyman.
Flax, &c., machinery for scutching, &c.—2291—J. Tate.
Gas, apparatus for manufacturing—2309—T. Ramsay.
Gas meters—2319—J. Pinchbeck.
Harvesting machines, grinding the knives of—2285—A. V. Newton.
Insulating moulding and stands for walls and household furniture for the prevention of vermin—2266—W. W. Roberts.
Life belts—2101—C. A. G. de Liancourt.
Locomotive engines—2314—J. Sharrocks.
Looms—2260—J. Holding and J. Eccles.
Lubricators—2293—W. E. Gedge.
Lubricators—2303—F. Jackson.
Manures, &c., manufacturing—2327—J. T. Way.
Measures, apparatus for regulating, &c., the standards of—2340—A. Tylor.
Metal tubes, machinery for manufacturing—2294—T. F. Taylor.
Meters for measuring liquids and gases—2346—B. J. B. Mills.
Mines, &c., apparatus for ventilating—2318—M. Henry.
Organs—1296—R. Flower and M. M. Crowly.
Pills, &c., apparatus for mixing substances for—2306—B. Goddard and W. Finley.
Puddling furnaces, &c.—2020—T. Smith.
Purses, &c., fastening for—2117—C. Shether.
Rail or tramways, apparatus for indicating stations to passengers by—2301 C. and T. Watts.
Rails, girders, &c., machinery for rolling—2342—W. Brown.
Rotary gas exhausters—2330—I. Davies.
Rotary motion, &c., converting reciprocating rectilinear motion into—2321—C. D. Abel.
Safety lamps—2262—J. and J. Hyde.
Screw engines, gearing for auxiliary—2308—H. S. Edwards.
Sewing machines—2065—T. James.
Sewing machines—2304—J. M. Clements.
Shuttles, &c., pins, pirns, or bobbins for—2307—J. C. Milns and J. Sandiford.
Steam condensers—2300—J. B. B. Pinchon.
Steam engines—2298—G. Allibon.
Steam engines—2320—H. Turner.
Sugar-cane juice, apparatus for concreting—2302—D. Stewart.
Sugar-cane juice, mills for extracting—2316—W. Hosack.
Taps—2823—A. Louden.
Threads, machines for polishing—2326—C. Tuer, R. Howarth, and J. Pimbley.
Tobacco, twisting and rolling—2283—H. Gillan and G. Crawford.
Velocipedes—2344—J. U. Fairbairn.
Woollen cloth, machinery to be applied to the cards employed for raising the nap of—2143—J. E. Millar.
Woollen cloth, &c., raising gigs used in the process of raising the nap of—2219—J. Dawson and T. C. Fawcett.
Wrought-iron, process for re-working—2322—E. Beanes.

Inventions with Complete Specifications Filed.

Cartridges—2399—A. H. Brandon.
Fibrous materials, machinery for combing—2368—W. R. Lake.
Rock-boring machinery, &c.—2387—E. T. Hughes.
Vehicles, mechanism for the propulsion of—2333—F. C. Colney.

Patents Sealed.

465. T. Winder.
467. T. Billyeald.
470. V. A. Houdaille.
471. G. W. R. Pigott.
474. H. Tylor.
481. J., B., and R. Wood.
482. E. T. Hughes.
488. W. R. Lake.
489. H. D. Bowyer and J. L. Norton.
493. A. Bartholomew.
494. A. Munro & W. B. Adamson.
496. J. D. Nichol and J. Eckersley.
501. D. G. Fitz Gerald.
508. W. M. Cochrane.
510. E. Dorsett.
511. A. Henry.
517. A. M. Clark.
521. W. R. Lake.
522. M. Mac Lennan.
532. J. H. Morl.
535. F. G. Fleury.
542. J. O. C. Phillips.
586. W. E. Newton.
590. W. R. Harris.
628. J. Hadley.
709. W. R. Lake.
1046. G. S. Chase.
1096. H. A. Bonneville.
1197. H. Aitken.
1822. J. G. Tongue.
1850. G. W. Fox.
1923. R. Caunce and M. G. and B. Bradley.

From Commissioners of Patents' Journal, August 17.

Patents Sealed.

497. C. Brook, L. Barker, and M. Thompson.
505. M. Vary.
513. J. Loader.
515. T. Smith.
520. J. Barton.
527. J. Mabson.
528. A. Jacob.
537. R. Foster.
538. J. E. Lucas.
540. W. Ibotson, W. W. Ladelle, and A. G. Southby.
541. S. Osborn.
563. J. Neilson and J. Marshall.
585. W. Parkinson.
591. W. T. Eley.
626. D. Davies.
649. W. Howes and W. Burley.
657. M. G. Cole.
707. W. R. Lake.
745. W. H. Clapp.
797. W. A. Lyttle.
835. E. A. Inglefield.
1156. C. T. Swanston.
1352. C. T. Liernur.
1467. W. A. Lyttle.
1610. R. Wheble.
1773. V. J. Four.
1826. A. W. Moss.
1861. J. Kirk, S. Shelmerdine, and C. Froggatt.
1941. F. C. Lecoultre.

Patents on which the Stamp Duty of £50 has been paid.

2060. M. A. Muir & J. McIlwham.
2269. E. Nelson.

Patents on which the Stamp Duty of £100 has been Paid.

2297. C. E. Spagnoletti.
2327. W. Whittle.

Journal of the Society of Arts.

FRIDAY, AUGUST 27, 1869.

Announcements by the Council.

Examinations, 1870.

The Council have this year decided to remove from the Programme those subjects in which the Science and Art Department holds examinations, which, it appears, are now largely taken advantage of by the same class of persons (and very often by the same individuals) as those who sit at the Society's examinations. The following subjects will therefore not appear in the programme for 1870 :—

Algebra.	Light and Heat.
Geometry.	Chemistry.
Trigonometry.	Mining and Metallurgy.
Conic Sections.	Botany.
Navigation, &c.	Animal Physiology.
Principles of Mechanics.	Free-hand Drawing.
Practical Mechanics.	Practical Geometry.
Magnetism, Electricity, &c.	Mechanical Drawing.

Owing to a prize of £5 having been kindly offered by Earl Fortescue, President of the British Branch of the International Decimal Association, the subject of the Metrical System will be retained.

The programme is now in preparation, and will include some further modifications in the system, but the above, being by far the most important, are announced at the earliest opportunity.

Designs for Channel Steamers.

The very defective state of the accommodation afforded by the Channel steamers, plying between this country and the Continent, having been brought under the notice of the Council, they have determined to offer the Gold Medal of the Society, and the large Silver Medal of the Society, for the best and the second-best block model of a steamer, which shall afford the most convenient shelter and accommodation to passengers on the deck of the vessel crossing the Channel between France and England. The steamer is not to exceed in tonnage and draught the best vessels now in use between Folkestone and Boulogne, and the model must be on a scale of a quarter of an inch to a foot. The models, marked in cypher, are to be sent in to the Society of Arts' House, John-street, Adelphi, on or before the 1st November, 1869, with a sealed envelope, giving the name and address of the designer.

The Council reserve the right of withholding either or both medals, in case, in their opinion, the models sent in do not possess sufficient merit.

The following particulars of the South-Eastern Channel steamers, *Victoria*, *Albert Edward*, and *Alexandra*, are given for the convenience of competitors, but it is not intended to confine the designs to them, except as to tonnage and draught :—

Length between perpendiculars, 200 ft.
Breadth of beam, 24 ft.
Depth underside of deck amidships, 12 ft. 6 in.
Draught of water, 7 ft.
Bow, clipper.
Stern, elliptic.
Rig, polacca with two masts, lug foresail, gaff mainsail, staysail, and flying jib.
Engines, oscillating.
Paddle wheels, 17 ft. 6 in. diameter.
Tonnage, 568 tons.
Speed, 17 miles an hour.

Subscriptions.

The Midsummer subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of Institutions.

EXAMINATION PAPERS, 1869.

(*Continued from page* 773.)

The following are the Examination Papers set in the various subjects at the Final Examination held in April last :—

PRACTICAL MECHANICS.

THREE HOURS ALLOWED.

1. Give some form of cam which, when acting upon a reciprocating bar by uniform rotation, will cause the up and down motions of the bar to have an interval of rest between each.

2. Explain the principle upon which flat bands are prevented from slipping off their pullies. How would you arrange to communicate motion between two shafts, neither parallel, nor meeting in a point, by a pair of pullies and an endless band? Why does the band slip off at once if the pullies are turned in a reverse direction?

3. Describe a ratchet-wheel. In what manner can a wheel without teeth, and movable by a frictional grip, be made to do the work of a ratchet-wheel? Contrast this contrivance with the arrangement of two pauls or clicks, whereby a ratchet-wheel of 60 teeth, for example, may be made to do the work of one with 120 teeth.

4. Describe the various parts of a planing machine. What are some of the modes of giving the backward and forward motion to the table? How is the length of motion of the table adjusted?

5. What is the principle of the slide rest, and why is it so superior to the common rest? Describe the method of using change wheels in a screw-cutting lathe, giving any numerical example which occurs to you.

6. Show how to produce a motion suitable for a boring machine, by a combination of toothed wheels and a screw.

7. Describe the construction of a rope, showing how it retains its twist. Explain the principle of the machinery employed for twisting strands into a rope?

8. Describe the manner in which the steam acts in a condensing beam engine, stating the general disposition of the moving parts and the objects which they fulfil. Make a sketch of the steam cylinder, steam ports, and slide-valve, so as to explain the method of admitting the steam into the cylinder and of allowing it to pass into the condenser.

9. How is the slide-valve of an engine worked by an eccentric? Show that this contrivance is the same as that of the crank and connecting rod, so far as the modification of motion is concerned.

10. Describe some form of balanced valve which will not be affected by steam pressure.

11. State approximately how much water should be pumped into the boiler of a locomotive for every cubic foot of steam, at 60 lbs. pressure, consumed in the cylinder. Sketch the feed-pumps and valves necessary for this purpose.

12. Describe Watt's parallel motion. In what manner should you arrange this parallel motion in the case of a double cylinder condensing engine, where the ends of two piston rods and of the air-pump rod are all three required to describe parallel straight lines?

ELECTRICITY AND MAGNETISM.

THREE HOURS ALLOWED.

1. Describe the construction of a mariner's compass. By what arrangement of needles may some kind of deviation be obviated?

2. What are the ordinary diurnal variations of terrestrial magnetism, and how have they been accounted for?

3. State some experiments which shew the phenomena of dia-magnetism.

4. What theory of the nature of electricity do you consider most in accordance with the present state of knowledge?—give some experimental illustrations.

5. Distinguish between an electrometer and an electroscope; and describe the condensing electroscope.

6. On what conditions does the efficiency of a lightning conductor depend?

7. In what respects does Franklinic differ in quality from Voltaic electricity; and how may they be shown to be identical?

8. What is an "astatic" needle, and what is its position of equilibrium, when the two needles are equal in force, and *very nearly* parallel?

9. Describe a tangent galvanometer, and explain its use.

10. Describe and explain the experiment of a wire conducting a current which rotates round a permanent magnet, or *vice versâ*.

11. Describe the construction of some magneto-electric telegraph now in use.

12. Explain the construction of some working submarine cable, and the method of testing its insulation.

13. How is an induction-coil machine constructed, and by what means may the shocks be intensified?

14. Describe the process of electro-plating.

15. By what means may the current be most economically generated for electro-metallurgy on the large scale?

16. Explain the means of producing a thermo-electric current, and state what is its peculiar character?

17. What electric phenomena are manifested by portions of nerve and muscle of a recently killed animal?

18. If a limb and its nerve be detached from a recently killed animal, what phenomena result from electric action on the nerve?

LIGHT AND HEAT.

THREE HOURS ALLOWED.

Geometrical Optics.

1. Give the definition of a ray of light and a pencil of rays, and also the definition of the brightness or intensity of a pencil of light. When rays of light diverge from a luminous point, what is the law of the intensity at different distances from it? Show how it arises that opaque objects, such as the page of a book, appear equally bright at different distances from the eye.

2. Enunciate the law of the reflexion of light at polished surfaces of media, and prove the property of the two plane mirrors which are used in Hadley's sextant, employed in taking astronomical observations at sea. Describe the construction of that instrument and the mode of using it.

3. Explain what is meant by the *chromatic dispersion* in the refraction of light by transparent media. Show how the dispersive power of a medium can be expressed in terms of the deviations of the different coloured rays transmitted by a prism of a small refracting angle. Show how the dispersive power of the glass affects the *image of a star* formed by a convex lens.

4. Describe the construction of the common compound microscope. Show how the magnifying power arises, by comparing the magnitude of the object seen by the naked eye with that of the image seen through the instrument.

Physical Optics.

5. Explain what is meant by the property of *periodicity* in light, and explain how interference arises in light from this property. Show how the colours of the soap-bubble and Newton's rings arise from the interference of light.

6. Give some illustration of the property of light which is called *polarization*, by showing some case where polarized light produces different phenomena to common light. How are the two rays in double refracting crystals related in this respect?

7. When the eye is turned towards a distant flame of a candle, and a hair of the head comes between the pupil of the eye and the candle-flame, describe the appearances which are seen, and give the explanation of them on the doctrine of interferences.

8. Explain what is meant by the *circular polarization* of liquids. As the value of certain substances depends on the quantity of sugar which they contain, describe some method by which their value can be found by the polariscope.

Heat.

9. Explain what is meant by the convection of heat. When a hot body cools in the air, show how the heat is lost by it. When hot bodies are required to be protected from this loss, what are the means to be employed?

10. Explain the construction of the maxima and minima self-registering thermometers. Describe some cases where such thermometers must necessarily be employed.

11. When vapours arise from solids and liquids at ordinary temperatures, to what cause is this attributable? Describe some instrument which can be used as a *hygrometer*, for showing the wetness or dryness of the air.

12. Explain the principle on which *hot-air* engines have been constructed. How is force obtained from the heat employed in such engines? If *olefiant gas* could be used in place of air, how would the amount of force produced by a given quantity of heat be affected by such change?

(*To be continued.*)

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, 1869.

The following is a list of Papers read in the various Sections:—

THURSDAY, AUGUST 19th.

Section A.—Mathematical and Physical Science.

Introductory Address by Professor Sylvester, President of the Section.

W. R. Birt—Report of the Lunar Committee.

Professor P. G. Tait—Provisional Report on the Repetition and Extension of Professor Forbes' Experiments on Thermal Conductivity.

G. J. Symons—Report of Committee on Underground Temperatures.

W. R. Birt—On Secular Variations of Lunar Tints.

W. R. Birt—On Spots and Shadows on the Lunar Crater Plato.

Professor G. C. Foster—Description of some Lecture Experiments in Electricity.

J. H. Gladstone—On the Relation between the Specific Refractive Energies and the Combining Proportions of Metals.

G. J. Symons and R. Field—On the Best Means of Determining the True Evaporation from the Surface of Water.

C. J. Woodward—On a Self-setting Type-machine Recording the Horizontal Motion of the Air.

— Martin—Description of a New Self-recording Aneroid Barometer.

Section B.—Chemical Science.

The President's Address.

Herbert McLeod—Report on the Determination of the Gases existing in Solution in Well Waters.

A. Matthiessen—Report of the Committee on the Chemical Nature of Cast-iron.

M. Jacobi—On Electrolytic Iron.

J. Moffat—On the Phosphorescence of the Sea and Ozone in connection with Atmospheric Conditions.

J. Moffat—On the Oxidation of Phosphorus and the quantity of Phosphoric Acid excreted by the Kidneys in connection with Atmospheric Conditions.

C. Tomlinson—On a Remarkable Structural Appearance in Phosphorus.

Section C.—Geology.

The President's Address.

R. A. C. Godwin Austen—The Devonian Group considered Geologically and Geographically.

J. M. Duncan, M.D.—Second Report of the Committee on British Fossil Corals.

J. Thompson—Report of the Committee on Sections and Photographs of Coral.

G. W. Ormerod—Sketch of Granite of the Northernly and Easternly sides of Dartmoor.

W. Pengelly—Course of the Miocene Clays of Bovey Tracy.

T. Davidson—Notes on the Brachiopoda hitherto obtained from the "Pebble Bed" of Budleigh Salterton.

E. Hull—On the Source of the Quartzose Conglomerates of the New Red Sandstones of Central England.

H. Woodward—Fresh Water Deposits of the Valley of the River Lea, in Essex.

Section D.—Biology (Department of Zoology and Botany.)

H. E. Dresser—Report of the "Close-time" Committee.

Rev. H. B. Tristram, F.R.S.—On the Effect of Legislation on the Extinction of Animals.

F. F. Hallett—On the Law of the Development of Cereals.

R. O. Cunningham—On the Flora of the Straits of Magellan and West Coast of Patagonia.

R. O. Cunningham—On *Chionis alba*.

C. E. Broome—On a lately discovered *Mixogaster*.

W. P. Hiern, M.A.—On the Occurrence of *Rapistrum rugosum*, All., in Surrey, Kent, and Somersetshire.

Section D.—Biology (Department of Anatomy and Physiology.)

B. W. Richardson, F.R.S.—Report on the Physiological Action of the Methyl Series.

E. Ray Lankester—Report on the Spectroscopic Examination of Animal Substances.

Rev. W. V. Harcourt—The Solution of Uric Acid Calculi, and the Quantitative Analysis of Uric Acid.

Dr. Wilson—The Moral Imbecility of Habitual Criminals exemplified by Cranial Measurements.

Section E.—Geography.

The President's Opening Address.

Dr. R. J. Mann—Erskine's Discovery of the Mouth of the Limpopo.

Dr. Beke—On a Canal to Unite the Upper Nile and Red Sea.

J. Stirling—Visit to the Holy City of Faz, in Morocco.

Captain T. P. White, R.E.—Bifurcating Stream in Perthshire.

Captain C. Dodd—Recent Visit to the Suez Canal.

Lieut.-Col. A. Strange, F.R.S.—On a small Altazimuth Instrument for the use of Explorers.

Section F.—Economic Science and Statistics.

The President's Address.

Canon Girdlestone—Maintenance of Schools in Rural Districts.

J. Bailey Denton—Technical Education of the Agricultural Labourer.

James Hunt Holley—Remarks on the Need of Science for the Development of Agriculture.

Dr. L. Lindsay—The Sutherland Gold Diggings as a Scientific and Social Experiment.

John Glover—Decline of Ship-building on the Thames.

Section G.—Mechanical Science.

President's Address.

W. Fairbairn, F.R.S., LL.D.—Further Report on the Mechanical Properties of Steel.

Colonel H. Clerk, R.A., F.R.S.—Description of the Hydraulic Buffer, and on the Flow of Liquids through Small Orifices at High Velocities.

R. Eaton—On Certain Economical Improvements in obtaining Motive Power.

FRIDAY, AUGUST 20th.

Section A.—Mathematical and Physical Science.

Lieut.-Col. Strange—Report of the Committee for Recommending Increased Facilities for Scientific Investigations.

Lieut.-Col. Strange—On the Best Forms of Numerical Figures for Scientific Instruments, and on a Proposed Mode of Engraving them.

Prof. Gustav Magnus—On the Absorption, Emission, and Reflection of Heat.

Prof. W. J. Macquorn Rankine—Summary of the Thermodynamic Theory of Waves of Finite Longitudinal Disturbance.

Rev. Dr. Robinson—On the Appearance of the Nebula in Argo as seen in the great Melbourne Telescope.

Rev. R. Main—Remarks on the British Association Catalogue of Stars.

Rev. R. Main—On the Longitude of the Radcliffe Observatory, Oxford, as deduced from Meridional Observations of the Moon, made at Greenwich and Oxford, in the years 1864-8.

Rev. R. Main—On the Discordance usually observed between the Results of Direct and Reflexion Observations of North Polar Distance.

Prof. P. G. Tait—On Comets.

J. P. Gassiot—On Metallic Deposits in Vacuum Tubes.

Rev. Prof. Jellett—On a Method by which the Formation of certain Chemical Compounds may be Optically Established.

Section B.—Chemical Science.

B. H. Paul—Report on Treatment and Utilisation of Sewage.

F. Braby—On Extraction of Ammonia from Gas Liquor.

Stevenson Macadam—On the Economic Distillation of Gas from Cannel Coal.

Walter Weldon—On the Manufacture of Chlorine by means of Perpetually Regenerated Manganite of Calcium.

T. L. Phipson—On some New Substances extracted from the Walnut.

T. L. Phipson—On the Solubility of Lead and Copper in Pure and Impure Water.

W. J. Russell—On the Measurement of Gases as a Branch of Volumetric Analysis.

C. Tomlinson—On the Supposed Action of Light on Combustion.

Crace Calvert—On the Amount of Soluble and Insoluble Phosphates in Wheat Seed.

H. Sorby—On Jargonia.

Section C.—Geology.

W. Pengelly—Fifth Report of the Committee on the Exploration of Kent's Cavern; with Notes on the Mammalian Remains—By W. Boyd Dawkins and W. A. Sanford.

H. H. Howorth—On the Extinction of Mammoth.

W. Pengelly—On the Alleged Occurrence of *Hippopotamus major* and *Machairodus latidens* in Kent's Cavern.

W. H. Bailey—Report of the Committee on the Fossils of Kiltorcan, Co. Kilkenny.

C. Moore—On a Specimen of Teleosaurus from the Upper Lias.

G. Maw—On the Trappean Conglomerates of Middletown-hill, Montgomeryshire.

J. Thomson—On Teeth and Dermal Structure associated with Ctenacanthus.

W. Carruthers—On Reptilian Eggs from Secondary Strata.

W. Carruthers—On "Slickensides."

Pierre de Tchihatchef—Paleontologie de l'Asie Mineure.

H. Woodward—On the Occurrence of Stylonurus in the Cornstone of Hereford.

H. Woodward—On the Discovery of a Large Myriapod of the genus *Euphoberia* in the Coal Measures of Kilmaurs.

Section D.—Biology.

Professor Dickson—To exhibit a specimen of *Primula sinensis*, in which short styles are accompanied by short stamens.

W. Carruthers, F.L.S.—Report on the Fossil Flora of Britain.

Rev. A. M. Norman, F.L.S.—Letter from Professor Wyville Thomson on the Successful Dredging of H.M.S. *Porcupine* in 2,435 fathoms.

Archdeacon Freeman—Man and the Animals, being a Counter Theory to Mr. Darwin's, as to the Origin of Species.

Rev. F. O. Morris—The Difficulties of Darwinism.

Section E.—Geography.

Sir Bartle Frere, K.C.B.—On the Runn of Cutch.

M. de Khanikof—Sur la Latitude de Samarcand.

Pierre de Tchihatchef—Central Asia.

George Peacock, F.R.G.S.—Encroachment of the Sea on Exmouth Warren.

Dr. G. Oppert—On the Kitai and Kara Kitai.

Captain C. Dodd—Notes on the Runn of Cutch.

Section F.—Economic Science and Statistics.

The Report of the Committee on Uniformity of Weights and Coins in the Interest of Science.

Dr. Farr—On International Coinage.

W. H. U. Sankey—On Weights and Measures.

Professor Leone Levi—On the Economic Condition of the Agricultural Labourer in England.

Professor Leone Levi—On Agricultural Economics and Wages.

Frederick Purdy—Statistical Notes on Mr. J. B. Lawes' Agricultural Experiments.

Section G.—Mechanical Science.

Professor Rankine, F.R.S.—Interim Report of Committee on the Laws Governing the Flow and Action of Water containing Solid Matter in Suspension.

Professor Rankine—Interim Report from the Committee on Agricultural Machinery.

F. J. Bramwell—On the Laws Determining the Fracture of Materials when Sudden Changes of Thickness take place.

J. F. Bateman, F.R.S.—On the Channel Railway.

Admiral Sir Edward Belcher, K.C.B., F.R.S.—On a Navigable Floating Dock.

SATURDAY, AUGUST 21st.

Section A.—Mathematical and Physical Science.

W. H. L. Russell—Report on the Recent Progress in the Theory of Elliptic and Hyper-Elliptic Functions.

E. Vivian.—On a new Mean Self-registering Hygrometer.

Prof. Sylvester.—On Prof. Christian Wiener's Stereoscopic Representation of the Cubic Eikosi-Heptagram.

W. K. Clifford.—On the Umbili of Anallagmatic Surfaces.

W. K. Clifford.—On the Theory of Distances.

R. B. Hayward.—Sketch of a Proof of Lagrange's Equations of Motion referred to Generalised Coordinates.

F. W. Newman.—On Conic Osculation.

F. W. Newman.—On Surfaces of the Second Degree.

F. W. Newman.—On Curves of the Third Degree.

M. Collins.—On the Common Tangents of Circles.

Section B.—Chemical Science.

This Section did not meet on Saturday.

Section C.—Geology.

J. Randall—On the Denudation of the Shropshire and Staffordshire Coal Field—Communicated by W. W. Smyth.

C. Le Neve Foster—On the Occurrence of the Mineral Scheelite at Val Toppa Gold Mine, near Domodossola, Piedmont.

J. E. Taylor—On certain Phenomena in the Drift, near Norwich.

J. E. Taylor—The Water-bearing Strata in the Neighbourhood of Norwich.

G. A. Lebour—Denudation of Western Brittany—Communicated by R. A. C. Godwin-Austen.

G. A. Lebour—Notes on some Granite of Lower Brittany.

H. A. Nicholson—On some New Forms of Graptolites—Communicated by the President.

Section D.—Biology.

This Section did not meet on Saturday.

Section E.—Geography.

This Section did not meet on Saturday.

Section F.—Economic Science and Statistics.

James Heywood, M.A., F.R.S.—On the Examination Subjects for Admission into the College for Women at Hitchin.

Rev. W. Tuckwell, M.A.—On the Method of Teaching Physical Science.

Jesse Collings—Some Statistics of the National Educational League.

Raphael Brandon—Some Statistics of Railways in their Relation to the Public.

James Stark, M.D.—Contributions to Vital Statistics.

P. M. Tait—Vital Statistics of Bombay.

Robert Main—On Naval Finance.

Hyde Clarke, F.S.S.—On the Want of Statistics on the Question of Mixed Races.

Hyde Clarke, F.S.S.—On the Rapidity of Human Thought.

Hyde Clarke, F.S.S.—On the Distinction between Rent and Land-tax in India.

Section G.—Mechanical Science.

This Section did not meet on Saturday.

MONDAY, AUGUST 23rd.

Section A.—Mathematical and Physical Science.

Sir E. Belcher—Report of the Committee appointed to apply to the Admiralty for Aid in Observing Certain Sea Temperatures.

Professor Rankine—Report of the Tidal Committee.

G. J. Symons—Report of the Rainfall Committee.

Dr. Neumayer—Recent Fall of an Aérolite at Krähenburg.

J. Glaisher—Results of Experiments with a Captive Balloon.

Dr. R. J. Mann—On the Rainfall in Natal.

Dr. Hudson—On the Formation of Dew.

A. E. Fletcher—On a New Anemometer.

F. J. Mott—On the Maury Barometer.

— Warner—On Chambered Spirit-levels.

Section B.—Chemical Science.

S. Williams—On the Action of Phosphoric-chloride on Hydric-sulphate.

J. Dewar and G. Cranston—On some Reactions of Chloro-sulphuric Acid.

A. Matthiessen and C. R. Wright—On the Action of Hydrochloric Acid on Morphia and Codeia.

Dr. Andrews—On the Absorption Bands of Bile.

M. Janssen—Methode Spectrale pour la Recherche des Composés du Sodium.

M. Janssen—Sur le Spectre de la Vapeur d'Eau.

W. C. Roberts—On a Specimen of Obsidian from Java.

W. D. Michell—Are Flint Instruments of the First Stone Age found in the Drift?

Section C.—Geology.

C. Moore—Report of the Committee for the purpose of Investigating the Veins containing Organic Remains, which occur in the Mountain Limestone of the Mendips, and elsewhere.

H. Brady—Notes on Mr. Moore's Foraminifera, from Mineral Veins.

C. W. Peach—Notice of the Discovery of Organic Remains in the Rocks between the Nare-head and Porthalla Cove, Cornwall.

H. Bauerman—Report of the Committee on "Ice as an Agent of Geologic Change."

R. Brown—On the Elevation and Depression of the Coast of Greenland.

G. Maw—On Insect Remains and Shells from the Lower Bagshot Leaf-bed of Studland Bay, Dorsetshire.

J. Thomson—On New Forms of Pteroplax and other Carboniferous Labyrynthodonts, and of Megalicthys; with notes on their Structure, by Dr. Young.

Dr. Hicks—On the Discovery of Fossil Plants in the Cambrian Rocks (Upper Longmynds), near St. David's.

Dr. Mann—On the Gold of Natal.

L. C. Miall—Experiments in illustration of the Contortion of Rocks.

Section D.—Biology.

Sir John Lubbock, Bart.—On the Primitive Condition of Man, being some Remarks in answer to the "Speculations" of the Duke of Argyll.

Dr. P. M. Duncan—On the Age of the Human Remains in the Cave of Cro-Magnon, in the Valley of the Vezere.

Colonel Lane Fox—Flint Implements of Palæolithic Age from the Gravels of Ealing and Acton.

Rev. E. N. Dumbledon—Discovery of a Crannog in South Wales.

Rev. Dr. A. Hume—On the so-called "Petrified Human Eyes" from the graves at Arica, Peru.

Section E.—Geography.

Captain R. C. Mayne, R.N.—Recent Surveys in the Straits of Magellan.

Admiral Sir E. Belcher—On the Distribution of Heat on the Sea Surface throughout the Globe.

A. G. Findlay—On the Supposed Influence of the Gulf Stream on the Climate of N.W. Europe.

Captain R. V. Hamilton, R.N.—On the Best Route to the North Pole.

F. F. Searle—The Upper Amazons.

R. Edmonds—On Extraordinary Agitations of the Sea.

T. Wyatt Reid—Influence of Atmospheric Pressure on the Displacement of the Ocean.

Section F.—Economic Science and Statistics.

Frederick Purdy—On the Pressure of Taxation on Real Property.

Dr. W. Neilson Hancock—On Local Taxation in Ireland.

W. Botly—On the Condition of the Agricultural Labourer.

Section G.—Mechanical Science.

Lavington E. Fletcher—Report of the Committee on Boiler Explosions.

C. W. Merrifield, F.R.S.—Report of the Committee on the State of Knowledge of Stability and Sea-going Qualities of Ships.

Professor W. J. M. Rankine, F.R.S.—Report of the Committee for the Analysis and Reduction of Observations in Report of "Steam-ship Performance Committee."

R. B. Grantham—Report of the Committee on Sewage.

T. Login—On Roads and Railways in Northern India, as affected by the Abrading and Transporting Power of Water.

Joseph Whitworth, LL.D., F.R.S.—On the Penetration of Armour Plates by Shells with Heavy Bursting Charges, fired obliquely.

Lavington E. Fletcher—On Government Action with regard to Boiler Explosions.

TUESDAY, AUGUST 24th.

Section A.—Mathematical and Physical Science.

J. Whitworth, F.R.S.—On the Penetration of Armour Plates by Shells with Heavy Bursting Charges fired obliquely.

M. Janssen—Sur une Méthode pour obtenir les Images Monochromatiques des corps Lumineux.

M. Janssen—Faits divers de Physique Terrestre.

Professor A. Morren—On the Chemical Reaction of Light discovered by Professor Tyndall.

H. Hodson—On the Formation of Dew.

G. Johnstone Stoney—On the Numerical Relations between the Wave-lengths of the Hydrogen Rays.

G. Johnstone Stoney—On a Convenient and Cheap Heliostat.

C. Brooke—On the Influence of Annealing on Crystalline Structure.

W. H. L. Russell—On the Mechanical Tracing of Curves.

Prof. Sylvester—On the Successive Involutes to a Circle.

Hon. J. W. Strutt—On an Electro-Magnetic Experiment.

Section B.—Chemical Science.

E. C. C. Stanford—A Chemical Method of Treating the Excreta of Towns.

H. Bamber—On the Water Supplies to Plymouth, Devonport, and Exeter.

P. Spence—On the Production of Higher Temperatures by Steam of 212° Fahrenheit.

A. Oppenheim—On Bromo-Iodide of Mercury.

A. Oppenheim—On Benzo-Sulphuric Acid.

Professor Jellett—On a Method of Determining with Accuracy the Ratio of the Rotating Powers of Cane Sugar and Inverted Sugar.

Dr. Fritsche—Notes on Structural Change in Block Tin—Communicated by W. C. Roberts.

H. Cooke—On the Registration of Atmospheric Ozone in the Bombay Presidency, and the Chief Causes which Influence its Appreciable Amount in the Atmosphere.

J. Lowthian Bell—On the Decomposition of Carbonic Oxide by Spongy Iron.

Section C.—Geology.

J. Bryce—Report of the Committee on Earthquakes in Scotland.

W. S. Mitchell—Report of the Committee for the purpose of Investigating the Leaf-beds of the Lower Bagshot Series of the Hampshire Basin.

R. Etheridge—On the Occurrence of a large Deposit of Terra Cotta Clay at Watcombe, Torquay.

Rev. J. D. La Touche—An Estimate of the Quantity of Sedimentary Deposits in the River Onny.

J. L. Lobley—On the Distribution of the British Fossil *Lamellibranchiata*.

Rev. J. D. La Touche—On Spheroidal Structure in Silurian Rocks.

N. Whitley—On the Distribution of Shattered Chalk Flints and Flakes in Devon and Cornwall.

Professor Tennant—Diamonds received from the Cape of Good Hope during the last year.

J. Jeffreys—On the Action upon Earthy Minerals and Compounds, of Water in the form of Heated Steam, urged by Wood Fuel, &c.

J. W. Reid—On the Physical Causes which have produced the Unequal Distribution of Land and Water between the Hemispheres.

C. Jecks—On the Crag Formation.

J. E. Lee—Notice of Remarkable Glacial Striæ lately exposed at Portmadoc.

E. A. Conwell—On a Fossil Mussel Shell found in Drift in Ireland.

Section D.—Biology (Department of Botany, Zoology, and Ethnology).

M. T. Blanford—On the Relations of the Fauna of British India to that of the Ethiopian and so-called Indian Regions.

Robert Brown, F.R.G.S.—The Mammalian Fauna of North-West America.

H. Woodward, F.G.S.—On a New Isopod from Flinder's Island.

Ralph Tate, F.G.S.—On the Land and Fresh-Water Shells of Nicaragua, Central America.

W. F. Webb—Five years' experience in Artificial Fish-breeding, showing in what waters Trout will and will not thrive, with some remarks on Fish and our British Fisheries.

Frank Buckland—On the Salmon Rivers of Devon and Cornwall, and how to improve them.

Professor E. Perceval Wright—On *Rhinodon typicus*, the largest known Shark.

Dr. Scott—On a Hybrid or other variety of *Perdix cinerea* found in Devonshire.

Miss Lydia Becker—On Alteration in the Structure of *Lychnis diorcha*, observed in connection with the development of Parasitic Fungus.

A. Hancock, F.L.S., and Thomas Atthey—On some curious Fossil Fungi, from the Black Shale of the Northumberland Coal Fields.

Admiral Sir E. Belcher—Stone Implements from Rangoon.

Sir Duncan Gibb, Bart.—Paucity of Aboriginal Monuments in Canada.

W. C. Dendy—On the Primeval Status of Man.

A. L. Lewis—Notes on the Builders and the Purposes of Megalithic Monuments.

H. H. Howorth—Westerly drifting of the Nomades from the 5th to the 19th Century.

J. Bonwick—Origin of the Tasmanians.

Section D.—Biology (Department of Anatomy and Physiology).

K. Bridgman—Voltaic Electricity in Relation to Physiology.

Professor Cleland—On the Interpretation of the Limbs and the Lower Jaw.

Dr. Richardson, F.R.S.—Report on the Physiological Action of Chloral.

Dr. Burdon Sanderson, F.R.S.—Exhibited an Instrument for Recording Respiratory Movements.

H. Blanc, M.D.—Human Vaccine Lymph and Heifer Lymph compared.

J. C. Galton, M.A., F.L.S.—The Myology of Cyclothurus Didactylus.

Professor Cleland.—On the Human Peritoneum illustrated by that of the Wombat.

Dr. Heaton.—Further Observations on Dendroidal Forms assumed by Minerals.

Section E.—Geography.

Trelawney Saunders.—Cooper's Attempt to Cross from China to India.

Douglas Forsyth.—Trade Routes between Northern India and Central Asia.

Trelawney Saunders.—The Himalayas and Central Asia.

Dr. G. Newmayer.—Scheme for a Scientific Exploration of Australia.

W. P. Blanford.—Northern Abyssinia.

Dr. Birdwood—On the Geography of the Frankincense Plant.

Dr. C. Le Neve Foster.—On Raleigh's El Dorado.

Section F.—Economic Science and Statistics.

Dr. Robert Mann—On Assisted Emigration.

Archibald Hamilton—The Economic Progress of New Zealand.

James Heywood—On Municipal Government for Canadian Indian Reserves.

Sir J. Bowring—On Prison Laws as associated with Prison Discipline.

F. P. Fellowes—On our National Accounts.

Sir J. Bowring—The Devonshire Association for Advancement of Science and Art.

Section G.—Mechanical Science.

Professor Rankine—Report of the Tidal Committee.

Adjourned Discussion on Mr. L. E. Fletcher's paper on Boiler Explosions.

Thomas D. Barry—On the Utilisation of Town Sewage.

Latimer Clark—On the Birmingham Wire Gauge.

S. A. Varley—On a New System of Communication between Guards and Passengers on Railways.

G. J. Symons and Rogers Field—On a Method of Determining the True Amount of Evaporation from a Water Surface.

R. E. Froude.—The Hydraulic Internal Scraping of the Torquay Water Main.

W. Froude—Some Difficulties in the Received Views of Fluid Friction.

Professor T. C. Archer—Description of a New System of House Ventilation, by J. D. Morrison, of Edinburgh.

Professor T. C. Archer—On the Working of Thomson's Road Steamer during the past year.

W. Smith, C.E.—An Improved Vertical Annular High Pressure Steam Boiler.

J. T. Chillingworth—An Air Engine.

WEDNESDAY, AUGUST 25TH.

Section A.—Mathematical and Physical Science.

J. Glaisher—Report of the Committee on Luminous Meteors.

T. Bruce-Warren—On Electrification.

F. H. Varley—On the Electrical Balance.

G. Johnstone Stoney—On Collimators for adjusting Newtonian Telescopes.

G. J. Symons—Exhibited a Storm Rain Gauge.

Balfour Stewart—On Meteorological Reductions, with especial reference to the Element of Vapour.

Balfour Stewart—On a Self-Recording Rain Gauge.

W. Huggins—On the Heat of the Stars.

Section B.—Chemical Science.

This Section did not meet.

Section C.—Geology.

This Section did not meet.

Section D.—Biology (Department of Botany, Zoology, and Ethnology).

C. Spence Bate, F.R.S.—Report on the Marine Fauna and Flora of the South Coast of Devon and Cornwall.

Dr. Maxwell T. Masters—Relative Value of the Characters employed in the Classification of Plants.

Dr. Birdwood—On the genus Boswellia, with Descriptions and Drawings of Three New Species.

W. Pengelly—Whale Remains washed ashore at Babbicombe, South Devon.

G. Gladstone, F.C.S.—Observations on Infusoria at Münster am Stein, Creuznach.

C. S. Wake—Initial Life.

Dr. R. King—On the Natives of Vancouver's Island.

W. S. Hall—The Esquimaux considered in their Relationship to Man's Antiquity.

Drs. R. S. Charnock and C. C. Blake—Notes on the Woolwa and Mosquito Vocabularies.

F. Drake—Human Remains in the Gravels of Leicestershire.

T. M. Hall—Method of forming Flint Flakes used by the Early Inhabitants of Devon.

R. Tate—Notes on an Inscribed Rock.

Sir D. Gibb, Bart.—An Obstacle to European Longevity beyond 70 years.

Sir D. Gibb, Bart.—A Cause of Diminished Longevity among the Jews.

R. Garner—On the Brain of a Negro.

H. H. Howarth—Frontier Line of Ethnology and Geology.

F. H. Kinahan—Race Elements of the Irish People.

C. S. Wake—Race Affinities of the Madecasses.

J. Stirling—Races of Morocco.

Section D.—Biology (Department of Anatomy and Physiology).

R. Garner—On the Homologies in the Extremities of the Horse.

Professor Crum Brown—On the Connection between Chemical Composition and Physiological Activity.

Dr. Kidd—On Sleep and Anesthetics.

Section E.—Geography.

This Section did not meet.

Section F.—Economic Science and Statistics.

Henry Dircks, C.E., LL.D.—Statistics of Invention, illustrating the Policy of a Patent Law.

Section G.—Mechanical Science.

This Section did not meet.

PROFESSOR HUXLEY ON SCIENTIFIC EDUCATION.

The following is extracted from a paper by Professor Huxley, which appeared in the June number of *Macmillan's Magazine* :—

The next question to which I have to address myself is, what sciences ought to be thus taught? And this is one of the most important of questions, because my side (I am afraid I am a terribly candid friend) sometimes spoils its cause by going in for too much. There are other forms of culture beside physical science, and I should be profoundly sorry to see the fact forgotten, or even to observe a tendency to starve or cripple literary or æsthetic culture for the sake of science. Such a narrow view of the nature of education has nothing to do with my firm conviction that a complete and thorough scientific culture ought to be introduced into all schools. By this, however, I do not mean that every schoolboy should be taught everything in science. That would be a very absurd thing to conceive, and a very mischievous thing to attempt. What I mean is, that no boy or girl should leave school without possessing a grasp of the general character of science, and without having been disciplined, more or less, in the methods of all sciences; so that, when turned into the world to make their own way, they shall be prepared to face scientific discussions and scientific problems, not by knowing at once the conditions of every problem, but by being able at once to solve it; but by being familiar with the general current of scientific thought, and being able to apply the methods of science in the proper way, when they have acquainted themselves with the conditions of the special problem.

That is what I understand by scientific education. To furnish a boy with such an education, it is by no means necessary that he should devote his whole school existence to physical science; in fact, no one would lament so one-sided a proceeding more than I. Nay more, it is not necessary for him to give up more than a moderate share of his time to such studies, if they be properly selected and arranged, and if he be trained in them in a fitting manner.

I conceive the proper course to be somewhat as follows:—To begin with, let every child be instructed in those general views of the phenomena of nature, for which we have no exact English name. The nearest approximation to a name for what I mean which we possess is "physical geography." The Germans have a better, "Erdkunde" ("earth knowledge" or "geology" in its entomological sense), that is to say, a general knowledge of the earth, and what is on it, in it, and about it. If anyone who has had experience of the ways of young children will call to mind their questions, he will find that far as they can be put into any scientific category, they come under this head of "Erdkunde." The child asks, "What is the moon, and why does it shine?" What is this water, and where does it run?" "What is the wind?" "What makes the waves in the sea?" "Where does this animal live, and what is the use of

that plant?" And if not snubbed and stunted by being told not to ask foolish questions, there is no limit to the intellectual cravings of a young child; nor any bound to the slow but solid accretion of knowledge and development of the thinking faculty in this way. To all such questions, answers which are necessarily incomplete, though true as far as they go, may be given by any teacher whose ideas represent real knowledge and not mere book-learning; and a panoramic view of nature, accompanied by a strong infusion of the scientific habit of mind, may thus be placed within the reach of every child of nine or ten.

After this preliminary opening of the eyes to the great spectacle of the daily progress of nature, as the reasoning faculties of the child grow, and he becomes familiar with the use of the tools of knowledge—reading, writing, and elementary mathematics—he should pass on to what is, in the more strict sense, physical science. Now there are two kinds of physical science; the one regards form and the relation of forms to one another; the other deals with causes and effects. In many of what we term our sciences, these two are mixed up together; but systematic botany is a pure example of the former kind, and physics of the latter kind of science. Every educational advantage which training in physical science can give is obtainable from the proper study of these two; and I should be contented, for the present, if they added to our "Erdkunde," furnished the whole of the scientific curriculum of schools. Indeed, I conceive it would be one of the greatest boons which could be conferred upon England, if henceforward every child in the country were instructed in the general knowledge of the things about it—in the elements of physics and of botany. But I should be still better pleased if there could be added somewhat of chemistry, and an elementary acquaintance with human physiology.

So far as school education is concerned, I want to go no further just now; and I believe that such instruction would make an excellent introduction to that preparatory scientific training which, as I have indicated, is so essential for the successful pursuit of our most important professions. But this modicum of instruction must be so given as to ensure real knowledge and practical discipline. If scientific education is to be dealt with as mere book-work, it will be better not to attempt it, but to stick to the Latin grammar, which makes no pretence to be anything but book-work.

If the great benefits of scientific training are sought, it is essential that such training shall be real; that is to say, that the mind of the scholar should be brought into direct relation with fact; that he should not merely be told a thing, but be made to see, by the use of his own intellect and ability, that the thing is *so* and no otherwise. The great peculiarity of scientific training, that in virtue of which it cannot be replaced by any other discipline whatsoever, is this bringing of the mind directly into contact with fact, and practising the intellect in the completest form of induction; that is to say, in drawing conclusions from particular facts made known by immediate observation of nature.

The other studies which enter into ordinary education do not discipline the mind in this way. Mathematical training is almost purely deductive. The mathematician starts with a few simple propositions, the proof of which is so obvious that they are called self-evident, and the rest of his work consists of subtle deductions from them. The teaching of languages, at any rate as ordinarily practised, is of the same general nature,—authority and tradition furnish the data, and the mental operations of the scholar are deductive.

Again—if history be the subject of study, the facts are still taken upon the evidence of tradition and authority. You cannot make a boy see the battle of Thermopylæ for himself, or know of his own knowledge that Cromwell once ruled England. There is no getting into direct contact with natural fact by this road; there is no dispensing with authority, but rather a resting upon it.

In all these respects science differs from other educational discipline, and prepares the scholar for common life. What have we to do in every-day life? Most of the business which demands our attention is matter of fact, which needs, in the first place, to be accurately observed or apprehended; in the second, to be interpreted by inductive and deductive reasonings, which are altogether similar in their nature to those employed in science. In the one case as in the other, whatever is taken for granted is so taken at one's own peril; fact and reason are the ultimate arbiters, and patience and honesty are the great helpers out of difficulty.

But if scientific training is to yield its most eminent results, it must, I repeat, be made practical. That is to say, in explaining to a child the general phenomena of nature, you must, as far as possible, give reality to your teaching by object-lessons; in teaching him botany, he must handle the plants and dissect the flowers for himself; in teaching him physics and chemistry, you must not be solicitous to fill him with information, but you must be careful that what he learns he knows of his own knowledge. Don't be satisfied with telling him that a magnet attracts iron. Let him see that it does; let him feel the pull of the one upon the other for himself. And, especially, tell him that it is his duty to doubt until he is compelled, by the absolute authority of nature, to believe that which is written in books. Pursue this discipline carefully and conscientiously, and you may make sure that, however scanty may be the measure of information which you have poured into the boy's mind, you have created an intellectual habit of priceless value in practical life.

One is constantly asked, When should this scientific education be commenced? I should say with the dawn of intelligence. As I have already said, a child seeks for information about matters of physical science as soon as it begins to talk. The first teaching it wants is an object-lesson of one sort or another; and as soon as it is fit for systematic instruction of any kind, it is fit for a modicum of science.

People talk of the difficulty of teaching young children such matters, and in the same breath insist upon their learning their catechism, which contains propositions far harder to comprehend than anything in the educational course I have proposed. Again, I am incessantly told that we who advocate the introduction of science into schools make no allowance for the stupidity of the average boy or girl; but, in my belief, that stupidity, in nine cases out of ten, *fit, non nascitur*, and is developed by a long process of parental pedagogic repression of the natural intellectual appetites, accompanied by a persistent attempt to create artificial ones for food which is not only tasteless, but essentially indigestible.

Those who urge the difficulty of instructing young people in science are apt to forget another very important condition of success—important in all kinds of teaching, but most essential, I am disposed to think, when the scholars are very young. This condition is, that the teacher should himself really and practically know his subject. If he does, he will be able to speak of it in the easy language, and with the completeness of conviction, with which he talks of any ordinary every-day matter. If he does not, he will be afraid to wander beyond the limits of the technical phraseology which he has got up; and a dead dogmatism, which oppresses or raises opposition, will take the place of the lively confidence born of personal conviction, which cheers and encourages the eminently sympathetic mind of childhood.

I have already hinted that such scientific training as we seek for may be given without making any extravagant claim upon the time now devoted to education. We ask only for a "most favoured nation" clause in our treaty with the schoolmaster; we demand no more than that science shall have as much time given to it as any other single subject—say four hours a week in each class of an ordinary school.

For the present, I think men of science would be well

content with such an arrangement as this; but, speaking for myself, I do not pretend to believe that such an arrangement can be, or will be permanent. In these times the educational tree seems to have its roots in the air, its leaves and flowers in the ground; and I confess I should very much like to turn it upside down, so that its roots might be solidly embedded among the facts of nature, and draw thence a sound nutriment for the foliage and fruit of literature and of art. No educational system can have a claim to permanence unless it recognises the truth that education has two great ends to which everything else must be subordinated. The one of these is to increase knowledge; the other is to develop the love of right and the hatred of wrong.

With wisdom and uprightness a nation can make its way worthily, and beauty will follow in the footsteps of the two, even if she be not specially invited; while there is perhaps no sight in the whole world more saddening and revolting than is offered by men sunk in ignorance of everything but what other men have written; seemingly devoid of moral belief or guidance, but with the sense of beauty so keen, and the power of expression so cultivated, that their sensual caterwauling may be almost mistaken for the music of the spheres.

At present, education is almost entirely devoted to the cultivation of the powers of expression, and of the sense of literary beauty. The matter of having anything to say beyond a hash of other people's opinions, or of possessing any criterion of beauty, so that we may distinguish between the Godlike and the devilish, is left aside as of no moment. I think I do not err in saying that if science were made the foundation of education, instead of being, at most, stuck on as cornice to the edifice, this state of things could not exist.

In advocating the introduction of physical science as a leading element in education, I by no means refer only to the higher schools. On the contrary, I believe that such a change is even more imperatively called for in those primary schools in which the children of the poor are expected to turn to the best account the little time they can devote to the acquisition of knowledge. A great step in this direction has already been made by the establishment of science-classes under the Department of Science and Art—a measure which came into existence unnoticed, but which will, I believe, turn out to be of more importance to the welfare of the people than many political changes, over which the noise of battle has rent the air.

Under the regulations to which I refer, a schoolmaster can set up a class in one or more branches of science; his pupils will be examined, and the State will pay him, at a certain rate, for all who succeed in passing. I have acted as an examiner under this system from the beginning of its establishment, and this year I expect to have not fewer than a couple of thousand sets of answers to questions in physiology, mainly from young people of the artisan class, who have been taught in the schools which are now scattered all over Great Britain and Ireland. Some of my colleagues, who have to deal with subjects such as geometry, for which the present teaching power is better organised, I understand are likely to have three or four times as many papers. So far as my own subjects are concerned, I can undertake to say that a great deal of the teaching, the results of which are before me in three examinations, is very sound and good, and I think it is in the power of the examiners, not only to keep up the present standard, but to cause an almost unlimited improvement. Now what does this mean? It means that by holding out a very moderate inducement, the masters of primary schools in many parts of the country have been led to convert them into little foci of scientific instruction, and that they and their pupils have contrived to find or to make time enough to carry out this object with a very considerable degree of efficiency. That efficiency will, I doubt not, be very much increased as the system becomes known and perfected, even with the very limited leisure left to masters and teachers on week-days. And this leads me to ask, Why should scientific teaching be limited to week-days?

Ecclesiastically-minded persons are in the habit of calling things they do not like by very hard names, and I should not wonder if they brand the proposition I am about to make as blasphemous, and worse. But not minding this, I venture to ask, Would there really be anything wrong in using part of Sunday for the purpose of instructing those who have no other leisure, in a knowledge of the phenomena of nature, and of man's relation to nature?

I should like to see a scientific Sunday-school in every parish, not for the purpose of superseding any existing means of teaching the people the things that are for their good, but side by side with them. I cannot but think that there is room for all of us to work in helping to bridge over the great abyss of ignorance which lies at our feet.

And if any of the ecclesiastical persons to whom I have referred, object that they find it derogatory to the honour of the God whom they worship, to awaken the minds of the young to the infinite wonder and majesty of the works which they proclaim His, and to teach them those laws which must needs be His laws, and therefore of all things needful for man to know—I can only recommend them to be let blood and put on low diet. There must be something very wrong going on in the instrument of logic if it turns out such conclusions from such premises.

Fine Arts.

Art Decoration of Theatres.—The *Pall Mall Gazette* says:—"Those who wish to see the decorations and other accessory attractions at our theatres taking a higher artistic form than has hitherto been generally discernible therein, will be glad to learn that Mr. H. S. Marks, whose first production of the kind is nightly before the audiences at the Gaiety Theatre, has just executed a similar commission, on a somewhat larger scale, at the Prince's Theatre, Manchester. The design, which, as at the Gaiety, occupies the wall-space immediately over the proscenium, represents Shakspeare enthroned in the centre, Tragedy and Comedy seated at his feet, the space on either side being occupied by a group of characters from his greatest plays, happily varied and contrasted, both as to character and composition. Two sitting figures, Lear and Falstaff, occupy respectively the centre of each group, as representative of the extremes of tragedy and comedy, further typified by the blasted tree which adjoins the figure of Lear, and the flowering plant in full bloom which rises over the head of the jovial knight. The same contrast is kept up throughout; Romeo and Juliet, for instance, on the one hand, are balanced by Benedick and Beatrice on the other, and the graceful and refined figure of Desdemona is set off by the sturdy rusticity of Audrey. There is much thought, as well as some very fine drawing, in the composition, which exhibits specially the qualities which ought to characterise mural painting—viz., entire flatness of treatment in the colouring, without any attempt at perspective effect, and just that degree of conventional character in the figures necessary to prevent their appearing to compete obtrusively with the living actors strutting their hour upon the stage below. This painting may be considered as an important contribution to a style of art which has been far too little practised in this country, but of which our theatres and other public buildings afford abundance of opportunity."

Manufactures.

New Explosive Material.—The following account of a new explosive material is copied from the *Kölnische*

Zeitung, May 19th, which gives the *Militär-Wochen-blatt* as its authority:—"It is now some time since the proprietors of the Nora-Gyttorp Powder Mills obtained a patent in Sweden for the discovery of the so-called 'ammonia powder,' a substance which has hitherto been only employed in a few mining districts, but which otherwise seems wholly unknown. We are therefore fully justified in calling attention to the particular properties of this new explosive material. During the short time that it has been employed, it has won the approval not only of the proprietors of mines, but also of the working miners themselves. Its explosive force may be compared to that of nitro-glycerine, and, consequently, far surpasses that of dynamite. It cannot be exploded by a flame or by sparks, and the explosion is effected by a heavy blow from a hammer. Blast holes loaded with this powder are exploded by means of a powerful cap, or, better, by means of a cartridge containing common powder, for this forms a more reliable exploder. Miners who have been obliged to give up the use of nitro-glycerine, on account of the danger connected with this powerful explosive agent, have a most satisfactory substitute in the ammonia powder, as the danger of using it is so small that it surpasses in safety every other blasting material. One of the useful and important properties of this new powder is, that it does not require heating in cold weather, whilst nitro-glycerine and dynamite must first of all be warmed, and this has been the cause of many accidents. The price of the ammonia powder is the same as that of dynamite." The same paper further adds:—"According to information we have received, ammonia powder was discovered by the chemist Norrbin." The German "Building News" contains extracts from a report of the Prussian architect Steenke, who makes the following remarks upon the safety of ammonia powder:—"Experiments were made by fastening a lamp to a pendulum, which was caused to oscillate; gunpowder, gun-cotton, nitro-glycerine, and dynamite all took fire as the flame passed over them, but the ammonia powder did not begin to burn till it had been touched by the flame twenty times. In making experiments upon the force of the blow required to explode it, it was found that, with the apparatus employed, where the fall of a weight from 4 to 5 feet would explode gunpowder, nitro-glycerine only required $1\frac{1}{2}$ to 2 feet, dynamite $2\frac{3}{4}$ to 3 feet fall, whilst a fall of from 12 to 15 feet was necessary to cause the explosion of the ammonia powder."

Commerce.

The Price of Cotton.—Mr. Sam Mendel's "Circular," dated August 2nd, says:—"The deficiency of some 400,000 bales in our visible supply of cotton, compared with last year, is a fact that cannot be overcome, and makes the raw material almost master of the situation; and, should consumption go on at the present rate, a further advance in prices can hardly be obviated. Not only will our stock be reduced to a low ebb, but the estimated extent of the growing crop does not seem to be such as to make buyers apprehensive of any serious decline, even after it becomes available; and holders of goods in foreign markets would do well to instil into the native mind the probable duration of the present comparatively high scale of prices. Cotton is now dearer than it has been since April, 1868, and as the prospects of supply have not improved, there is no ground for the expectation of lower prices, unless present values greatly interfere with the consumption of goods. It is generally admitted that any advance over a shilling per lb. for middling Orleans does have this effect, and I therefore expect to see some diminution in the production of goods over the next two or three months; and I do not think that exports to foreign markets for the second half of the year will exceed those in the first half."

Colonies.

Education in South Australia.—At the close of the year 1868, the number of schools conducted by teachers licensed by the Central Board of Education had increased to 325. Only one teacher is licensed to each school, but in most of the larger schools one or more assistant teachers or pupil teachers are employed. 15,259 children attended the public schools during the month of October, viz., 8,514 boys and 6,745 girls, showing an increase over the previous year of 274 boys and 385 girls; total increase, 659. Twenty-two schools were in Adelaide, 21 in corporate towns, 215 within the limits of district councils, 64 in hundreds, and three in outlying districts. The total number of buildings held in trust for school purposes under the board is now 78. The amount paid by the board in stipends to teachers was £16,680. The amount of fees received by the teachers from the parents was £14,214 8s. The destitute fees paid by the board amounted to £1,544 14s. Total cost of the education of the 15,259 children, £32,449 2s., or an average for each child of £2 2s. 6d., against £2 3s. 11d. for 1867.

Notes.

Social Science Congress.—The following are the special questions to be discussed at the forthcoming Social Science Congress, to be held at Bristol from the 29th of September to the 6th of October next:—Municipal Law Section—1. What ought to be the legal and constitutional relations between England and the Colonies? 2. What is the most expedient mode of introducing into England a system of public prosecution? 3. What limits ought to be placed by law to charitable endowments? Reformatory Section—1. Can infanticide be diminished by legislative enactment? 2. What have been the results of the Industrial and Reformatory Acts of 1866? Educational Department—1. Is an unsectarian scheme of education inconsistent with religious teaching? 2. How may the State best promote the education of the destitute and neglected portion of the population? 3. In what way can the Endowed Schools Bill be worked so as to bring the educational endowments within reach of all? Health Department—1. Can Government beneficially further interfere to limit the spread of infectious diseases? 2. What legislative measure might be proposed to deal with cases of uncontrollable drunkenness? 3. Should the Contagious Diseases Act be extended to the civil population? Economy and Trade Department—1. Is it desirable that State aid should be given to emigration, and, if so, in what form? 2. In what respects may the administration of the Poor-law be improved? 3. How may the condition of the agricultural labourer be improved? Voluntary papers on other subjects in connection with the departments will be taken.

Anthropological Museum in France.—The Minister of Public Instruction in France, some time since, founded a museum of anthropology, and confided its direction to M. Quatrefages, member of the Institute. This museum has just been enriched by a collection of types, life-size, of the natives of the Valley of the Nile, painted by M. Georges Lefébure, who has returned from a mission to the East.

Correspondence.

Velocipedes.—Sir,—Your *Journal*, vol. 17, p.p., 183, 200, 221, contains letters upon these machines, which, in their improved form, are deemed by the *Lancet* desirable for exercise, if not utility. I believe at Alnwick Castle a drawing is extant of a similar machine, made in the 17th century. In the *Journal de Paris*, 27th July, 1799,

Blanchard's velocipede was described. In 1818, the French invention was improved by Dennis Johnson, and dandy-horses were used, the riders striking the ground with their feet. In Wright's "History of the House of Hanover," the late Duke of York was represented on one of these machines. In March, 1819, "The road from Ipswich to Whitton, in Suffolk, was travelled every evening by pedestrian hobby-horses, six at a time; the distance, three miles, performed in 15 minutes." The machines consisted of two wheels, one before the other, connected by a perch, on which the pedestrian rested, urging the machine on the principle of skating. A Mr. Howard, of Bristol, invented a pedestrian chariot, to carry several persons. It was suggested that the new machines might be used for conveying light weights, as in the velocipedes. One step is only required once in five or six yards, and less on a declivity. At Ackerman's, in London, a model velocipede for females was exhibited, having two wheels behind, wrought by two levers, like weaver's treadles, on which the propeller of the machine pressed alternately, with a walking motion, sitting on the front seat. The treadles moved the axle by leather straps round the cramps, and the fixed wheels revolved with it. A writer in a public periodical (June, 1819) suggested that velocipedes might have been invented from the "go-carts" used in Wales, in parallelogram form; and that, where gain of time was desired, velocipedes or dandy-horses might be useful, as in the cases of postmen and medical men. At present this machine seems to be more adapted for recreation than utility, but may be improved, so as to become of practical benefit.—I am, &c., Christopher Cooke.

London, Aug. 10th, 1869.

Cotton Cultivation in India.—Sir,—The discussion on cotton has elicited from all sides such interesting information, bearing not only upon the highest interests of the inhabitants of India, and therefore of the government, but upon an enormous manufacturing population in this country, that I scarcely think it right I should withhold my small modicum of experience of agriculture and association with all classes of the population. One gentleman has told us that cotton, under good management, will produce £10 per acre, while, for the same land, the ryot, after deductions, can hardly be said to receive more than 25s. for his present crops. Now, after such a fact as this being admitted, can any one doubt the enormous value of the production of this staple to the people of that country, or the necessity and importance of making all considerations subsidiary to its production, which all profess to desire? It is said by some that efforts have been made and failed, to induce the native population to take to this profitable source of cultivation; but to me it appears very important to know by whom, and in what manner, these efforts were made. One gentleman said that, on the various appliances for the preparation of this article being introduced to the notice of the natives, they were much pleased, spoke very much in its favour, used them, but the moment your back was turned threw it aside, saying it was different from what they were accustomed to, and that their fathers and grandfathers did not use it. It is likewise said that Lord Tweeddale had taken great interest in improving the cultivation, with Sir E. Denison and other gentlemen, but that all had given the matter up in despair. Now, I must be pardoned for saying that I very much prefer an experiment, upon which such enormous results depend, being carried out by a practical person, intimate and acquainted with all the habits of the native population, and whose fortune, more or less, depends upon the result. We have incontestible evidence in that country of the success which has attended similar efforts when well and perseveringly directed. There are two stereotyped answers in the mouths of natives, throughout the length and breadth of India, when any change is wished for in their customs. The one is, that their fathers and grandfathers did not do it; the other, that they will lose caste if they attempt it; but experience constantly shows that these prejudices vanish when they get confidence in any profitable source of occupation. Silk printing and dyeing, the manufacture of sugar, indigo, and silk, and this very article of cotton-manufacture, have at various times, with marvellous success, been carried on by the native population. I visited, out of curiosity, the cotton-mills at Fort Gloucester, on the banks of the Hoogly, to the south of Calcutta, when they were in full working order. Two young men had come, I think from Glasgow, and I quite failed to learn that there was any inability or disinclination on the part of the native population to carry out the work as they required it. I saw the whole business of a cotton-mill in progress, precisely as I should expect to see it in this country. With regard to a former discussion, in which an impression existed that the native population could not reel silk as it was required, the solution of that apparent mystery was very simple. A practical gentleman told me it was a question of money; and when I asked what he meant, he said, to manipulate it as required they must dispense with the waste, and that they could not afford to do. Silk printing and dyeing was carried on by one of the eminent Calcutta mercantile houses at Hourah with great success; the natives there again acquired the art, and practised it with great efficiency, and I believe large sums of money were derived from it. If we turn to the preparation of indigo, we find precisely the same result, that is, an article which, during its whole process, requires the closest attention and greatest care, and yet the native, having been constantly and unceasingly tutored, does produce the finest article in the world without, if necessary, even the presence of the European. I am entitled to speak with some confidence on this matter, as although the value and quantity are small, I may say that on two occasions the very best in the country came from where I was, and partly belonged to me. Then, from the Mofussil or country districts of India I turn to the various capitals, and what do I find? I will go no further than Calcutta. Coach-makers, carpenters, tailors, shoe-makers, cabinet-makers, silversmiths, blacksmiths, &c., are there to be found acquitting themselves with marvellous cleverness, at a few rupees a month. I hope I have said enough to show that caste and prejudice are not so deep-seated in the native population as is generally supposed, and that they are not wanting in teachable ability. If I were asked my opinion, I should say, properly trained and taught, they were equal to the least advanced of European nations. I recollect hearing the well-known Dr. Duff say, in one of his splendid orations, that the great pioneer of Christian truth was the destruction of the caste; but I have known a Rajpoot and a Brahmin in my service, without being asked, when they saw my necessities, perform services which I knew to be utterly destructive of their caste. Can it be supposed for a moment that all that I have indicated has been accomplished, and that the natives, from any cause whatever, are incapable of further advancement. I believe it is a great injustice to them to suppose it. I now come to another portion of the subject. One gentleman, very properly, I think, looking at the character of the population, thought that the government ought to take an active part in this cotton cultivation, and he is met by the observation, that political economy forbids it. Another gentleman adverted to the contract law, and he is met by the assertion that all jurists have given their opinion that a breach of contract can only be met by a purely civil proceeding. Now, political economy is a science of yesterday, comparatively speaking, and has arisen entirely out of that advanced state of civilisation which we and other European nations enjoy, and it does seem singularly out of place to apply it to a people whose habits and customs are very like they were in the time of Alexander the Great. The population of India are not yet alive to the simple principle of supply and demand. I can supply many proofs of it, but will be satisfied with one. Take the article of sugar (I mean the date sugar), and I believe it is admitted that India

might supply the whole world at a fabulously small price, but the population do not enter into it, although it would cost them nothing; they have simply to plant the tree upon the divisions marking the boundaries of each piece of land; and yet in one district you see them, while in the next not a tree is to be found. I can understand fostering and improving in every possible way the native population, until they are fairly launched in a career of progress, and then leaving them in the hands of modern science in all its integrity. It has been stated at these conferences that it was remarkable how little hold we had obtained on the native population; that our rule was like the trees in the Himalaya mountains, whose roots took hold of the surface only, to be carried away by the first storm, and this said after you have had quiet possession of the country for a century and a quarter. I know no better way of inducing those roots to grow downwards than encouraging a great enterprise, such as cotton cultivation; and if I am asked for one of the best elements for the material progress of India, I should say it was an Englishman carrying on a cultivation of this remunerative character amongst hundreds and thousands of the native population, implanting in their minds the justice of all his transactions, settling their disputes, assisting them in their poverty, and exercising a wise discretion in all his relations with them, irrespective of all considerations of political economy, or the dictum of jurists. There are just three ways in which this cotton cultivation, it seems to me, can be carried out:—The one is, by the government taking up and carrying out the whole scheme, until it is matured and taken up by the natives; the other, that the parties interested should send out a commissioner and authorities of their own, on the distinct condition that they shall be effectually supported by the government, for, as has well been observed, the natives are very fond of authority, and more readily take to a novelty coming from persons in authority than any private individual; and the third is, that this shall be purely a matter of private enterprise. In the latter event, the only effectual way is to have a tenantry of your own, by underleasing an estate from a zemindar, where it is known there is a great deal more land in the hands of the ryots than they pay for, and where there is a good deal of excellent waste land, that the want of enterprise in the zemindar and the poverty of the tenant prevent being cultivated. In such an estate there ought to be a profit in the rental of five per cent., and much of the unpaid-for and uncultivated land might be utilised for cotton purposes; but I must emphatically warn those who may be interested in this matter from making large advances to the native population for these purposes. They may rest assured that the native mind is governed by two influences, fear and self-interest; that morality, truth, and honour are utterly unknown; that fraud, forgery, perjury, and the whole catalogue of vice which demoralise a community, flourish, and go very far to paralyze any efforts that may be made to reclaim them. I will just conclude with this, that if a proposition of this magnitude to that country and to this is to be looked upon coldly by authority, it is tantamount to saying that no further progresss can or ought to be made, by the population of a country who have shown, to those best able to understand them, that they are capable of unlimited advancement. — I am, &c., Maxwell Turnbull.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb. *Delivered on 10th August*, 1869.

167. (III.) Trade Accounts (Foreign Countries)—Belgium, Holland, France, and United States.
357. Weights and Measures (Metropolis)—Return.
385. Thames Conservancy—General Report.
National Education (Ireland)—Thirty-fifth Report.

Patents.

From Commissioners of Patents' Journal, August 20.

Grants of Provisional Protection.

Alcohol, &c., purifying—2364—W. E. Newton.
Candles, machinery for stamping—2095—L. Schalleidner.
Carriages, &c., sunshades for—2370—G. Ritchie.
Cast-iron, converting into malleable iron or steel—1100—J. B. Spence.
Cast-iron, &c., treating conglomerates of—2392—T. S. Blair.
Drills, &c.—2352—C. J. Chubb.
Eggs, apparatus for carrying or storing—2378—C. E. Brooman.
Fabrics, waterproofing—2398—C. D Watson.
Fires, extinguishing—1661—J. M. Muterse and H. G. de Valory.
Gas-burners, &c., devices for holding the chimneys of—2354—W. R. Lake.
Harvesting machines—2358—W. Manwaring.
Knobs and spindles—2396—W. Wright.
Life-preserving dress—2348—E. Rihoux.
Liquids, apparatus for preserving while on draught—2406—F. H. Needham.
Lubricators—2400—J. Tenwick.
Manometers—2388—C. W. Zenger, C. L. Strube, and L. Merlett.
Marine propellers, &c.—2340—H. Wimshurst.
Motive-power apparatus—2356—W. Tongue.
Numbering apparatus—2350—B. Hunt.
Numbers, apparatus for adding—2382—W. R. Lake.
Phosphate of ammonia, manufacturing—2408—A. M. Clark.
Pickers used in weaving—2376—J. Froggatt.
Railway rails, joints for uniting and securing the ends of—2366—A. B. Ibbotson.
Reaping and mowing machines, knives and knife bars for—2374—S. Osborn.
Safes and refrigerators—2384—R. Longdon.
Saw handles, &c., cutters used in the manufacture of—2362—H. Brandreth.
Stone, cutting and dressing—2390—J. E. Holmes.
Straw, &c., apparatus for raising and stacking—2360—G. Nickerson.
Velocipedes—2372—G. Rastall.

Inventions with Complete Specifications Filed.

Agricultural machinery, &c.—2435—E. H. C. Monckton.
Copper, extracting from its ores—2425—J. Lewis.
Gas retorts, machinery for charging—2416—W. R. Lake.
Signalling apparatus used in hand signal lamps—2421—E. J. Hill and R. Davis.
Tobacco, machinery for twisting—2438—T. Ward and W. S. Black.

Patents Sealed.

543. J. W. Reid.
544. W. R. Lake.
549. J. E. Liller.
560. J. Johnson and W. Gill.
567. W. E. Gedge.
571. W. Williams.
574. J. I. Vaughan.
577. J. T. Griffin.
596. J. Cheetham.
612. T. S. Blair.
615. R. S. Norris.
616. G. J. Snelus.
666. J. Gough.
692. C. Mather & W. Rossetter.
846. S. R. Wybrants.
929. H. Haschke.
963. B. Dobson and J. Eastham.
1054. J. Robbins and J. Allbut.
1284. H. Hall.
1466. H. Luke.
1516. C. Moseley.
1546. D. Roberge.
1929. J. Taylor, R. & J. Ingham and J. Sharples.

From Commissioners of Patents' Journal, August 24.

Patents Sealed.

592. H. J. Ledger.
610. J. H. Johnson.
617. L. G. Lysons.
704. A. Mitchell.
711. J. J. Shedlock.
712. J. J. Shedlock.
732. W. Weldon.
750. W. E. Newton.
774. W. H. Harfield.
778. E. W. and M. Slade.
780. C. Vero.
804. J. L. Norton.
969. G. Wells.
994. W. Allan.
1335. J. R. Jefferies.
1358. B. Hunt.
1443. B. J. B. Mills.
1557. Z. E. Coffin.
1790. G. Fry.
1804. W. E. Newton.
1899. W. R Lake.
1948. W. H. Perkin.
2004. W. A. Biddell and J Redgrave.
2009. P. G. Gardiner.
2048. F. Trappes.
2103. C. F. Dunderdale.

Patents on which the Stamp Duty of £50 has been paid.

2069. E. A. Cowper.
2244. C. D. Abel.
2127. J. Varley.
2155. W. Tongue.
2160. J. Livesey and J. Edwards.
2174. J. B. Fell.
2136. W. Taylor.
2139. R. A. E. Scott
2069. E. A. Cowper.
2149. J. Longbottom.
2151. J. M. Hyde.
2168. W. Welch.
2192. G. Hunter & W. F. Cooke.

Patents on which the Stamp Duty of £100 has been Paid.

2331. J. Standish and J. Gooden.
2398. J. Davis.

Journal of the Society of Arts.

FRIDAY, SEPTEMBER 3, 1869.

Announcements by the Council.

Improved Cabs.

The Council of the Society of Arts offer the following medals for improved hackney carriages specially suited to the metropolis :—

The Society's Gold Medal for the best and most convenient open hackney carriage for two persons.

The Society's Silver Medal for the second-best ditto.

The Society's Gold Medal for the best and most convenient closed hackney carriage for two persons.

The Society's Silver Medal for the second-best ditto.

The Society's Gold Medal for the best and most convenient hackney carriage for four persons, either open or closed, or both.

The Society's Silver Medal for the second-best ditto.

Lightness of construction, combined with adequate strength and durability, will be especially considered in making the awards.

The awards will be made after actual trials of the carriages extending over a certain period.

Communications describing the carriages must be sent to the Secretary of the Society of Arts before the 1st January, 1870, the carriages to be sent to a place hereafter to be appointed.

The Council also offer the Society's Silver Medal for the best instrument, to be affixed to a cab or other hackney carriage, for indicating the fare as between the passenger and the driver, whether by registering the distance travelled or otherwise, and which instrument shall also indicate, for the convenience of the cab-owner and of the driver, the total distance travelled during the day and the total amount earned. The instruments competing, with full descriptions of their construction, to be sent to the Society's House before the 1st January, 1870.

Competitors may, at their option, sign their communications, or may forward with them sealed letters containing the name and address of the writer.

The Council reserve to themselves the right of withholding all or any of the medals, in case none of the carriages or instruments possess, in their opinion, sufficient merit.

In the trials of the several carriages, the small amount of vibration and noise will be duly considered by the judges.

Subscriptions.

The Midsummer subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

PROGRAMME OF EXAMINATIONS FOR 1870.

The Council have decided to remove from the Programme those subjects in which the Science and Art Department holds examinations, which, it appears, are now largely taken advantage of by the same class of persons (and very often by the same individuals) as those who sit at the Society's examinations. The following subjects, therefore, do not appear in the programme for 1870 :—

Algebra.	Navigation, &c.	Light and Heat.	Animal Physiology.
Geometry.	Principles of Mechanics.	Chemistry.	Free-hand Drawing.
Trigonometry.	Practical Mechanics.	Mining and Metallurgy.	Practical Geometry.
Conic Sections.	Magnetism and Electricity.	Botany.	Mechanical Drawing.

PRELIMINARY NOTICE.

I. These Examinations have been established for the benefit of the members and students of Institutions in Union with the Society of Arts, who are commonly mechanics, artisans, soldiers, labourers, clerks, tradesmen and farmers in a small way of business, apprentices, sons and daughters of tradesmen and farmers, assistants in shops, and others of various occupations. To all such members and students in the Institutions, and to other persons of the like condition, male and female, the Examinations, certificates, and prizes, described in this programme, are open on the general conditions stated herein. Persons, however, who are, or have been, professional teachers or pupil-teachers; persons who either are enjoying or have enjoyed a liberal education, or who occupy a higher position in society than those above described, may obtain certificates, but cannot compete for the prizes, of which particulars are given on pages 798 *et seq.*

II. The certificates are not competed for. They are awarded as records of positive, not comparative, attainment. The prizes are competed for.

III. For the conditions on which persons of a higher grade in society may be examined and receive certificates, but not compete for prizes, see paragraph 4 (*D*).

IV. The Candidates for Examination have not to go to a distance from their homes. The Examinations are held in all places in the United Kingdom where a Local Educational Board connected with the Society of Arts is willing to make the requisite arrangements.

V. For a list of the Local Boards already formed, see page 800.

VI. For instructions as to the formation of Local Boards and their duties, see page 793.

The EXAMINATIONS are—

(1.) The Previous Examination by District Unions and Local Boards for ascertaining the fitness of Candidates to present themselves at the Final Examination.

(2.) The Final Examination by the Society of Arts' Board of Examiners, under the supervision of the Local Boards.

PREVIOUS EXAMINATIONS BY DISTRICT UNIONS AND LOCAL BOARDS.

1. The object of these examinations is to "sift" the Candidates for the Final Examinations, so as to keep back (1) those who are not fairly grounded in the elements of education—spelling, writing, and arithmetic—and (2) those who are not fairly acquainted with the subject or subjects in which they desire to be examined by the Society of Arts, and are therefore unlikely to succeed in that examination. The sifting in the above-named elementary subjects may be effected at the discretion of the Local Boards; they should examine their Candidates in spelling and writing by dictating to them a passage from an English author for them to write down; in arithmetic by setting them moderately easy questions to work out in the usual manner. The best mode of sifting the Candidates in the special subjects in which they desire to be examined by the Society of Arts is for the Local Boards to examine them therein by means of printed (or written) questions and written answers; but, where a Local Board finds itself without the means of conveniently holding such an Examination in any special subject, such Board may satisfy itself in any other mode, and state simply that it has satisfied itself that the Candidate is fit to be examined by the Central Board in that subject.

2. The previous Examinations must be held sufficiently early in the year to enable the proper returns to be made, as explained in par. 6.

FINAL EXAMINATION BY THE SOCIETY OF ARTS.

3. No candidate can be admitted to the Final Examination unless duly returned by a District Union or Local Board as having passed a Previous Examination.

4. Every admitted Candidate must be at least 16 years of age.

(A.) Members of, or students of classes in, Institutions in Union with the Society of Arts, are examined .. .. Free.

(B.) Members of, or students of classes in, Small Institutions,* not in Union with the Society of Arts, but subscribing one guinea a year for admission to the Examinations alone, are examined .. .. Free.

(C.) Members of, or students of classes in, "Small Institutions"* not in Union with the Society of Arts, but connected with it through a District Union or Local Board, are examined on payment of a fee of .. .. 2s. 6d.

N.B.—It will be understood that Candidates coming under the heads *(A)*, *(B)*, or *(C)* must not be of a higher class in society than those described in par. 1. of the Preliminary Notice.

(D.) Persons of a higher class of society than those described in paragraph I. (Preliminary Notice), cannot compete for prizes, but may be examined for certificates on payment of a fee of .. .. 5s.

* Small Institutions are defined as those which have an income of less than £75 a year.

5. The Council in every case require the Local Boards to certify whether a Candidate should pay this higher fee; and it is earnestly hoped that in any instance where a Local Board has reason to believe that a Candidate is or has been a teacher, or that he or his parents occupy such a position in society or are in such easy pecuniary circumstances as to disqualify him, according to the regulations, for competing for a prize, they will at once, in case of certainty, return him as not competing for a prize, or in case of doubt, communicate with the Secretary of the Society of Arts.

6. A Copy of Form No. 2 will be forwarded to the Secretary of each Local Board, and must be filled up and returned to the Secretary of the Society of Arts before the 18th of March. The requisite number of forms No. 4 will then be forwarded, and these, when filled up, must be returned not later than the 3rd of April. Each of these forms, when returned, will be numbered at the office of the Society of Arts, and a card for each candidate, with his name and his number, will afterwards be forwarded to the Secretary of the Local Board for distribution, together with copies of the time-table.

7. The printed papers of questions in the various subjects will be afterwards forwarded to the Secretary of the Local Board; details as to the mode in which the Final Examination is to be conducted are contained in the Letter of Instructions (Form No. 6), and members of the Local Boards should make themselves thoroughly acquainted with them.

8 When the Candidates' papers have been submitted to the judgment of the Society's Examiners, certificates of three grades will be awarded, and the names of the Candidates who obtain prizes and certificates will be afterwards published in the *Journal of the Society of Arts*.

9. A Candidate who has obtained from the Society a certificate of the 1st class in any subject cannot again be examined in the same subject; but a Candidate who has obtained a certificate of the 2nd or 3rd class may, on the recommendation of the Local Board, be examined in the same subject, in a subsequent year, without again passing the Previous Examination.

10. A Candidate who, having obtained a certificate in any subject, desires to be examined in some other subject, in a subsequent year, may be "passed" by the Local Board, after an examination in that subject, without re-examination in the elementary subjects; but, in all cases, the name must be returned in the proper form (No. 4).

11. Particulars of the subjects for the Final Examination are given below.

12. The Time-table has been drawn up to meet the general convenience of the Candidates; and *no variation* of it can *possibly* be allowed, so that, in choosing the subjects in which they desire to be examined, Candidates must take notice of the arrangements of this Time-table, as they *cannot* be examined in *two* subjects which are set down for the same evening. The days and hours of Examination must be *strictly* adhered to.

13. The Examiners will reject all ill-written, ill-spelt, ill-composed, or ungrammatical papers that may be laid before them.

Time-Table for 1870.

Tuesday, 26th April, From 7 to 10 p.m.	Wednesday, 27th April, From 7 to 10 p.m.	Thursday, 28th April, From 7 to 10 p.m.	Friday, 29th April, From 7 to 10 p.m.
Arithmetic.	Book-keeping.	Metrical System.	Geography.
Logic & Mental Science.	Theory of Music.	Mensuration.	Latin.
German.	Domestic Economy.	Political Economy & Civil Government.	Spanish.
Floriculture.	English History.	French.	Fruit and Vegetable Culture.
Musical Composition. (Tonic Sol-fa.)	Italian.	English Language & Literature.	

Friday, April 29th 6 to 7 p.m.—Dictation (see page 800.)

LOCAL EDUCATIONAL BOARDS.

14. Local Boards may be formed wherever the managers of Institutions, or other persons, may be prepared to co-operate with the Society of Arts.

15. Each Local Board must consist of at least three members, and must have a Chairman and a Secretary. The district for which the Board is to act should be defined, and the composition of the Board must be such as to command the respect and confidence of the neighbourhood. No member or officer of a Local Board can be admitted to examination.

16. The duties of Local Boards may be defined as follows:—

(A.) To give publicity to the system of Examinations by the circulation of the programmes, hand-bills, &c. (copies of these will be furnished *gratis* on application), and to give encouragement and advice to those young persons who are likely to become candidates.

(B.) To hold the Previous Examinations.

(C.) To superintend the Final Examinations.

17. Local Boards make no payment to the Society, unless they exercise the power of admitting Candidates who are not members of any Institution in Union with the Society of Arts (see par. 4 *C.*); in which case a subscription of one guinea a year must be paid.

18. A detailed list of each Local Board (giving the exact address of the Secretary) should be submitted to the Council of the Society of Arts before the 1st of February, 1870, when the general list of such Boards will be published; and where a Local Board comprises so large a district that, for the convenience of the candidates, Branch Local Boards have to be formed, lists of these must also be given. All changes in the composition of the Boards must be notified to the Society of Arts.

19. N.B.—Local Boards may also usefully direct their attention to the holding of Preparatory Examinations in Elementary Subjects, either upon the system described at page 803, or upon any other system that they may prefer.

SUBJECTS FOR THE FINAL EXAMINATION IN 1870.

20. In the following paragraphs will be found brief outlines of the subjects in which Candidates may be examined, and their attention is especially drawn to this part of the Programme. In many instances the Examiner has set down certain Text-books; but, in most cases, a Candidate may exercise his own judgment as to what Text-book he uses; real knowledge, however or wherever acquired, will be accepted by the Examiners. In the following subjects, however—Political Economy including Civil Government, English History, English Language and Literature, Logic, Latin, French, German, Italian, and Spanish, the course of study is necessarily prescribed with more or less exactness.

I.—Arithmetic.

Examiner—Rev. Alexander Wilson, M.A., National Society, London.

21. Practice—Simple and Compound Proportion—Interest—Discount—Insurance—Vulgar and Decimal Fractions; with the principles of a Decimal Notation in money on the basis of a pound unit.

22. The questions framed from the preceding syllabus will consist mainly of practical problems, and the Examiner will take into account not only the correctness of the answers, but also the excellence of the methods by which they are worked out, and the clearness and neatness of the working, *which must always be shown.*

23. Text Books:—Any of the modern treatises on Arithmetic, such as Hunter's Text Book *(National Society)*, Colenso *(Longmans)*, or Barnard Smith *(Macmillan)*.

II.—Principles and Practice of the Metric System.

Examiner—W. Fletcher Barrett, Esq., Lecturer on Physical Science at the International College, &c.

24. Candidates will be required to have some knowledge of the history and philosophy of the Metric System; why the metre was selected as the basis; the places and possessions where this system is already in use; reasons for the general adoption of the Metric System. They will have to be acquainted with the manner in which the units of weight, capacity, and surface are derived from the metre; and should be able readily to convert the multiples and divisions of the fundamental units into English equivalents. Problems will be given on the application of the Metric System to the calculation of the volumes and weights of liquid or solid masses, the dimensions and specific gravity of which are stated; and also on the determination of the relative and absolute weight of any gas in any given vessel. Candidates will bear in mind that this examination presupposes a general acquaintance with decimal arithmetic.

25. Candidates may obtain much useful information on this subject by studying chapter 8 in Dr. Hofmann's "Modern Chemistry" (*Walton and Maberly*); No. 1 of "Arithmetical Exercises for Chemical Students," by Mr. Woodward, published by the Educational Trading Company, 29, Union-street, Birmingham; or consulting the publications of the International Decimal Association (*Bell and Daldy*).

III.—Book-keeping by Double Entry.

Examiners.—John Ball, Esq., of the firm of Messrs. Quilter and Ball, and Robert G. C. Hamilton, Esq., Accountant to the Board of Trade.

26. Candidates should be prepared to answer questions as to the nature and use of the different books usually kept in a merchant's office; to journalise a series of transactions from a waste book, and having posted the entries to the ledger, to balance the accounts, to prove the correctness of the postings by a trial balance, and finally to exhibit an account of profit and loss, and a balance-sheet.

27. Text Books:—Kelly's Elements of Book-keeping *(Simpkins and Co.)*. Examination-Questions in Book-keeping by Double Entry, by the Rev. J, Hunter, M.A. *(Longmans)*. Hamilton and Ball's Treatise on Book-keeping *(Clarendon Press Series)*.

IV.—Mensuration.

Examiner.—John Sykes, M.A., Assistant-Secretary to the Committee of Council on Education.

28. The calculation of the areas and circumferences of plane figures bounded by arcs of circles or right lines, and solid contents of cones, cylinders, spheres, &c. Candidates will be expected to be familiar with the different rules for measuring and estimating artificers' work, such as joiners', bricklayers', masons', and plumbers' work.

29. Text Books:—Lund's Mensuration, Part III. of his Elements of Geometry and Mensuration. Tate's Mensuration. Young's Treatise on Mensuration *(Simms and M'Intyre)*.

V.—Floriculture.

Examiner.—Thomas Moore, Esq., F.L.S., Curator of the Botanic Gardens, Chelsea, and Floral Director of the Royal Horticultural Society.

30. The Flowers of the different seasons available for Garden, Hothouse, and Greenhouse decoration: whether obtainable by natural or artificial means, and under what modes of treatment.

31. Special culture:—Ixias, Orchids, Allamandas, Heaths, Cyclamens, Carnations.

32. Practical Operations:— Potting; Planting; Pruning; Training; Watering; Propagation.

33. Flower-garden, Pleasure-ground, and Shrubbery:—Materials for Planting and their arrangement; Flowering plants and Foliage plants for summer gardens; Herbaceous plants; Rock plants; Florists' flowers. Geothermal culture, bed arrangements for. Lawns, formation and management of.

34. Influence of Cultivation on the formation and development of blossom buds. Action of Light, Heat, and Fresh Air on Plants. Flower forcing. Soils, nature and properties of. Composts for different classes of plants. Manures.

35. Acclimatization. Improvement or ennobling of races—by Selection; by Hybridization and Cross-breeding.

36. Construction and management of houses for plant culture; Atmospheric conditions; Heat; Moisture; Shade; Ventilation; Glazing. Ward's cases.

37. Text Books:—Lindley's Theory and Practice of Horticulture *(Longmans)*. McIntosh's Book of the Garden *(Blackwood and Sons)*. Thompson's Gardener's Assistant *(Blackie and Son)*. Thompson's Handy Book of the Flower Garden (*Blackwood and Sons*). Williams' Select Ferns, and Williams' Choice Stove and Greenhouse Plants (*Williams, Holloway*).

38. The Examiner, in speaking of last year's papers, says:—"The papers show an evident improvement on those of last year, but there is still reason to complain, in many cases, of bad spelling, especially as regards the names of plants."

VI.—Fruit and Vegetable Culture.

Examiner.—Robert Hogg, Esq., L.LD., F.L.S.

39. Sect. I.—Fruit-Tree Culture,—Kinds of Fruits adapted for various soils and exposures. The Propagation, Pruning, and Training of Fruit-trees. The Structure and Functions of the Organs of Trees, considered in their relation to growth and reproduction. The Forcing of Fruit-trees, and their Cultivation under glass, both in and out of pots. The Theory of Ripening, and the Principles that ought to Regulate the Preservation of Fruits after they are Ripe or their subsequent Maturation. The Packing of Fruit for transmission to great distances.

40. Sect. II.—Vegetable Culture.—The kinds and quantities of vegetable seeds and roots required for cropping gardens of given dimensions. The most approved mode of culture of the different kinds of vegetables and salads. The preparation of fermenting materials for artificial heating. The forcing of vegetables and salads.

41. Sect. III.—General Subjects.—Soils, Water, Atmospheric Air, Light and Heat, in their relation to the successful cultivation of Fruit and Vegetables. Manures and their application. The Diseases and Insects to which Fruit-trees and Vegetables are subject, and their remedies. The erection, heating, and ventilation of garden structures.

42. Text Books:—Lindley's Theory and Practice of Horticulture (*Longmans*). The Cottage Gardener's Dictionary (*Bell and Daldy*). Hogg's Fruit Manual, 3rd edition (171, *Fleet-street*). Rivers' Miniature Fruit Garden (*Longmans*). Bréhaut's Modern Peach Pruner (171, *Fleet-street*).

43. The Examiner, in his report on last year's papers, says:—"Some of the candidates would have received a much higher number of marks if they had attended more carefully to the nature of the questions. In some cases they lose sight of one-half of the question, and, consequently, lose also in the number of marks; as, for example, in the second question they are asked 'What varieties, and how many of each,' they would select to plant a quarter of an acre with. In more than one instance the reply to the latter part of the question is entirely omitted. I would therefore advise future candidates to make themselves thoroughly acquainted with the question before they begin to answer it."

VII.—Domestic Economy.

Examiner.—Edward Carleton Tufnell, Esq., one of Her Majesty's Inspectors of Schools.

44. Candidates will be expected to possess such a knowledge of the essential elements of Mechanical and Chemical Physics, Chemistry,* and Physiology, and of the general outlines of Natural History, as may enable them to describe the origin and properties of the articles, and the rationale of the processes indicated or suggested by the following heads, as well as to explain the practical rules which science suggests for the promotion of health and comfort, and for turning limited means to the best advantage:—

45. Dwellings for town or country; site, general design, details of parts, materials and processes of construction and decoration; fixtures and fittings; furniture, fabrics, and clothing; the philosophy of food based on the functions and requirements of the human frame, and on the chemical and hygienic properties of proximate constituents; unwholesome food; adulterations; preservation; condiments; culinary processes; refreshing, stimulating, and intoxicating beverages; fuel and other household stores; means for promoting a vigorous development of the frame, and for maintaining the healthy exercise of its functions; means of safety; the care of the sick; household management and accounts; best ways of investing savings and of providing against emergencies.

46. The questions will be comprehensively framed, so as to give to candidates a free scope for making evident the extent of their studies in the various departments of Domestic Economy. Sound practical notions of the most essential points throughout the whole range of subjects are desired, rather than a deep knowledge of a few of them.

47. Text Books:—Tegetmeier's Domestic Economy (*Home and Colonial School Society, Gray's Inn-road*). Healthy Dwellings, &c., a lecture by Henry Roberts, F.S.A. (*Ladies' Sanitary Association*, 8, *Pont-street, Belgrave-square.*) The Useful Arts employed in the Construction of Dwelling-houses; in the Production of Clothing and of Food (*Longmans*). Lankester's Lectures on Food, 1st and 2nd Course. Tomlinson's Warming and Ventilating (*Weale's Series*). The necessary Physical Chemical, and Physiological knowledge may be obtained from Chambers's Educational Course on the Sciences (*W. and R. Chambers*).

VIII.—Political Economy, including Civil Government.

Examiner—Jacob Waley, Esq., M.A., Emeritus Professor of Political Economy in University College, London.

48. Political Economy is the science which investigates the laws regulating the production, the distribution, and the exchange of wealth. The subject embraces questions which concern not only the wealth of nations, but also the wealth of individuals.

49. Candidates are recommended to read "Principles of Political Economy," by Mr. J. S. Mill (cheap edition). Those who have not leisure to read Mr. Mill's work may study the outlines of the subject in "A Manual of Political Economy," by Professor Fawcett; or "A Manual of Political Economy," by Professor Thorold Rogers.

50. For Civil Government, Candidates should study Creasy's "Rise and Progress of the English Constitution" (*Bentley, New Burlington-street*).

IX.—Geography.

Examiner—Wm. Hughes, Esq., F.R.G.S., Professor of Geography in King's College, London.

51. Candidates must show a sound knowledge of Elementary Geography, physical and descriptive. Such knowledge must embrace an acquaintance with at least

* The use of symbols and equivalents will be optional.

the outlines of the great natural features of the globe, the political divisions of countries, and the localities of towns and other places of importance. This knowledge will be looked for in fuller extent with regard to the British Islands, and the various portions of the British Empire, than with regard to other countries. The recent changes in the map of Europe—especially in the cases of Germany and Italy—with the altered relationships between the various German States, may also be referred to as amongst the topics that prominently demand attention on the part of the geographical student. Canada, the United States, and British India are proposed as subjects for more especial study on the part of the intending Candidates for the present year's Examinations. The Candidate will be required to sketch, from memory, a map of any one of those, or of any single European country that may be named by the examiner. Such sketches need not possess accuracy of detail, but should at least show the general direction of coast-lines, mountain-chains, or river-courses, with the localities and names of the principal towns.

52. Candidates who aim at the highest class of certificate should also be prepared to answer such questions upon Geography, in its relation to the Physical Sciences and the History of Mankind, as involve a general acquaintance with the subject of climate, the laws of Meteorology, the Distribution of Plants and Animals over the Globe, the leading outlines of Geology, the Ethnographic Division of the Human Race, and the commercial resources of different lands. This kind of knowledge is looked for, not in place of geographical knowledge of a more elementary kind, but as supplementary to it, and throughout based upon it.

53. Text Books:—Manual of Geography, by William Hughes (*Longmans*). Geography of British History, by William Hughes (*Longmans*). Guyot's Earth and Man (*Longmans*). Page's Introductory Text Book of Geology (*Blackwood*) The School Physical Atlas (*either Johnstone's, Philips's, or that published by the National Society*).

X.—English History.

Examiner.—The Rev. J. S. Brewer, M.A., Professor of Modern History in King's College, London.

54. English History and English Constitutional History.

55. Text Books:—Manual of English History, by Ross; or The Student's Hume. Creasy's English Constitution.

56. Special subject:—The Reign of Henry III. Lingard or Macintosh.

XI.—English Language and Literature.

Examiner—Rev. Samuel Clark, M.A., *Chairman of the Board of Examiners.*

57. All candidates will be required to parse correctly a passage from the first hundred lines of "Paradise Lost" (Book I.), and to answer questions on the elements of English grammar,. In parsing, they will have not merely to state the part of speech to which each word belongs, but to explains it connection with other words in the sentence. They will also be expected to write a letter or a short English essay, on a subject to be given in the paper.

58. Candidates for a first-class certificate will have, in addition to the above, to answer questions on the history of the English Language, and to explain passages from the prologue to Chaucer's "Canterbury Tales," and from Shakespeare's "Julius Cæsar."

59. Any of the elementary English grammars in common use may be studied by candidates, and due allowance will be made by the examiner for the different grammatical systems and technical terms that are adopted in them.

XII.—Logic and Mental Science.

Examiner.—J. D. Morell, Esq., LL.D., one of Her Majesty's Inspectors of Schools.

60. Logic: Candidates will be expected to answer questions on the different processes of thought, and the symbols by which they are expressed. Every candidate must be prepared to analyse examples of reasoning, and to detect fallacies.

61. Text Books: Whateley's Elements of Logic, or Morell's Handbook of Logic.

62. A Candidate for a second or third-class Certificate will be expected to prepare, in addition, any one of the following books which he may select:—Mill's system of Logic, Book III., Of Induction; Dugald Stewart's Outlines of Moral Philosophy (McCosh's Edition); Sir William Hamilton's Lectures on Metaphysics, Lectures xx to xl.; or Morell's Elements of Mental Philosophy (*Longmans*).

63. A Candidate for a first-class Certificate will be expected to prepare any two of these works which he may select.

XIII.—Latin.

Examiner.—Rev. F. Temple, D.D., Head Master of Rugby School.

64. Cicero, De Officiis, Lib. iii. Virgil Œneid, ix.

XIV.—French.

Examiner.—Alphonse Mariette, Esq., M.A., Professor of French, King's College, London.

65. The Examination Paper will be divided into three parts.

66. The first will comprise grammatical questions and an extract from a modern French writer, to be translated into English. Candidates merely aiming at a 3rd class certificate should confine themselves to this first part.

67. The second part will comprise, together with a few grammatical questions, an English extract to be translated into French, and a list of idiomatic expressions to be rendered from French into English, or *vice versa.* This should be done satisfactorily by the Candidate who aims at a 2nd class certificate.

68. In the third part, Candidates for a 1st class certificate will have to translate an English extract into French (to which great importance is attached), and to answer properly (*in French*) some *elementary* questions on the two following subjects:—

1. French literature during the sixteenth century.
2. The History of France, from the death of Louis IX. to that of Louis XII. (1270—1515).

69. Books recommended:—Mariette: Half-Hours of French translation (*Williams and Norgate*, London and Edinburgh). Nisard: Histoire de la Littérature Française, vol. I. (*Williams and Norgate*); or Demogrot, Histoire de la Littérature Française (*Williams and Norgate*). Duruy: Histoire de France, vol. I. (*Williams and Norgate*).

XV.—German.

Examiner.—Dr. Buchheim, Professor of German in King's College, London; Examiner in German to the University of London, &c.

70. The German examination paper will consist of three parts.

71. The *first* will consist of passages from Schiller's "*Neffe als Onkel,*" and of questions on German accidence. This part will serve as a test for a third-class certificate.

72. The *second* part will consist of passages from Goethe's "Egmont," of easy English sentences to be rendered into German, and of some advanced grammatical questions. Candidates for a second-class certificate will be expected to work this portion of the paper, together with the grammatical questions in part one.

73. The *third* part will consist of (*a*) passages from Schiller's "Wallenstein's Tod;" (*b*) an English extract to be rendered into German; (*c*) questions on German

syntax; (*d*) historical questions on the period from the peace of Luneville, 1801, to the establishment of the German Confederation, in 1815; (*e*) literary questions on the above-mentioned period, more particularly on the "Freiheits und Vaterlandsdichter" and the "Schwäbische Dichterschule." Candidates for a first-class Certificate are expected to work part three.

74. Candidates for a first-class Certificate are recommended to read some of the works of the poets alluded to, and not to content themselves with the mere biographical outlines given by the manuals.

75. Books and editions recommended:—Buchheim's "German Prose Composition" (*Bell and Daldy*). "Egmont," Buchheim's edition, (*Clarendon Press Series*). Kohlrausch's "Kurze Darstellung der Deutschen Geschichte." Weber's "Geschichte der Deutschen Literatur." Schiller's "Wallenstein," Buchheim's edition (*Bell and Daldy*).

76. The Examiner, in his report on last year's papers, says:—"The principal defects I have to point out in general are these:—1. Insufficient practice in the conjugation of verbs, both regular and irregular. 2. Imperfect knowledge of the rules referring to the construction of sentences. 3. Want of a sufficient German vocabulary, which defect showed itself particularly in the translations from English into German. The deficiency just pointed out arises, in my opinion, from the circumstance that the candidates, though well prepared in the subjects which have been set, do not seem to have read much German besides."

XVI.—Italian.

Examiner.—Professor Pistrucci, King's College, London.

77. Candidates for a first-class certificate will be required—(1st) To translate into English passages from some of the principal Italian poets and historians, and to answer the grammatical questions which may be added to those passages. (2nd) They will also have to translate into Italian an extract from some English author; (3rd) and turn a few familiar idioms into their equivalents, from Italian into English, and *vice versa*.

78. For second and third-class certificates candidates will translate into English some selection from Metastasio's *drammi*, and Foscolo's or Manzoni's prose works, and answer a certain number of grammatical questions.

79. The Examiner, in his remarks on last year's work, inculcates a more diligent application to Italian grammar, of too deficient a knowledge of which he has again met many instances; this remark applies more especially to the candidates for second-class certificates.

XVII.—Spanish.

Examiner.—B. B. Aguirre, Esq., Lecturer on Spanish in King's College, London.

80. Candidates for a first-class certificate will have to translate an English passage into Spanish, to render into English or French several idiomatic phrases, and to write in Spanish a short essay.

81. Candidates for a second-class certificate will have to translate the half of the passage for the first-class, and to render into English or French some historic *chistes* and two letters of business.

82. Candidates for a third-class certificate will have to translate from Spanish into English, and to answer several grammatical questions.

83. Books recommended: Spanish Gil Blas, Nueva Floresta Española, por Dn. Ignacio Castellar; Trozos escogidos de los mejores hablistas españoles, por Dn. Carlos de Ochoa; Don Quixote, translated into English by Charles Jarvis.

XVIII.—Theory of Music.

Examiner.—John Hullah, Esq.

84. Notation, the modern modes, intervals, time signatures, the stave, transposition, modulation, terms and characters in common use.

85. The Elements of Harmony.

86. Musical History and Biography.

87. Arrangements must be made, in the Previous Examinations by the Local Boards, to test Candidates, by oral examination, in their knowledge or appreciation of the *sound* of musical successions and combinations. A form of the test to be used for this purpose by the Local Board at the Previous Examination, will be sent by the Council to such Local Boards as may *apply for it* in due time before the Previous Examination.

XIX.—Elementary Musical Composition (Tonic Sol-fa System).

Examiner—G. A. Macfarren, Esq.

88. This Examination is open to all, on equal terms, on whatever system they may have studied.

89. The examination papers will announce the exercises, both in the Tonic Sol-fa Nomenclature and in that which is most commonly understood by musicians who have studied upon other systems. The exercises may be written either in the Common Notation or in the Tonic Sol-fa Notation.

90. Tonic Sol-faists are admitted to this Examination on showing their Certificate of Honourable Mention in Elementary Composition, and their Member's Certificate of "General Musical Culture," when giving their names to the Secretary of the Local Board. These Certificates imply more general knowledge than is absolutely necessary for the Examination; therefore Tonic Sol-faists, as well as others, *whatever the system on which they have studied*, may also be admitted by passing the previous test described below.

91. The Candidates will submit themselves to this test at the Previous Examination by the Local Board. The test will consist of the following requirements:—

92. (*a*) *Memory and Notation.*—The candidate to bring copies of the melody of twelve psalm tunes, or other tunes of equal length, and write down correctly from memory any one of these the examiner calls for. His writing from memory, with the copy he brought, to be sent to the Secretary of the Society of Arts. This may be done in either notation.

93. (*b*) *Time.*—The candidate to sing in correct time four bars (or measures) given in the examination paper. They will be selected from Handel's "Messiah." This may be done from either notation. The test will be printed in both.

94. (*c*) *Sight Singing.*—The candidate to pitch the key-tone and sol-fa at first sight, and afterwards sing to the open syllable "lah" a tune given in the examination paper. He may, if he please, omit the sol-faing. The tune will contain transition or modulation of the second remove, that is, adding or subtracting two sharps or two flats in the signature, and of the third remove, that is, adding or subtracting three sharps or three flats in the signature; but it will not contain any difficulty of time. The test will be printed in both notations.

95. (*d*) *Ear Exercise.*—The candidate to copy by hearing it, the Air and Bass of a simple single chant which will be given in the examination paper. Although only Air and Bass are to be copied, the four parts are to be sung or played together, the key-tone being first sounded. The chant should be played or sung at the rate at which the pulse beats, or M. 60, the reciting tone being reckoned as two beats. This may be done three times. There should be a pause of a quarter of a minute between the two parts of the chant, and of half a minute between the repetition of the chant.

96. (*e*) *Harmony Analysis.*—The candidate to write the Tonic Sol-fa analysis, or figure the bass of a psalm tune included in the examination paper, printed in both notations.

97. (*f*) *Knowledge of Cadence.*—The candidate to write from memory examples of any cadence of the major or minor mode which is in common use. This may be done in either notation.

98. (*g*) *Knowledge of Harmony.*—The candidate to harmonise, for three or for four voices, a psalm tune given in the examination paper. This may be done in either notation.

99. (*h*) *Invention.*—The candidate will write a brief two-part fugue on a theme to be given in the examination paper. This may be done in either notation. The members of the Local Board will report to the Secretary of the Society of Arts on Exercises 2 and 3, giving one mark for "fairly done," 2 for "well done," and 3 for "excellently done." The other exercises will be sent to the Secretary of the Society of Arts for examination by the Society's Examiner.

100. Special "previous examination" papers will be supplied to the Local Boards *applying for them* to the Secretary of the Society of Arts before the 10th of February. The answers will be sealed and sent to London, *with numbers attached*, in the same way as those for the principal Examinations; and the Local Boards will, in the course of a few days, receive a list of the papers which will qualify their writers for further examination.

101. The Examiner, in reporting on last year's work, says:—"I find, on the whole, evidence of much musical fluency, but of little real talent; a few candidates, however, indicate decided exceptions from this last remark. I find that the first exercise seems to have been more perplexing than the other two; in this the metre was prescribed, but no verses given, and certain modulations and cadences were required. Hence it is shown that there is greater difficulty in writing within defined limits, than when the invention is left free. I find that the compositions set to the prose verse from the Psalms make more pretension than those set to metrical verses, but are, for the most part, less meritorious as they are more ambitious. I think that the signs of musical aptitude which the examination affords are in a high degree satisfactory, and that they are still more promising of progress. I have counted as faults any errors in writing the notes, considering that all who practise music must begin by understanding either its usual or its exceptional characters. I have made a small deduction also for not writing the words under the notes, because this is a very unmusicianly method, to say nothing of the extra trouble it has given in judging the accentuation, which, indeed, has not always been possible."

PROPOSED VIVA-VOCE EXAMINATION IN MODERN LANGUAGES.

102. The following memorandum, kindly furnished by Mr. Hyde Clarke, a member of the Council, is issued for the information of any Local Board who may have facilities for carrying out such examinations as those described therein:—

103. In complying with the request of my colleagues, that I should give a note for the consideration of Local Boards, on suggestions for extending the utility of our examinations in modern languages, it may be desirable that the matter should be explained a little more fully.

104. The ground for my proposition is the observation that, from the want of knowledge of local languages, Englishmen are supplanted by Germans in many countries, particularly of late years, and, as a consequence, English goods are being supplanted by German imitations, with forged English trade-marks and labels.

105. Speaking generally, an Englishman will be found abroad in the position of a merchant, and a Frenchman in that of a petty shopkeeper, dealing in "articles de Paris." In a Spanish country, the English merchant will speak and write the language, but in other countries he neglects the local language, and employs interpreters, brokers, and native clerks. These latter always get rich, and perhaps the merchant may; but, in the end, the merchant or his children become bankrupt, and the native followers carry on the business. A man who does not carry on his own affairs direct with the native producer, in the language of the latter, is of course exposed to the competition of the native or foreigner who can. Hence we get the result of English merchants not increasing proportionately in number, and, in many cases, the trade in English goods passing into the hands of other houses. The cause often assigned for this is, the unscrupulous trading of natives, but the true interpretation is, far oftener, ignorance by Englishmen of local languages.

106. The employment for English clerks is narrowed, as they are only useful for keeping the English correspondence, or as ledger clerks.

107. The young German at once begins to learn the local languages, colloquially and by grammar. He is able to travel about and acquire a better knowledge of the country and the natives than the Englishman. He is more useful as a clerk than the latter, and he can set up for himself as a broker, small store-keeper, or in a petty commission agency, laying the foundation for a large business, as he can get credit in his store more easily for German goods than English goods. Although the natives want English goods, he who speaks the language supplies them with imitations made to suit the markets. The hardware trades of Birmingham, Sheffield, &c., particularly suffer by this, not less than every other branch of manufacture.

108. The question arises whether the German has any natural superiority over the Englishman in learning or speaking languages, and the answer must be, certainly not. The Germans, although having many admirable linguists, have generally a disagreeable pronunciation. The English in all times have been good linguists, and in the present day it is only necessary to refer to our people in India. To go back, to show there is nothing inherently incompatible in our organisation, it will suffice to call to mind the ladies of the time of Henry VIII. and Elizabeth, who could speak English, Flemish, Latin, French, Spanish, and Italian.

109. These accomplishments were then more widely diffused in society, but if they are not now found, there is no effective reason why they should not now be acquired. The cause is, that we have gone back educationally. Classical instruction, for two centuries, suppressed modern languages, and the system of teaching the grammar of dead languages has crippled the teaching of spoken languages. Ignorance has nursed prejudice, until at length, instead of a man's attainments as a linguist bringing him reputation, they may be employed by persons professing to be scholars to discredit his intellectual capacity. Somebody lately wrote an article in a popular magazine to show that a man who went beyond reading the classics, and learned a living language well, must sacrifice his individuality and his originality.

110. The whole result is, that while England has rendered the foremost service in the advancement of comparative philology and linguistics, she has no credit for it, and that we lose by neglect what the great masters of the past generation have done, and those of the present are doing, for our national reputation.

111. Popular ignorance consequently stands in our way. We have no public school of linguistics even in the metropolis, and the wants of the public service and the commercial community are unprovided for. With a great expenditure for acquiring modern languages, very little practical benefit is obtained.

112. A language may be acquired for various purposes, and in various ways, to speak it enough for travelling, to read a newspaper or price current, or to write it classically. The system adapted for teaching is in reality chiefly directed to the latter end, and if sufficient time and attention be given, will produce pupils who can write a good French or German essay, as well as a fair Latin prose composition. If, however, a person has not sufficient time to reach this goal, he will have learned nothing that he can turn practically to account, although he may have learned the French grammar as thoroughly as the Latin.

113. The truth is, the process for teaching composition

in a language is not the same as that for teaching speaking or reading, nor do men of science, who become accomplished as linguists, go the longer way to work.

114. What we want for general and practical commercial purposes is, to have people who can go to India, Spanish America, the Brazils, the Levant, and Russia, speaking the languages enough to work their way about, and to read a paragraph in a newspaper, an account, or an hotel bill, and a common commercial letter so as to get at its general meaning, the said letter being perhaps written in *patois*, and not in the high style.

115. To carry this out is no new experiment, for the necessities of our government in India have long since provided us with an example. If the civilian was highly trained at Haileybury in the grammar of Sanskrit, Persian, and Arabic, each regiment wanted its officers who could make their way in the language of their troops, who, whatever their proficiency might be in the written character, could, on the examination day, carry on a conversation on matters of duty with a private sentry or soldier taken by chance from the ranks, and read up such common documents as are of ordinary use. These "vernacular" examinations are the basis of the connection between our European officers and the population. They do not necessarily produce great scholars, but they prepare the way for many to become such.

116. The Society of Arts has already taken up the subject of examinations in modern languages, and the number of candidates in French and German attests the good it is doing in this respect.

117. The working of papers does not, however, meet the lower wants. It does not encourage the working engineer, who picks up sufficient French to take employment abroad, and who has not the time to study the detailed structure of the French language. Eight students represent the demands of our relations with Spain, Central and South America, Cuba, and the Phillippines. This cannot be enough. It would not even supply us with waiters for the West India Mail steamers.

118. What we have to aim at is, to give the working-classes and the poorer middle-classes better chances of employment, in all occupations where the practical knowledge of a foreign language can be of use. The chief of such languages are—

Netherlandish or Dutch.	Turkish.
German or High Dutch.	Arabic.
Russian.	Hindostanee.
French.	Bengalee and Indian Vernaculars.
Spanish.	Chinese.
Portuguese.	Japanese.
Italian.	

119. There are numbers of our working men, having already some practice in these languages, who might be encouraged to persevere to acquire more, and to perfect themselves in what they have attained.

120. The examinations can only be carried on in certain centres, where there are learners and examiners, thus:—

London	For most of the languages enumerated.
Dublin	
Southampton ..	For French, Spanish, and Portuguese.
Plymouth	
Cork	
Liverpool	For Spanish, Portuguese, German, and French.
Manchester ..	For German and French.
Leeds	
Sheffield	
Bradford.....	
Birmingham ..	
Hull	For the Northern Languages.
Newcastle	
Aberdeen	

121. The examinations should be—

(*a*) Conversation, divided into grades of proficiency.
(*b*) Translations from newspapers and commercial documents.

122. The Examining Boards should consist of—

(*a*) Members of Local Boards of the Society of Arts.
(*b*) Consul, merchant, or native of the nation speaking the language of examination.
(*c*) A teacher of the language.
(*d*) Englishmen conversant with the language.

123. No prizes should be given, but only certificates of qualification. These would be given by the Society of Arts, on the recommendation of the Local Boards.

124. A candidate might pass in conversation alone. The certificate might express sufficiency for the business of an engineer, waiter, &c., for it is of more value to possess the technical terms of some trade than to acquire greater general proficiency.

125. It is to be expected that the consuls and natives of many states will take an interest in the preservation of their own language. Surely, at Liverpool, there must be consuls and natives from the many countries of Old Spain and the American world who can promote such a purpose, and, in the result, give a real encouragement to the liberal study of Spanish literature.

126. For the purposes of these examinations it may be further useful to divide the candidates into

(*a*) Working-class, with a lower standard.
(*b*) General.

127. The Council, having considered the above memorandum, are willing, in places where Special Boards, as above described, can be formed, to grant Certificates on their recommendation.

128. The Examinations may be held at any time during the month of April that the Special Board may fix, their report being sent in to the Secretary of the Society of Arts not later than the 30th of April.

VOCAL AND INSTRUMENTAL MUSIC.

129. The Council suggest that, where arrangements can be made, Local Boards should organise musical performances, both vocal and instrumental, and should be prepared to return on a form, to be hereafter supplied, certain particulars respecting those candidates who may display remarkable aptitude for further instruction, and may desire to obtain it.

PRIZES FOR 1870.

THE PRINCE CONSORT'S PRIZE.

130. His Royal Highness the late President of the Society was pleased to offer annually to the Candidate who, obtaining a Certificate of the First-class in the current year, in any of the subjects (this year nineteen in number), shall have obtained in that year and the three years

immediately preceding it, the greatest number of such Certificates,* a Prize of Twenty-five Guineas, and this Prize Her Majesty the Queen has graciously intimated her intention to continue. This Prize cannot be taken more than once by the same Candidate. It will be accompanied by a Certificate from the Society of Arts, setting forth the special character of the Prize, and the various Certificates for which it was granted.

GENERAL PRIZES.

**** *None of these Prizes will be awarded to a Candidate who does not obtain a Certificate of the First-class in the subject.*

1. Arithmetic (F)	First Prize	£5
	Second Prize	3
2.†The Metrical System (F)	First Prize	5
	Second Prize	3
3. Book-keeping (F)	First Prize	5
	Second Prize	3
4. Mensuration	First Prize	5
	Second Prize	3
5.‡Floriculture	First Prize	5
	Second Prize	3
6.‡Fruit and Vegetable Culture	First Prize	5
	Second Prize	3
7.‡Domestic Economy (F)	First Prize	5
	Second Prize	3
8.‡Political Economy and Civil Government	First Prize	5
	Second Prize	3
9.‡Geography (F)	First Prize	5
	Second Prize	3
10. English History (F)	First Prize	5
	Second Prize	3
11. English Language and Literature (F)	First Prize	£5
	Second Prize	3
12. Logic and Mental Science	First Prize	5
	Second Prize	3
13. Latin	First Prize	5
	Second Prize	3
14. French (F)	First Prize	5
	Second Prize	3
15. German (F)	First Prize	5
	Second Prize	3
16. Italian (F)	First Prize	5
	Second Prize	3
17. Spanish (F)	First Prize	5
	Second Prize	3
18. Theory of Music (F)	First Prize	5
	Second Prize	3
19.§Elementary Musical Composition (Tonic Sol-fa System) (F)	First Prize	5
	Second Prize	3

SPECIAL PRIZES.

Council Prize to Females.

131. The Council of the Society offers to the female candidate who, obtaining a certificate of the first-class in the current year, in any of the subjects (this year nineteen in number), shall have obtained, in that year and the two years immediately preceding it, the greatest number of such certificates,|| a Prize of Ten Guineas. This Prize cannot be taken more than once by the same candidate. It will be accompanied by a certificate from the Society of Arts, setting forth the special character of the Prize, and the various certificates for which it was granted.

132. The whole of the General Prizes are offered to female candidates on the same terms as to male candidates; and, in each of the subjects marked F, an additional prize of £2 is offered to the *female* candidate who gets the highest number of marks with a certificate of the first-class. This special prize may be taken with, or apart from, any other prize.

133. In addition to the First and Second Prizes in Political Economy offered by the Society of Arts, Mrs. Harry Chester offers a Third Prize of £2, and three prizes of books, value £1 each, to candidates taking First-class Certificates in that subject.

134. In addition to the First and Second Prizes in Domestic Economy offered by the Society of Arts, Mr. Thomas Twining, a Vice-President of the Society, offers a Third Prize of £2, and three prizes of books, value £1 each, to candidates taking First-class Certificates in that subject.

135. In addition to the Prizes in Geography, offered by the Society of Arts to candidates taking Certificates of the First-class, the President and Council of the Royal Geographical Society offer an additional prize of £5 to the candidate who, taking any grade of certificate in Geography, obtains the highest number of marks in that subject.

* In case of equality in the number of such Certificates, the Council, in making the award, will take into consideration the ability shown by such Candidates in the examinations generally. First-class Certificates, obtained in the three preceding years, in any of the subjects now removed from the Programme (see page 791) will be counted in making the award.

† Earl Fortescue, President of the British Branch of the International Decimal Association, contributes £5 towards these Prizes.

‡ For Extra Prizes in these subjects see paragraphs 133, 134, 135, 136, 137.

§ These Prizes are offered by the Tonic Sol-fa Association.

|| In case of equality in the number of such Certificates, the Council, in making the award, will take into consideration the ability shown by such Candidates in the examinations generally. First-class Certificates, obtained in the two preceding years, in any of the subjects now removed from the Programme (see page 791) will be counted in making the award.

136. In addition to the Prizes in Floriculture, and in Fruit and Vegetable Culture, offered by the Society of Arts to Candidates taking Certificates of the First-class, the Council of the Royal Horticultural Society offers two additional prizes of £5 and £3 respectively to the two Candidates who, taking any grade of Certificate in Floriculture, obtain the highest number of marks in that subject; also two additional prizes of £5 and £3 respectively to the two Candidates who, taking any grade of Certificate in Fruit and Vegetable Culture, obtain the highest number of marks in that subject. These Prizes are offered only to Candidates who are *bonâ fide* professional gardeners.

137. In addition to the Prizes in Floriculture, and in Fruit and Vegetable Culture, offered by the Society of Arts to Candidates taking Certificates of the First-class, the Proprietors of the *Gardener's Chronicle* offer three additional prizes of £3, £2, and £1 respectively, to the three Candidates, being *bonâ fide* professional gardeners, who, obtaining a Second-class Certificate, at least, in Floriculture or Fruit and Vegetable Culture, shall obtain the highest number of marks in one of these subjects, and also a Second-class Certificate, at least, in Book-keeping or Mensuration.

ADDITIONAL PRIZES.

Prizes for Writing from Dictation.

138. The Council offers three prizes, of £3, £2, and £1 respectively, to the three Candidates who shall send in the best exercises, written from dictation.

139. A passage from an English author, set by the Rev. Samuel Clark (Examiner in the English Language) will be sent under seal to such Local Boards as may apply for it. On the evening fixed (Friday, the 29th April) a member of the Local Board should first read the passage aloud to the Candidates at the ordinary speed. He should then read it slowly, so that it may be written out by them, and they should afterwards have a quarter of an hour for correcting the punctuation, in which, of course, they should receive no assistance.

140. The exercises, when completed, should be submitted to the judgment of two members of the Local Board, to whose discretion it should be left to forward to the Society of Arts such exercises as, in their judgment, are so excellent as to have a fair chance of obtaining a prize.

141. In judging of the merits of the exercises, the handwriting, spelling, and punctuation, will all be considered by the Examiner. No certificates will be given.

Prizes for Writing.

142. The Council offers four Prizes, of £5, £3, £2, and £1 respectively, for the four best specimens of handwriting, as shown in any of the Papers worked in any subject, the letters being well-formed, and the writing being distinct and legible.

143. Mr. Henry Cole, C.B., a Vice-President of the Society, offers three Prizes of £3, £2, and £1 respectively, for the best writing and manuscript-printing on a foolscap page, as follows:—

One line of Italic writing, of one-inch letters.
One line of Roman capitals, of one-inch letters.
One line of Italic writing, of half-inch letters.
One line of Roman capitals, of half-inch letters.
One line of Italic writing, of quarter-inch letters.
One line of Roman capitals, of quarter-inch letters.
One line of Italic writing, of one-eighth inch letters.
One line of Roman capitals, of one-eighth inch letters.

144. The Roman capitals should be formed of single (not double) lines.

145. The writing should be done in presence of some members of the Local Board, on a day in April, to be fixed by them, and only those specimens that are of sufficient merit to have a chance of obtaining a prize should be sent to the Secretary of the Society of Arts. These should be forwarded by the 30th April. No certificates will be given.

LOCAL EDUCATIONAL BOARDS.

The following is a List of the places at which Local Boards have already been formed, with the names of the Secretaries, from whom intending Candidates and others may obtain information relative to the Examinations:—

Local Boards.	Secretaries.
Aberdeen	Mr. J. Sinclair, Mechanics' Institution, Aberdeen.
Accrington Mechanics' Institute	Mr. John Barlow, Croft-house, Blackburn-road.
Alderley Edge Educational Institute	Mr. Alfred Wilkins.
Alnwick	Mr. Adam Robertson, jun., 12, Narrowgate, Alnwick.
Alton	Mr. John Bryant, Post-office, Alton.
Ashford	Mr. Thos. Nesbit, 11, Doverplace, Ashford.
Ashton-under-Lyne	Mr. George Hay, Bank-top Academy.
Bacup Mechanics' Inst.	Mr. James Pilling, Goosehill.
Banbridge (Ireland)	Mr. Gilbert McKenna, Dromore-street.
Banbury	Mr. J. H. Beale, Mechanics' Institute, Banbury.

Belfast (Acad.) Science School	Mr. James McNeil.
Belfast Literary Institute	Rev. W. C. McCullagh.
Belfast, (Union-place Science Schools	Mr. John Anderson, 11, Carnmoney-street, Belfast.
Bewdley and Wribbenhall	Rev. J. Fortescue.
Birmingham and Midland	Mr. Edwin Smith, Birmingham and Midland Institute, Birmingham.
Bishop's Stortford	Mr. F. W. Nash, B.A., Birchanger, Bishop's Stortford.
Blackburn Science School	Mr. Giles Parkinson, London-terrace, Blackburn.
Blackley Science Class	Mr. Schofield, Ashenhurst, Blackley, near Manchester.
Blandford	Mr. J. B. Green.
Bodmin	Mr. Josiah Phillipps, Little Berry-cottage, Bodmin.
Bollington Useful Knowledge Society	Mr. T. Bradley.
Bolton Mechanics' Inst.	Mr. Isaac Barrow, 16, Commission-street, Bolton.
Bolton Science and Art School	Rev. Jos. Lowe, M.A.
Bradford Mech. Institute	Mr. Jos. Holbrey.
Brighton	Mr. Barclay Phillips, 75, Lansdowne-pl., Brighton.
Bristol Young Men's Christian Association	Mr. W. Henry Williams, 4, St. James's-square, Bristol.
Bromley (Kent) Lit. Inst.	Mr. W. W. Baxter.
Bromsgrove	Mr. W. Holyoake
Burnley Church Literary Institute	Mr. Wm. Austin Lee.
Burnley (East Lancashire Union Institutions)	Mr. J. Sutherland.
Burnley Mechanics' Inst.	Mr. J. Sutherland.
Burrage-rd. (Plumstead) Classes	Mr. J. Hammond.
Bury Athenæum (Lancashire)	Mr. T. W. Probert.
Bury St. Edmund's	Mr. J. Jackson, Head Master of the Guildhall Schoool.
Canterbury	Rev. Edgar H. Cross.
Carlisle Mechanics' Inst.	Mr. J. Saunders, Mechanics' Inst., Fisher-st., Carlisle.
Chapeltown (near Bolton) Institute	Mr. Thos. Haworth, Victoria Mills, Chapeltown, nr. Bolton
Chatham (St. Mary's Sci. School	Mr. T. Wilkins.
Chelmsford	Mr. W. Cutts.
Cheltenham (Whitworth School of Science)	W. S. Davis, LL.D.
Cheltenham Working Men's Club	Mr. W. Dugdale.
Chorley Mechanics' Inst.	Messrs. T. Rigby and F. Sargeant.
Christchurch	(*Vacant.*)
Clitheroe Mechanics' Inst.	Mr. John Gornall, Moor-lane, Clitheroe.
Colne Mech. Institution	Mr. J. Phillips.
Compstall Literary Inst. (near) Stockport	Mr. John Fernley.
Cork (Young Men's Society)	Mr. James J. Ryan, 21, Richmond-hill, Cork.
Crawshawbooth, near Rawtenstall	Dr. Kerr, Crawshawbooth, Rawtenstall, near Manchester.
Crewe	Mr. J. E. Cubbon, Mechanics' Institute, Crewe.
Darwen Mechanics' Inst.	Mr. E. Neville, 6, Green-street East.
Dean Mills Even. Class, Halliwell, Bolton	Mr. W. Taylor, Dean Mills.
Denton and Haughton Mechanics' Inst., Denton, Manchester	Mr. John Collins, Hyde-road, Denton.
Deptford	Mr. T. Earland, 2, Wellington-grove, Greenwich-road, E.C.
Derby	Mr. H. M. Holmes, London-road, Derby.
Devonport	Messrs. W. Mogg and S. Chapple, Mechanics' Inst.
Droitwich	Mr. Jeacock.
Droylsden Educational Institute	Mr. Jonathan Hadfield, Droylsden.
Dudley Mechanics' Inst.	Mr. Thomas Brown.
Earlstown	Mr. Charles Shaw, Earlstown, Newton-le-Willows.
Ebley	Mr. H. Webb.
Eccleshill (Leeds)	Mr. Isaac Bakes.
Edinburgh Watt Institution and School of Arts	(*Vacant.*)
Evesham	Rev. M. Wood.
Failsworth Mech. Inst., near Manchester	Mr. John Brierly, Moston, Failsworth.
Farnham and Aldershot	George Dewdney, B.A.
Faversham, The Institute	Mr. Samuel G. Johnston, Town Clerk, Faversham.
Freetown Inst., Glossop	Mr. William Swire, High-st., Glossop.
Galgate	Mr. Wm. Parkinson, Railway-cottage, Galgate, Lancaster.
Garforth Working Men's Club	Mr. A. Woodhead.
Gilford (Ireland)	Dr. Henry M'Bride, Gilford, co. Down.
Gisborough	Messrs. Wm. K. Cockerline and J. Saunderson.
Glasgow Athenæum	Mr. Gavin Chapman, Ruby-street, Bridgeton, Glasgow.
Glasgow Institution	Mr. John Craig, F.E.I.S., Glasgow Institution, 280, George-street.
Glasgow Mechanics' Inst.	Mr. John Dyer, 38, Bath-street, Glasgow.
Glasgow Popular Evng. Classes, Andersonian University	Mr. G. Martin, 11, Great-Western-road.
Glasgow Tonic-Sol-Fa Choral Society	Mr. Colin Brown.
Glodwick Mut. Improvement Society, Oldham	Mr. Jeremiah Green.
Gloucester	Dr. S. Brady, 4, Norfolk-terrace.
Greenwich (St. Mary's National Schools	Mr. William Howarth.
Halifax Mechanics' Inst.	Mr. James Watson.
Halifax Working Men's College	Mr. G. Gibbs, Haley-hill, Halifax
Hanley Castle	Rev. J. B. Cox.
Hansworth Working Men's Club	Mr. S. Richardson, 59, Barker-st., Lozells, Birmingham
Hartlepool West	Messrs. E. Cory and J. P. Fea.
Haslingden	Dr. John Binns.
Hastings and St. Leonards	Mr. J. Charles Savery, 12, York-buildings, Hastings.
Hatherlow and Bredbury	Mr. T. Greenwood.
Haughton Dale	Mr. J. T. Fallows, Haughton Dale Works, Denton, Manchester.
Hertford	Mr. John Lyon Foster.
Heywood	Mr. George Fairbrother, Heywood Mechanics' Inst.
Holbeck (Leeds)	Messrs. John Nichols, jun., and G. Higgs.
Holywell Green Mech. Inst. (near Halifax)	Mr. Benjamin Morton.
Huddersfield Mechanics' Institution	Mr. Joseph Bate, Mechanics' Inst., Huddersfield.

Hull	Mr. P. Blackmore, 2, Charlotte-street.
Hulme Working Men's Institute	Mr. George A. Letch.
Hunslet School of Art	Mr. John C. Nicholson, Glasshouse-street.
Hyde Mechanics' Inst., near Manchester	Mr. James Bradley.
Ipswich	Messrs. Edwin Barrett and Herbert Wright, Mech. Institution.
Kendal	Mr. C. L. Braithwaite, jun.
Keswick	Mr. Henry Irwin Jenkinson.
Kidderminster Church of England Mutual Improvement Society	Rev. W. Packe.
Kidderminster Mech. Institute	Mr. H. Fawcett.
King's Lynn	Mr. T. Burton, Chester-street, Lynn.
Kinver	Rev. W. H. Bolton, Kinver, near Stourbridge.
Lancashire and Cheshire Union of Institutes (Central Board)	R. M. Pankhurst, LL.D., and Mr. Thomas Lawton, St. James's-chambers, South King-street, Manchester.
Lancashire Mech. Inst.	Mr. Thos. H. Dalzell, Mawdale-villa.
Leeds Church Institute	Rev. F. J. Wood, M.A.
Leeds Mechanics' Inst.	Mr. J. O. Dayson.
Leeds Young Men's Christian Association	Mr. W. Hind Smith, South-parade.
Lichfield	Rev. Thomas Dainty, M.A., the Close, Lichfield.
Liverpool	Mr. Charles Sharpe.
Lomeshaye (near Burnley) Evening School	Mr. Leonard Clement.
London, Beauvoir College	Mr. Robert Griffiths, Plaistow, E.
,, Birkbeck Literary and Scientific Inst.	Mr. George M. Norris, 29, Southampton Buildings, Chancery-lane.
,, City of London College	Mr. H. W. Hansen.
,, Lambeth	Mr. T. E. Heller, Herculesbuildings, Lambeth.
,, Polytechnic Institution Classes	Mr. Jas. Cousens, Polytechnic Institution.
,, St. Stephen's, Westminster	Mr. J. Cawood.
,, Stepney Deanery	Mr. T. Wild.
,, South London Working Men's College	Mr. Wm. Rossiter, 91, Blackfriars-road, S.E.
Louth	Mr. B. Crow.
Macclesfield Useful Knowledge Society	Mr. William Jeffery, Park-street.
Malvern	Dr. Marsden.
Manchester Mech. Inst.	Mr. E. L. Jones.
Middlesborough	Mr. William Taylor,
Mossley Mechanics' Inst.	Mr. James Holt.
New Brompton (Kent), St. Mark's School-room	Mr. J. Bridger, Chatham Prison.
Newcastle - on - Tyne Church of Eng. Inst.	Mr. Jos. Forster, 69, Maple-terrace.
New Mills Working Men's Institute, near Stockport	Mr. Edward Godward.
New Swindon	Mr. J. Goudge.
Newton Heath (All Saints School)	Mr. Thomas Hudson, Springfield-view, Newton Heath.
Northampton	Mr. John B. Hensman.
Oldbury	Rev. W. T. Taylor, Oldbury.
Oldham Analytic Lit. Institution	Mr. Robert Hall
Oldham Lyceum	Mr. William Noton, Union-street, Oldham.
Padiham	Mr. T. D. Harland.
Paisley	Rev. John Crouch, 8, George-street, Paisley.
Parsonstown (Ireland)	Mr. Edward Morrison.
Patricroft Mechanics' Institution	Mr. John Hewitt, Mechanics' Institution, Patricroft.
Pembroke Dock	Mr. J. T. Cock, B.A., Meyrick-street.
Penzance	Mr. Councillor Rodd.
Poole	Mr. John J. Norton, West-street, Poole.
Portsmouth	Mr. Alfred R. Robinson, 198, Lake-road, Landport.
Preston Institution	Mr. William Newsham, Avenham Institute, Preston.
Ramsgate	Rev. F. L. Fisher, M.A., 9, Clarendon-gdns. Ramsgate.
Rawtenstall Mechanics' Institution	Mr. William Wardleworth, Pleasant-view, Rawtenstall.
Redditch	Mr. V. Milward.
Richmond	Mr. F. G. Trevor, Richmond, S.W.
Rishton Mechanics' Inst. Blackburn.	Mr. James Hoyle.
Rotherham	Mr. William Unwin.
Rugby	Mr. F. E. Kitchener, M.A.
Salford Working Men's College	Mr. John Plant, Peel-park, Salford.
Scarborough	Messrs. J. H. Yewdall and J. R. Behenna.
Sheerness	Mr. J. Henry.
Slough	Mr. W. H. Ward, Alpha-st., Slough.
Smethwick	Mr. F. Talbot, Messrs. Chance's Schools.
Southampton	Mr. W. Johnson, Caprera-cottage, Bevois - mount, Southampton.
Southport Athenæum	Mr. B. Bennett.
South Staffordshire Educational Association	Mr. Fredk. Talbot, Messrs. Chance's Library, Smethwick.
Staleybridge Mechanics' Instutute	Mr. Joseph Wood, Foresters'-street.
Stockport Mechanics' Institute	Mr. Mark Potts.
Stockport Sunday School Young Men's Mutual Improvement Society	Mr. Thomas Small, Baguley-street.
Stockton-on-Tees	Mr. T. H. Ainsworth.
Stourbridge Associated Institutes	Rev. D. Maginnis.
Stourbridge Church of England Institute	Rev. T. Williams.
Stroud	Mr. S. Dickinson.
Swinton Mechanics' Inst. (near Manchester)	Mr. Nicholas Kenyon.
Thirsk	Mr. Richard D. Carter.
Tintwistle Mech. Inst.	Mr. John S. Lees, Tintwistle.
Tottington Mutual Improvement Society (nr. Bury)	Mr. Joseph Lord.
Tyldesley Mech. Inst.	Mr. William Lomax.
Wakefield	Mr. J. Sugden, Thornhill-street, Wakefield.
Walsall	Mr. J. Webb, Free Grammar School.
Waterford	Mr. James Budd, 5, Kings'-street, Waterford.
Wednesbury	Rev. J. Winter, M.A., Rector of St. John's.
Wellingborough	Mr. T. S. Curtis.
Werneth Mechanics' Institute, near Oldham	Mr. Fred. H. Chadderton.
West Bromwich (1)	Rev. F. P. Hutton, Gold's-hill, West Bromwich.
West Bromwich (2)	Mr. Henry Ward, West Bromwich.

Weston-Super-Mare	Major-Gen. Gore Munbee.
Whaley-bridge Mech. Institute	Mr. A. H. Colles.
Willenhall	Mr. J. C. Tildesley, Willenhall.
Wolverhampton	Mr. J. N. Langley, M.A., LL.D., Wolverhampton.
Woolwich Arsenal	Mr. W. D. Keeble, Royal Laboratory, Royal Arsenal, Woolwich.
Woolwich (Rectory-pl. Science School	Mr. Wm. Fairbrother, Pinecottage, New-rd., Charlton, S.E.
Woolwich (St. Michael and All Angels Science Class)	Mr. Louis J. Ruegg.
Woolwich (St. Thomas's Parochial Schools)	Mr. J. H. Norman.
Worcestershire Union of Institutes	Rev. G. D. Boyle and Mr. F. Marcus, Worcester.
Worcester Catholic Inst.	Mr. J. Tree.
Worcester Co-operative Reading-room	Mr. Smith.
Worcester, Bridport Free Church Mut. Improvement Association	Mr. E. J. Lewis.
York	Mr. Robert Hall, 8, Feasegate, York.

ELEMENTARY EXAMINATIONS.

The Society of Arts, ever since the establishment of its system of Examinations, has (while abstaining on its own part from examining students in elementary subjects) recommended the District Unions and Local Boards in connection with it to hold Examinations of this character as preparatory to the Final Examinations of the Society. In order to aid them in doing this, and at the same time to promote, as far as possible, a uniformity of standard all over the country, the following definite scheme of elementary examinations is recommended for the use of the District Unions and Local Boards. It is in two grades, and the candidates should be allowed to select either grade at their discretion.

LOWER GRADE.

1. Every candidate must be examined in the first four rules of Arithmetic, simple and compound.
2. Female candidates must also be examined in plain needlework.
3. Male candidates must also be examined in one at least of the three following subjects:—

A. A general knowledge of the Gospel History.
B. The rudiments of English History.
C. The rudiments of the Geography of England.

4. Fairly good writing and spelling, with good reading of a simple narrative will also be required.
5. A satisfactory examination will entitle the candidate to a certificate (of the Lower Grade) from the District Union or Local Board.

HIGHER GRADE.

1. Every candidate must be examined in Arithmetic, including the Rule of Three, Decimal and Vulgar Fractions.
2. Every female candidate must also show proficiency in needlework.
3. Male candidates must also be examined in *one* at least of the four following subjects:—

A. The facts of St. Matthew's Gospel and the Acts of the Apostles.
B. A general knowledge of English History, and especially of the reign of George III.
C. The Geography of Great Britain and Ireland.
D. English Grammar.

4. Candidates will be expected to write fairly, spell correctly, and express themselves grammatically.
5. A satisfactory examination will entitle the candidate to a certificate (of the Higher Grade) from the District Union or Local Board.

No candidates under 12 years of age should be admitted to either grade of these examinations.

The Secretary of any District Union or Local Board in connection with the Society of Arts, desiring to adopt this scheme of Elementary Examinations, must apply to the Secretary of the Society of Arts before the 10*th of February*, stating the number of *male* and *female* candidates respectively desiring to be examined in *each grade*. Examination Papers* in the above subjects will then be forwarded to him, which of course must be kept secret from the candidates until the time of the Examinations.

These Examinations (where papers supplied by the Society of Arts are used) must, in 1870, be held on the 22nd, 23rd, and 24th March, after four o'clock, p.m., as follows:—

TUESDAY, 22nd March, After 4 p.m.	WEDNESDAY, 23rd March, After 4 p.m.	THURSDAY. 24th March, After 4 p.m.
Arithmetic.	English History. Geography.	Gospel History. English Grammar.

The District Unions and Local Boards will understand that, whether in the Elementary Examination the papers supplied by the Society of Arts, or entirely different papers are used, the Local Boards or their own Examiners must look through the candidates' answers and award the certificates. When this has been done, a return in the following form must be made to the Secretary of the Society of Arts, who, in those cases where the Society's elementary papers have been used, will forward the proper number of blank Forms of Certificate to be filled up by the Local Board:—

ELEMENTARY EXAMINATIONS, 1870.

Name of Board or District Union, _____

No. of Centres _____

	HIGHER GRADE.		LOWER GRADE.	
	Examined.	Passed.	Examined.	Passed.
Males				
Females				
Total				

It is particularly requested that this form may be filled up and returned to the Secretary of the Society of Arts in every case, as it is important that the full number of Candidates examined in the Elementary Examinations should be accurately known and stated.

Any Candidate who has obtained a certificate of the Higher or Lower Grade in these Preparatory Examinations in Elementary Subjects may, at the discretion of

* The uniform Examination Papers afford a common standard of examination; and, to promote uniformity in the application of that standard, special copies of the Examination Papers, with the number of marks to be awarded for a complete answer to each question, will be printed for the use of the local examiners. Thus, suppose that in a paper there are twelve questions, and that the aggregate number of marks assigned to the paper is 120; the number of marks placed opposite to each of the questions will depend upon their relative difficulty, and the proportion of these marks given by the examiner for the answer of any candidate will depend upon its accuracy and completeness. Supposing a perfect answer to a question to be set down as worth 20 marks, an examiner may award 20, 17, 12, or any less number, according to the merit of the answer. Thus the candidates all over the country, though their papers be tested by different examiners, will be placed as nearly as possible upon an equal footing. No candidates should receive a certificate who does not obtain at least 30 marks in *each* paper, the whole paper being worth 120 marks. It is desirable that the same person should examine *all* the candidates in any one subject at any centre.

the Local Boards, if not less than sixteen years of age, be "passed" to the Final Examination of the Society of Arts in any of the special subjects in which his or her knowledge has also been properly tested.

The Council of the Society of Arts, while desiring thus to aid local bodies in promoting elementary education, hope they will prevent the possibility of the elementary certificates awarded by themselves being confounded with the certificates awarded by the Society of Arts.

The foregoing Programme of Examinations is published in a separate form, and may be had *gratis* on application to the Secretary of the Society of Arts.

Fine Arts.

Indian Architecture.—The Government of India has made arrangements for having a cast taken of the principal remaining gateway of the Sanchi Tope, near Bhilsa, with a view of having produced several copies of this work, the date of which is supposed to be about 250 B.C. It is the most elaborate work of sculpture existing in India.

Notes.

The Channel Passage.—The Paris correspondent of the *Times* (August 21st) says:—"It was lately authoritatively stated by a Calais paper that the French and English governments had come to an understanding to execute great works in the ports of Calais and Boulogne, to deepen them, and enable them to receive ships of larger tonnage, and thus give greater facility to the international intercourse. Some details were given of the works contemplated at Calais. It seems improbable that the English government would share the labour or expense of works to be executed in a French port; but, without inquiring into this, it would be good news that some one was going to improve the port of Calais, so as to allow larger vessels than at present to enter at all times of tide."

Patents.

From Commissioners of Patents' Journal, August 27.

Grants of Provisional Protection.

Artificial stone, manufacturing—2448—F. Ransome.
Bearings and lubricating apparatus for revolving shafts—2371—A. C. F. Franklin.
Bedsteads, spring sackings for—2440—J. Lewis.
Boots and shoes, heels for—2337—W. T. Ramshill.
Boring braces—2359—D. Ridge.
Candlesticks—2393—J. Cardick.
Carriage wheels—2332—E. H. de Bodmer.
Carriages—2434—S. Smith.
Casks, lining the interior of—2162—J. Jenkins.
Centrifugal pumps—2414—W. E. Newton.
Cops and spoles, manufacturing—2432—H. T. Yates.
Cotton, &c., clearers used in machinery for preparing and spinning—2361—W. Guest.
Cotton, &c., presses for compressing—2472—J. Watson.
Drills for boring rocks—2355—W. R. Lake.
Earth screws—2466—A. Brown.
Easy chairs, &c.—2347—E. Cocking.
Felted fabrics—2377—J. H. Johnson.
Flax, &c., apparatus for spinning yarns of—2454—B. Hunt.
Furnaces—2450—T. J. Leigh.
Galvanoplastic stereotyping—2456—M. H. Jacobi.
Grain, pulverised, apparatus for distributing the different qualities into compartments—2375—J. Staniar, S. Dawson, and E. Davies.
Hats—2349—J. and A. Garde.
Hides, &c., apparatus for dressing—2452—H. B. Barlow.
Hoop skirts—2407—J. Mayer.
Hydraulic printing or copying presses—2401—A. B. Brown.
India-rubber, utilising waste strips of—2379—A. Turner.
Iron—2458—J. H. Johnson.
Iron and steel—2381—G. F. Ansell.
Iron and steel—2391—T. S. Blair.
Iron and steel—2409—J. H. Johnson.
Land, irrigating and manuring—2363—I. Brown.
Leather, apparatus for striking-out—2389—S. Hutchinson.
Looking-glasses, attachment for balancing—2339—J. Taylor.
Looms, self-acting temples for—2341—J. Elce and R. Bond.
Looms—2428—T. Sagar and T. Richmond.
Looms—2468—E. T. Hughes.
Manure from the waste of wool, &c.—2420—C. E. Brooman.
Marseilles quilts—2365—J. Mitchell and T. Settle.
Metals and metallic alloys, fusion of—2397—H. Bessemer.
Paddle wheels—2315—L. W. Wright.
Passenger register, automatic—2446—H. H. Trenor.
Petroleum, &c., refining—2290—A. Smith and D. Cunningham.
Ploughing and tilling apparatus—2343—G. W. Murray and G. M. Garrard.
Portfolios—2351—W. B. Rust.
Railway trains, communication in—2335—G. S. Hazlehurst.
Reaping and mowing machines—2422—T. Beckwith.
Seed, &c., machine for sowing and covering—2367—W. R. Lake.
Seeds, &c., machinery for sowing—2464—J. Mackenzie.
Sewing needles, machine for making—2460—W. R. Lake.
Ships' bottoms, composition for coating—2353—T. Leach.
Size, boiling—2331—T. Livesey and T. Abbott.
Size, manufacturing—2403—C. and T. Crossley and R. Whipp.
Skips, hampers, &c.—2412—J. Parrish.
Soap—2404—J. Cross and J. McCann.
Soap—2424—J. Cowan.
Tobacco pipes—2405—G. White.
Tobacco pouches—2373—J. Quinton.
Tunnels—2410—J. F. E. Martin and L. G. le Guay.
Turret clocks, &c.—2474—H. W. Cook.
Velocipedes—2165—C. Hook.
Velocipedes—2426—J. Hampton and S. Partridge.
Vessels, apparatus for diminishing the effects of the oscillation of—2430—L. D. Newell.
Wheels, &c., apparatus for rolling metallic axles for—2385—T. Hancox.
Wood and stone, machinery for sawing—2198—G. Finnegan.
Worsted, &c., apparatus for spinning and doubling—2444—G. Sunderland and R. J. Midgley.

Inventions with Complete Specifications Filed.

Railways, &c.—2506—L. D. Girard.
Steel—2501—J. Baur.

Patents Sealed.

618. P. S. Regnauld.
621. J. Rust.
622. W. E. Gedge.
629. A. H. Honegger.
631. C. E. Brooman.
645. R. Law and S. Hargreaves.
650. H. A. Bonneville.
685. A. M. Clark.
743. W. Wells.
763. J. Porteous and H. Gibson.
789. C. D. Abel.
889. J. B. Fell.
1045. R. Norfolk.
1245. B. Dobson.
1442. B. Latham.
1844. R. McHardy.
1939. C. Cochrane.
1964. H. Yates.

From Commissioners of Patents' Journal, August 31.

Patents Sealed.

312. A. Barclay.
619. J. Ladley.
627. J. Cliff.
633. W. Oxley.
635. F. N. Gisborne and H. Allman.
643. J. Sloper.
644. H. W. Goldring.
646. F. Audoe.
647. J. Robertson and J. Shanks.
659. S. Marsden.
661. J. B. Spence.
665. W. Betts.
678. W. S. Meldrum.
680. A. Morrall.
698. H. W. Cook.
714. H. Mason, G. Hartley, and J. Hindle.
717. B. Hunt.
719. A. M. Clark.
747. W. Betts.
746. J. Waddington, jun., A. Waddington, & F. Bell.
755. J. M. Napier.
758. T. Beeley and D. Hanson.
760. W. Coxhead.
857. H. E. Newton.
884. J. H. Johnson.
943. S. Firth.
962. A. Chambers.
1022. J. Woods, J. Hampson, and L. and G. Fish.
1105. O. Vivier.
1144. W. E. Newton.
1365. R. Wappenstein.
1795. J. Foster and J. Hollinrake.
1884. H. A. Bonneville.
2013. T. Grahame.
2028. G. Buchanan.
2068. M. A. Muir & J. McIlwham.
2070. G. A. Nowell.

Patents on which the Stamp Duty of £50 has been paid.

2188. G. Little.
2195. J. F. M. Pollock.
2199. C. T. Porter.
2222. W. T. Eley.
2490. A. F. Johnson and M. P. Griffin.
2204. H. A. Dufrené.
2313. J. Silvester.
2213. J. Foster, jun.
2226. J. Richards.
2238. T. Gall.
2242. W. E. Newton.

Patents on which the Stamp Duty of £100 has been Paid.

2441. R. A. Brooman.
2374. R. Sims.
2101. W. Owen.
2951. J. G. Marshall.

Journal of the Society of Arts.

FRIDAY, SEPTEMBER 10, 1869.

Announcements by the Council.

Notice to Institutions.

A copy of Vol. I. of the "Reports on the Paris Universal Exhibition of 1867" has been forwarded to each Institution in Union with the Society. This volume completes the set of six, five having already been sent to the Institutions, in October, 1868. With this volume has been also sent a copy of the Report of Her Majesty's Commissioners for the Paris Exhibition.

Improved Cabs.

The Council of the Society of Arts offer the following medals for improved hackney carriages specially suited to the metropolis :—

The Society's Gold Medal for the best and most convenient open hackney carriage for two persons.

The Society's Silver Medal for the second-best ditto.

The Society's Gold Medal for the best and most convenient closed hackney carriage for two persons.

The Society's Silver Medal for the second-best ditto.

The Society's Gold Medal for the best and most convenient hackney carriage for four persons, either open or closed, or both.

The Society's Silver Medal for the second-best ditto.

Lightness of construction, combined with adequate strength and durability, will be especially considered in making the awards.

The awards will be made after actual trials of the carriages extending over a certain period.

Communications describing the carriages must be sent to the Secretary of the Society of Arts before the 1st January, 1870, the carriages to be sent to a place hereafter to be appointed.

The Council also offer the Society's Silver Medal for the best instrument, to be affixed to a cab or other hackney carriage, for indicating the fare as between the passenger and the driver, whether by registering the distance travelled or otherwise, and which instrument shall also indicate, for the convenience of the cab-owner and of the driver, the total distance travelled during the day and the total amount earned. The instruments competing, with full descriptions of their construction, to be sent to the Society's House before the 1st January, 1870.

Competitors may, at their option, sign their communications, or may forward with them sealed letters containing the name and address of the writer.

The Council reserve to themselves the right of withholding all or any of the medals, in case none of the carriages or instruments possess, in their opinion, sufficient merit.

In the trials of the several carriages, the small amount of vibration and noise will be duly considered by the judges.

Designs for Channel Steamers.

The very defective state of the accommodation afforded by the Channel steamers, plying between this country and the Continent, having been brought under the notice of the Council, they have determined to offer the Gold Medal of the Society, and the large Silver Medal of the Society, for the best and the second-best block model of a steamer, which shall afford the most convenient shelter and accommodation to passengers on the deck of the vessel crossing the Channel between France and England. The steamer is not to exceed in tonnage and draught the best vessels now in use between Folkestone and Boulogne, and the model must be on a scale of a quarter of an inch to a foot. The models, marked in cypher, are to be sent in to the Society of Arts' House, John-street, Adelphi, on or before the 1st November, 1869, with a sealed envelope, giving the name and address of the designer.

The Council reserve the right of withholding either or both medals, in case, in their opinion, the models sent in do not possess sufficient merit.

The following particulars of the South-Eastern Channel steamers, *Victoria*, *Albert Edward*, and *Alexandra*, are given for the convenience of competitors, but it is not intended to confine the designs to them, except as to tonnage and draught :—

Length between perpendiculars, 200 ft.
Breadth of beam, 24 ft.
Depth underside of deck amidships, 12 ft. 6 in.
Draught of water, 7 ft.
Bow, clipper.
Stern, elliptic.
Rig, polacca with two masts, lug foresail, gaff mainsail, staysail, and flying jib.
Engines, oscillating.
Paddle wheels, 17 ft. 6 in. diameter.
Tonnage, 568 tons.
Speed, 17 miles an hour.

Subscriptions.

The Midsummer subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of Institutions.

EXAMINATION PAPERS, 1869.

(*Continued from page* 780.)

The following are the Examination Papers set in the various subjects at the Final Examination held in April last :—

CHEMISTRY.

THREE HOURS ALLOWED.

No candidate is allowed to answer more than three questions in each division.

First Division.

1. Describe experiments by which you could prove that air, deprived of its minor constituents, consists of nitrogen and oxygen.
2. What grounds have you for believing that the oxygen of atmospheric air is not combined with the nitrogen, but only mixed with it?
3. How would you ascertain whether an ammonia-salt is present in a given solution?
4. What are the chief constituents of coal-gas? How could you distinguish marsh gas from olefiant gas?
5. A sample of chalk is said to contain phosphoric acid. How would you ascertain whether the acid is present?
6. Describe by equations the action of dilute sulphuric acid on bicarbonate of soda, on nitrate of lead, and on chloride of calcium.

Second Division.

1. How would you separate tin from antimony?
2. How is lead separated from silver by Pattinson's process?
3. A solution acid to test paper gives a white precipitate on the addition of hydrochloric acid. What may the precipitate contain? How would you examine it?
4. How is aluminic chloride prepared from a ferruginous mineral?
5. How is quicklime prepared? What admixture does it commonly contain, and what influence has this admixture on its properties?
6. How is potassic chlorate prepared?

Third Division.

1. How is acetic acid obtained from wood?
2. Describe the action of chlorine on marsh gas, and the general properties of the product formed.
3. How is aldehyde obtained in a pure state from the products of oxidation of alcohol?
4. How is tartaric acid prepared in a pure state from cream of tartar? Give its formula and those of its chief salts.
5. A volatile organic base is given containing carbon, hydrogen, and nitrogen. How could you ascertain whether it is a primary, a secondary, or a tertiary derivative of ammonia?
6. How is sugar deprived most completely of the foreign bodies which occur mixed with it, in so-called moist sugar?

MINING AND METALLURGY.

THREE HOURS ALLOWED.

Six questions to be answered.

1. The water flowing into the workings of a mine amounts to 864,000 gallons in twenty-four hours. What will be the diameter of the pump required for its extraction if the stroke be six feet, and the number of strokes per minute ten?
2. Briefly describe the various methods employed for the ventilation of mines.
3. Which are the most important tin-producing countries of the world, and by what means is tin ore prepared for metallurgical treatment?
4. What do you, severally, understand by the terms *vein*, *seam*, and *deposit*?
5. Describe the ordinary volumetric process for the estimation of copper by means of a standard solution of cyanide of potassium.
6. How would you ascertain the amount of lead, silver, and gold contained in a specimen of galena?
7. Describe the process of converting iron into steel by cementation.
8. How, on a large scale, is metallic antimony obtained from the native sulphide of that metal?
9. Describe the processes commonly employed for the extraction of gold from auriferous veinstone.
10. From what sources is sulphur commercially obtained?
11. Describe the processes by which pig-iron is converted into merchant bars.
12. How would you estimate the amount of zinc contained in an ore of that metal?

BOTANY.

THREE HOURS ALLOWED.

The candidate is expected to answer correctly three questions in Section I. and six questions in Sections II. and III., including descriptions of at least two of the fresh specimens. Nos. 8, 9, *and* 10 *each stand for an answer.*

Section I.—Structure and Physiology.

1. Define the following terms, giving an example in illustration of each:—*Distractile, Homogamous, Loculicidal, Lyrate.*
2. Describe the origin, function, and mode of growth of *roots*, noting the particulars in which they generally differ from stem-structures. If the extremity of a root be removed, what follows? And is such removal useful under any circumstances?
3. What is *Transpiration?* What external conditions affect it?
4. Give the principal insoluble *Cell-contents*, stating briefly the characters of each.
5. What is *Albumen?* How does it originate?
6. Enumerate the principal forms of *Inflorescence* distinguished by special names, giving a species in illustration of each.

Section II.—Systematic and Economic Botany.

1. Which natural orders furnish the following products? State the part of the plant affording each. *Vanilla, Flax, Cream of Tartar, Tapioca, Valonia, Chicory.*
2. Enumerate the genera of indigenous *British Trees*, giving the natural order to which they respectively belong.
3. Name the natural orders of British Dicotyledons in which the stamens are *opposite* to the petals or to the lobes of the corolla.
4. Distinguish Liliaceae from Amaryllidaceæ, Iridaceæ, Juncaceæ, and Alismaceæ.
5. How does Barley *(Hordeum)* differ from Rye *(Secale)?*
6. Give the general characteristics of *Lichenes.*
7. Name the natural orders to which the three plants marked A, B, and C respectively belong, *with the reasons* for your opinion.

Section III.—Descriptive Botany.

8, 9, 10. Describe the three plants marked A, B, and C, noticing the various organs in their proper sequence.

FLORICULTURE.

THREE HOURS ALLOWED.

1. What is the difference between a Tuber and a Corm, and how does any difference which may exist affect the propagation of the plants by which they are respectively formed? Name examples.
2. Explain in what respects the germination of a seed differs from that of a spore.
3. What use do you attribute to the stomates in the leaves of plants?—on which surface of the leaf are they as a rule most abundant?—and what do your conclusions on these points suggest to you as regards the cultural treatment of the plants?
4. Indicate the general features of the treatment you would give to a Fuchsia, a Tulip, an Odontoglossum, and a Globe Amaranth?

5. Name the best half-dozen Marantas known to you, and note down the colours of their leaves.

6. Name the best half-dozen evergreen trailing plants suitable for covering a garden wall, and hardy in the climate of London.

7. What treatment would you resort to in order to restore greenhouse plants which had been accidentally frozen?

8. Name what you regard as the best 12 Hardy Perennials of distinct character, excluding all garden varieties. The points of merit to be—facility of culture, intrinsic beauty, and duration of bloom.

9. Is the root action of plants continuous or intermittent? Mention illustrative cases which you may have specially noticed.

10. Set down the names of the coloured-leaved varieties of Coleus known to you.

11. How would you cultivate Tree Pæonies?

12. Point out in what particulars the plants classed as Parasitical, Epiphytal, and Terrestrial, differ in respect to the characteristics here mentioned, and refer to examples of each class.

FRUIT AND VEGETABLE CULTURE.

THREE HOURS ALLOWED.

FRUIT CULTURE.

1. If you were required to plant an acre of ground as a fruit garden, what steps would you take in the preparation of it before planting the trees?

2. A quarter of an acre will take 108 pyramidal trees at ten feet apart; what varieties and how many of each, apples, pears, plums, and cherries, would you select to plant it with?

3. What are the different stocks usually employed on which to graft the apple, pear, and plum?

4. How would you distinguish a Jefferson plum from a Green Gage?

5. In the summer the plum and cherry are frequently infested with the blue aphis, which retards the growth and impairs the vigour of the trees. What remedy would you employ to destroy it?

6. In what way does root-pruning induce fertility in fruit trees?

VEGETABLE CULTURE.

7. Prepare a list of seeds necessary to supply a garden of an acre in extent.

8. If you were to sow Champion of England and Veitch's Perfection Peas on the same day and on the same piece of ground, which of them would come into use first?—and how would you distinguish the one from the other?

9. What is Rampion, and how is it cultivated?

10. Write a short treatise on an approved method of cultivating horse-radish.

11. What is the difference between the artichoke and cardoon, and for what purpose is each cultivated?

12. Write a short treatise on the cultivation of cucumbers in pots.

ANIMAL PHYSIOLOGY.

THREE HOURS ALLOWED.

No candidate will be allowed to pass who does not satisfactorily answer three of the four questions which follow. He may answer any three, but not more than three.

1. Of what alimentary principles (food-stuffs), and of how much of each, ought a man's daily food to consist?

2. In what respects does the circulation of blood through the lungs differ from the circulation of blood through the liver?

3. In what respects does the skin of the tip of the finger differ from the skin of the heel?

4. What is the spinal cord? Where is it situate? What is its structure?

Candidates who desire to be placed in the first or second class may, in addition, answer one of the two following questions:—

5. What are the microscopical characters and chemical constituents of human blood? Enumerate the differences found in blood drawn from the pulmonary, hepatic, renal, and jugular veins.

6. Describe the position and structure of the retina. State what is known of the functions of its various parts. How is it that with two eyes we see single?

(*To be continued.*)

CHANNEL PASSAGES BETWEEN ENGLAND AND FRANCE.

Captain Tyler, R.E., has, in compliance with instructions from the Board of Trade, visited the French and English coasts, with a view to preliminary inquiry as to the improvements which may be effected in the means of communication between the two countries. His report has just been printed by order of the House of Commons. He was accompanied in his inspection by Mr. Eborall, the General Manager of the South-Eastern Railway; Captain Boxer, R.N., the Harbour-Master at Folkestone and Superintendent of the South-Eastern Company's Steamers; and Mr. Brady, one of the engineers of the South-Eastern Railway; and he had the advantage of conferring with the Mayor of Boulogne, the President and certain members of the Chamber of Commerce of Boulogne, the Engineer-in-Chief of the *Ponts-et-Chaussées* for that part of the French coast, M. Le Gros, and the Engineers of the ports of Boulogne and Calais, M. Le Blanc and M. Æron; the General Manager of the Northern Railway of France, M. Pétiet; the General Manager of the London, Chatham, and Dover Railway, Mr. Forbes; the Superintendent of the London, Chatham, and Dover Company's steamers, Captain Morgan, R.N., the Engineer of the Pier at Dover, Mr. Druce, and several others.

In his report it appears that, "omitting from consideration the ports of Hamburg, Rotterdam, Antwerp, and Ostend, the passenger traffic between England and France, for the year 1868, amounted to 309,479 altogether; 141,633 passengers having travelled by Calais, 109,006 by Boulogne, 41,371 by Dieppe, and 17,469 by Havre. A large proportion of these, namely, 46,411, crossed the Channel in the month of August, as against 12,946 in January, and 13,514 in February. In the year 1867 (of the Paris Exhibition) the numbers were 454,350 altogether, 199,837 having travelled by Calais; 146,226 by Boulogne; 86,914 by Dieppe; and 21,373 by Havre. Of these 84,684 crossed in August, against 13,163 in January, and 13,721 in February. In addition to the ordinary annual increase, which is considerable, there would naturally be a very large augmentation in these numbers if better arrangements were made for crossing the Channel. Considering the restrictions as to dimensions which are imposed upon the South-Eastern and London, Chatham, and Dover Railway Companies by the circumstances of the harbours and the various conditions of the service, the steamers are admirably constructed for the work they are required to perform. But it is, nevertheless, an undoubted fact, that the great majority of these passengers suffer (short as is the sea passage) extreme discomfort from sea-sickness and want of shelter during bad weather. Not unfrequently, the traveller from India or from America finds the British Channel the most unpleasant part of his journey, and he sometimes looks forward with more anxiety to the state of the Channel than to the heat of the Red Sea or the passage of the Atlantic, selecting, in the case of America, a French or an English vessel, in order to avoid the Channel-crossing, according to the country which he desires to reach, rather than from any other consideration.

"As the mean of three years, Captain Boxer calculates,

from his meteorological journal and from the journals of his steamers, that there are, out of the 365 days, 29 days of 'gales and storms, with heavy seas,' 102 days of 'good round sea and breezes,' 144 days with 'moderate weather and sea,' and 90 days of calm weather. It is, no doubt, partly from the check which winter weather exercises, that only 13,000 to 14,000 travellers pass between England and France in January and February, against 46,000 in August, and 310,000 in the year. It may, at any rate, be safely asserted that there is nowhere any sea service of equal importance which is so much in need of improvement. Between England and Ireland the service has now been conducted for many years in commodious vessels, and at fixed times, irrespective of tide or weather. Between Great Britain and Europe, for want of better harbour accommodation, it is found impossible to employ vessels of greater length than about 200 to 240 feet, or drawing more than 7 ft. to 8 ft. of water; and even those vessels cannot at times enter the French harbours, or land their passengers on the French coast."

He then proceeds to discuss the different modes by which this condition of affairs may be ameliorated, and enters into minute examination of the coast from Cape Alprech to Calais, within which lie the harbours of Boulogne and Calais, and the other spots which have been suggested as suitable for the establishment of harbours, and the capabilities of each. He considers that "Any other pier or breakwater, of whatever form or in whatever direction, would probably, sooner or later, lead to accumulation and obstruction; and as far, therefore, as an improved service with England is concerned, Calais does not appear to be the harbour to which attention should be directed. But it must not be forgotten that Calais has (while Boulogne forms the nearer route from London to Paris) the advantage of being a great centre of communication, *viâ* Brussels and Cologne, for Strasbourg, the Rhine, the North of Europe, and North and South Germany; and travellers proceeding in those directions would be taken considerably out of their course by steamers running to Boulogne. The books of the London, Chatham, and Dover Railway Company for the year ending 31st December, 1868, show that there were carried in that year by that company's boats between Dover and Calais altogether 133,670 passengers, of whom 77,443 were to or from Paris or places beyond it, 39,547 were to or from Belgium and Germany, and 16,680 were booked locally between Dover and Calais, so that their destination was not known."

In referring to Mr. Fowler's scheme for a harbour south of Cape Grisnez, at Audresselles, as the best point on the French coast for a harbour of communication, he says:—"Mr. Fowler has, for the last six or seven years, directed his attention to the question of the best mode of improving continental communication, and has preferred to advocate a system of ferrying the trains over in steam vessels rather than either a bridge, which he believed to be impracticable, or a tunnel, which he did not think likely to be undertaken. He has for the last two years associated with him Mr. Abernethy, and Mr. Wilson, as acting engineer. After a careful examination of the harbours of Calais and Boulogne, and the coast between them, and after considering the general question, they came to the conclusion that the following were essential requirements:—

"1. Well sheltered harbours, with deep water on both coasts, capable of affording ingress and egress at all times, irrespective of weather and tide.

"2. A class of vessels, in the nature of ferry-steamers, of greater size and power, making rapid passages, and comparatively unaffected by wind and sea.

"3. Safe and speedy means for the interchange of passenger traffic between the railways and such ferry-steamers, so as practically to form a continuous communication.

"Conceiving that the harbour and pier at Dover afforded very inadequate terminal accommodation, and insufficient protection, particularly from easterly and south-easterly gales, they proposed the construction of a new harbour westward of the existing pier, with a graving dock, a covered berth for the steamers, and hydraulic apparatus for transferring the trains from the quay to the steamers, and *vice versâ*. They considered that Calais, which was exposed to all winds from west to east, and was choked up with sand, offered no facility for a harbour for such steamers; and that the harbour of Boulogne, though more readily capable of partial improvement, partook of the same natural defect of sand accumulation. They, therefore, selected a point of the coast south of Cape Grisnez and north of Ambleteuse, near the village of Audresselles, where the deepest water was to be found near the coast, and sheltered from the northward and eastward by Cape Grisnez; and they considered that, by constructing a harbour at this point, they would secure the shortest available sea passage, with clear navigation across the Channel from Dover, and with the advantage of the first-class light on Cape Grisnez as a guide on the darkest nights. They proposed to connect this harbour by a railway four miles long with the 'Chemin de Fer du Nord,' and to add a short branch for communication with Calais and the north.

"They proposed further to employ between these harbours, steamers 450 feet long, with 57 feet of beam, and 80 feet across the paddle-boxes, propelled by disconnected engines of 1,500 horse-power, performing the voyage in one hour, and with comparatively little pitching or rolling in any state of the weather; and to form covered stations for the interchange of passenger and goods traffic between the steamers and the shore, the transfer of the passenger carriages to be effected by hydraulic apparatus, irrespective of tide, in a few minutes. The steamers were to be luxuriously fitted up with first and second-class refreshment saloons, and with ladies' and private cabins; and, in addition to the saving of time in the sea passage, and on either coast, the passengers were to have the advantage of being able to secure and retain the seats in their railway carriages throughout the journey between London and Paris and other centres, at the same time that the various saloons and cabins and the decks of the steamers would be at their service. They believed that the extra comfort to the passengers afforded by such accommodation, and by the regularity of the service, was far more important than the saving of time that would be effected. They rejected as insufficient and unsuited to the requirements of the present day, all partial improvements of Boulogne Harbour and the service between that harbour and Dover or Folkestone; and they estimated that these works, and the railway steam-ferry steamers, might be completed within three years, at an expenditure of £2,000,000.

Captain Tyler considers that "the project thus put forward by Mr. Fowler would, no doubt, require some modifications in detail; and it is a question whether it would be worth while to ferry the railway carriages as well as the passengers across the Channel; but the main features, of an improved harbour at Dover and a new harbour south of Cape Grisnez, are sound, if means can be found for meeting so great an expense." He then proceeds to discuss the question of the improvement of Boulogne Harbour; and after describing the existing harbour, says:—"The steam-vessels of the South, Eastern Company, plying between Boulogne and Folkestone, and drawing seven feet of water, can safely cross the bar, which extends for a distance of about 300 metres from the entrance between the piers, at three hours and thirty minutes after high water, giving a range (the ebb and flow being unequal) of five hours and fifty minutes of tide for vessels of that draught. The difference between good and bad weather allows of a quarter of an hour extra, sooner or later, in entering or leaving the harbour, the fall at that period of the tide being a foot or more for every quarter of an hour. It is a singular fact that at the four harbours of Dover, Folkestone, Calais, and Boulogne, the vessels float in

their ordinary berths at the quays at nearly the same instant of time; and, indeed, it is the practice to regulate the tidal service for Boulogne by the Folkestone tide-table. The bar at the mouth of the harbour is actually dry occasionally, at very low tides, in March and September," but the condition of this bar and the harbour are improved by the sluicing from the backwater of the Liane, which is stored up for the purpose.

"In the existing state of the harbour of Boulogne, it is not considered safe to employ vessels of greater length than 240 feet over-all, because longer vessels cannot be swung round in bad weather, especially when the harbour is crowded with vessels; and it would be inconvenient in several respects, having reference to passenger accommodation, to construct steamers of the class now in use on a model that would admit of their travelling in either direction without turning round. But larger steamers, with more ample accommodation differently arranged, might, of course, be so constructed, and such a system of construction would tend to obviate the difficulties in the interior of the harbour."

Captain Tyler then proceeds to discuss the various improvements which might be made in Boulogne harbour, so as to render it available for a fixed service, day and night, and this it appears is estimated at £500,000. He goes on to say:—"By way of utilising the existing harbours, Mr. John Grantham, C.E., proposed, two years since, to the directors of the South-Eastern Company (and he has now renewed the proposal), the construction of vessels drawing only 5′ 6″ of water, 400 feet long by 45 feet beam, with a rudder at each end, and a steering apparatus on the paddle-box platform. He would fit up such vessels with grand saloons and good refreshment departments, and ensure safety by a system of cellular construction; and he proposes to attain a speed of twenty-two miles an hour on trial, or eighteen as a working average, with engines of 600 (nominal) horse-power.

"But it is asserted by some of the officers engaged in the performance of these services, that vessels of the class now employed are, upon the whole, the safest that could be devised for the particular duties required of them. It is argued that the sea-passage, in which greater length and size might lead to increased comfort, is comparatively short, while the entrance of the French harbours, by day and night, in certain states of the weather, which is already the more difficult and dangerous part of the service, would be attended with still greater disadvantages. The existing vessels are fitted to encounter any weather with which they can meet in the channel, and are handy for entering the harbours, while longer vessels would be exposed to increased risk at the moment of entering the harbours. The bow of a long vessel getting under the shelter of one pier, and a heavy sea striking her on the quarter, she might be driven against the other pier. There is, no doubt, much truth in this argument. Such a risk must increase in proportion to the length of a vessel, to the narrowness of the entrance to a harbour, to the exposed position of its entrance, as regards winds and currents, and to any necessity which may exist for reducing the speed before entering it; and having regard to the existing state of the French harbours, the employment of longer vessels would, for this reason, be attended in bad weather with greater danger; but the argument would no longer apply if the service were performed from a convenient and well constructed pier on the one, to a similar pier on the other side of the Channel. The longer and larger vessels having increased proportional power, with disconnected engines, so as to be able to use either paddle at pleasure, could be under no disadvantage in approaching the lee side of a pier; and the above argument, therefore, tells in favour of the construction of an extended pier at Boulogne, already referred to, to be used on the French, in combination with the pier at Dover on the English coast, for an improved Channel service.

"The pier at Dover has now been completed to quay level for a length of 1,800 ft., and 170 ft. more will be completed this season. Thus there remains 130 ft., which will be completed at the end of 1870, if the winter be moderate, and if no unexpected difficulties are encountered. This will give a total length of 2,100 ft. This pier was commenced in 1848, and a careful series of soundings was taken about four years ago, under Captain Calver, for the purpose of ascertaining what had been the effect of the pier. It was then found that, although there had been a redistribution of the material of the bottom, there had been no loss of depth throughout the bay, and indeed that the average depth had been slightly increased. The flood tide, which is the stronger, sweeping round the exterior or west side of the pier, forms eddies against the coast beyond, to the eastward, and while scouring and deepening one part of the bay, deposits a portion of the material suspended in it on the eastern side of the pier. The ebb tide being in the same direction with the eddy of the flood, tends to increase the mischief, and the result is an accumulation of chalk, sand, and refuse, under cover of the pier. There has been a little decrease of depth in the immediate neighbourhood of the pier on each side, but there still remains an average depth of about forty feet outside, and thirty-five feet inside, for a length of 800 of the above 1,800 ft. already constructed; and there has of late been a general diminution of beach between Folkestone and Dover. The beach appears lately to have been stopped at Rye and Romney, besides other places, and the supply is now hardly equal to the waste between those places and Dover.

"The whole pier will cost, when complete to a length of 2,100 ft., £725,000, or, on an average, £1,035 per yard. Although the depth to the foundations is about the same as for the last 700 ft., the work is now being done more cheaply, the last contract being let at the rate of £750 a yard.

"There is no reason why this pier should not be used for the accommodation of Channel steamers of larger dimensions, say 400 ft. long, and drawing ten or twelve feet of water, though it might be desirable to lengthen the jetties on either side, to meet increased traffic, to afford separate gangways for passengers and luggage, and to prevent loss of time. The largest vessels used in the transport service, the *Himalaya*, the *Orontes*, and the *Serapis*, make use of the pier at the present time, though not in very rough weather. But the captains of the Channel steamers run alongside of the pier in all weathers, keeping always to the lee side, and, during the past winter, no instance has occurred in which the weather has prevented them from doing so. The only state of the weather that would prevent them from landing passengers from one side or other of the pier, would be during a south-easterly gale, or a very heavy sea from the south-west, such as might occasionally occur about the period of the Equinox. But, for all practical purposes, and with rare exceptions, the pier may be considered, even in its present condition, available for regular communication by steamers of a larger class; and if an extra length were added to it, proportional to the size of the steamer to be employed, and curving to the eastward, so as to face the south and south-east, with a return at the end, there is probably no gale in which the steamers could not be accommodated for passenger traffic.

"The tidal harbour at Dover contains twelve acres of superficial area, and the inner harbour six acres. The 'Pent,' with an entrance sixty feet wide, contains about six acres more of available space. Existing vessels are obliged to wait for the tide to enter the harbour, which is practically dry at low water, and vessels of a larger class would have to do the same, being accommodated with proper moorings on both sides of the pier when not requiring to lie alongside of it. The rise and fall of the tide being, say, nineteen feet at spring tides, and fourteen at neaps, the harbour would not be available for vessels drawing more than, say, ten feet of water at present, or twelve feet of water if certain minor improve-

ments were carried out. To avoid the necessity for turning round in Dover as well as in other harbours, it would be necessary to construct such vessels stem and stern alike, so as to move forward with equal facility in either direction; and in any case, the enlargement and deepening of Dover Harbour, and the deepening of the approach to it, for their accommodation, would be advantageous, if not absolutely necessary. It is, of course, undesirable to go into detail as to the cost of such works until precise schemes have been worked out; but it may be stated roughly that, independently of any extension of the pier, £100,000 would go a long way in making necessary improvements. The population of the borough of Dover is upwards of 25,000, and the tonnage of vessels cleared in 1868 was, outwards, 269,804, and inwards, 321,993.

"The port of Folkestone has been formed by the South-Eastern Railway Company, who have expended upon it altogether upwards of £250,000, including the harbour-works, pier, sea-works, Pavilion Hotel, station and other buildings, and purchase of land. The population of Folkestone was, by the census of 1861, 8,507, and has since increased to, say 10,000. The harbour comprises an area of 16 acres, and its entrance on the east is, since the extension of the pier at Dover, more protected than formerly from eastern gales. The Mole-head rocks, also, in front of the harbour, act, as the tide falls, as a natural breakwater. These rocks extend from Copt Point, which is half a mile east of the pier, in a semicircular direction towards the harbour, and there is eight feet of water at low-water spring-tides inside their southern barrier. West of Folkestone, the beach is protected for a considerable distance by a series of groynes, and the shingle accumulates on one side or the other of these groynes, according as easterly or westerly winds prevail. As the latter winds are most constant, an excess of shingle travels naturally up channel, but it is said to disappear in deep water, in consequence of the set of the currents, as it passes this pier.

"At the head of the southern pier of the outer harbour there is a lighthouse for tidal purposes, and from this point a horn is extended in a south-westerly direction for 445 feet, against which shingle accumulates, and by which the property is secured. From this horn a new pier has been run out in a south-east by southerly direction for 430 feet, having 16 to 17 feet of water (at low water spring-tides) at its extremity, and nearly the same depth for some distance on its western side, diminishing, of course, towards its junction with the horn. On the east side of the pier the depth varies from 14 ft. at the extremity to 10 ft. about half way up the pier; and the company's vessels, 240 ft. in length (over all), touch the ground at very low tides on the inshore end. Larger vessels could not, therefore, be employed without an extension of the pier. There is an iron skeleton lighthouse at the end of this new pier, showing a white light within and a green light without the shoals on either side. Since the formation of this pier, the water has deepened on the western, but shallowed on the eastern side of it. The harbour itself is, like the other harbours referred to, dry at low water, and the ships float in the upper quay berths from two hours to two hours and fifteen minutes before high water, and ground three hours and forty-five minutes to four hours after high water.

"The South-Eastern Railway Company have 11 ships, varying from 185 to 240 ft. in length, and 7′ 6″ to 8 ft. of water. The speed of the larger vessels averages nearly 16 knots per hour. The traffic of the harbour is, for the most part, in the hands of the South-Eastern Company, and the tonnage varies from 180,000 to 200,000 tons. The merchants import, however, timber and building materials, and occasionally grain. The imports by the South-Eastern boats vary from 15,000 to 18,000 tons, and the exports from 15,000 to 21,000 per annum, the greater part of the goods being of high value. The new pier is only used when the vessels are unable to enter the harbour, which happens perhaps once in four times. The landing-places have an advantage over the jetties at the Dover pier, inasmuch as there are separate gangways for embarking and disembarking passengers and luggage, and the general arrangements, both for passengers and goods, are admirably organised, and the buildings conveniently arranged for the purposes of traffic. The means of access by the Folkestone incline, from the junction with the main line to the harbour, neutralises the effect of the greater proximity of Folkestone as compared with Dover, from London by the South Eastern route; but the company have already obtained a bill for a loop-line to Sandgate, which might be extended along the coast to the station and pier at Folkestone.

"The distances from Boulogne of Folkestone and Dover are practically the same, or about 30 English or 26 nautical miles, the difference being slightly in favour of Dover; while the distance from Folkestone to Boulogne, round the north end of the Varne, would be 27 nautical miles, or one mile more than from Dover outside the Bassure de Baas; and there is the advantage at Dover of the two railways from London running conveniently on the pier, and of the pier itself (on which so much money has been expended) having nearly approached completion, as far as it has yet been authorised. The position of Folkestone would always be under the disadvantage, if larger ships were used at all times of tide, that the well-known shoals, "the Varne" and "the Ridge," on each of which there is at one part only 1½ fathoms of water (at low-water spring tides), lie directly on the route to Boulogne. The South-Eastern boats pass, indeed, over 2½ fathoms of water, at a distance of one and a-half miles from the shallower part of the Varne, and three miles from the shallower part of the Ridge. But it is not necessary that I should refer here to the natural capabilities that exist for the construction of an improved harbour at Folkestone.

"Any report on the general question of continental communication would, however, be incomplete without a cursory reference to the bolder schemes which have been put forward, from time to time, for avoiding the use of steam vessels altogether, by the construction of bridges, or tunnels, or tubes, over, under, or in the bed of the channel, with or without islands, piers, or air-shafts, so as to connect the railway system of England directly with that of the Continent.

"Elaborate plans, which have since been lost, for a Channel tunnel, were laid before the then First Consul, Napoleon Buonaparte, by a French engineer, M. Mathieu, in 1802, and were for some time exhibited in the Luxembourg Palace. After a series of geological investigations, M. Thomé de Gamond also proposed, in 1856, the construction of a tunnel, and his propositions were submitted to the examination of a scientific commission, by order of the French Emperor, in that year. That commission appears to have come to the conclusion that it was desirable to test his investigations by sinking shafts and driving short headings under the sea, at the expense of the two governments. Mr. Low, an English engineer, also laid his plans for a tunnel before the Emperor in 1867, and Mr. Hawkshaw, whose attention has been for some years directed to the subject, caused a trial boring to be sunk on each side of the Channel in 1866, in order to test practically the result of his geological investigations. Mr. Remington published a plan for a tunnel in 1865, and has deposited plans and sections with the Board of Trade. And amongst the names of other proposers or projectors in this direction may be enumerated Messrs. Franchot, Tessier, Favre, Mayer, Dunn, Austin, Sankey, Boutet, Hawkins Simpson, Boyd, and Chalmers. Mr. Austin has of late brought his plan, more than once, to this office.

"Of these various projects, those which have of late made the most progress are, the bridge scheme of M. Boutet and the tunnel scheme presented under the chairmanship of Lord Richard Grosvenor, with Messrs.

Hawkshaw, Brunlees, and Low, as engineers on the English side, assisted by Messrs. Talabot, Michel Chevalier, and Thomé de Gamond, on the French side. The documents in connection with this latter scheme are now before the Board of Trade. The result of the deliberations of a French commission, which was appointed by the Emperor, and presided over by M. Combes, the director-general of the Ecole des Mines, to inquire into this scheme, were on the whole favourable, as regards the geological and engineering parts of the project, though the members of the commission were divided as regarded its financial prospects, the president and two members attaching more importance to the "utility and grandeur of the undertaking," and three other members looking at it from a more strictly economical point of view. The General Council of Ponts-et-Chaussées, presided over by the Minister of Public Works, to whom the matter was afterwards referred, were unable, "upon the documents submitted to them, to decide on the probability of success of the tunnel under the Channel," and considered that "if, from political considerations, the undertaking should be considered useful, the government should follow up the investigations at their own expense."

"In this scheme it is proposed to commence by driving preliminary driftways through the grey chalk, at a great depth below the bed of the Channel, between a point near Dover and another point near Calais; as it is conceived that this material would be easily cut through, and would not be likely to present insuperable difficulties from the influx of water; whereas Mr. Remington, as appears from the printed remarks which he has forwarded to the Board of Trade, selects the line from Dungeness to Cape Grisnez, in order to avoid the chalk, and the fissures which he fears to encounter in it, and to work in the Wealden formation, which would, he believes, afford a greater chance of success.

"In the case of M. Boutet's bridge scheme, an association has been formed for making experiments, two small bridges have been built in France, and arrangements are made, near St. Malo, for a third, a mile in length, to be constructed in two spans of half a mile each. The Emperor Napoleon visited the works of M. Boutet, on a site which has been granted by the French government, on the 8th instant, and his Majesty is stated to have expressed himself favourably with regard to the project.

"This bridge is intended to cross from Dover to Blancnez, and is advocated, in a paper forwarded on the 27th June to the Board of Trade, as (1.) being less costly than a tunnel; (2.) occupying less time in construction; (3.) giving no trouble in ventilation; (4) avoiding the danger of sudden inundations.

"Mr. Charles Boyd has forwarded to the Board of Trade a pamphlet, containing his proposal for a 'marine viaduct' from Dover to Cape Grisnez, constructed with iron girders on 190 towers, 500 feet apart, and 500 feet above the sea, and he estimates the cost of such a bridge at £30,000,000.

"Mr. Hawkins Simpson has addressed the Board of Trade, under date the 25th June, on the subject of working a submarine tunnel on a pneumatic system, which he has termed his "Eolian system," for which he claims cheapness, expedition, superior ventilation, and greater utility.

"Mr. Alexander Vacherot has submitted to the Board of Trade a scheme, on which he has several years been engaged, and which he laid before the Emperor of the French in 1856, for 'laying on the bed of the sea a tunnel made or formed of concrete, so as to form, when completed, a monolith.' He would construct it on the shore, and 'draw it down to its place in sections.' And he considers that greater economy and security might thus be obtained, than by the other methods that have been proposed."

With regard to these various projects, Captain Tyler, though unable to convince himself of the feasibility of any bridge scheme, conceives "that it might be wise to test the practicability of a tunnel scheme by means of preliminary driftways. It is probable that, even if any of them should hereafter be carried out in practice, they could not go forward otherwise than under the supervision of, and a previous guarantee from the two governments; and obvious that, as at least 10 or perhaps 15 years may elapse before they could be made available for traffic, improvements in the shape of more convenient and larger steam vessels are required in the meantime for the better performance of the service." In this view of the case, he sums up the conditions of the problem as follows:—

"The steam-packet service between England and France, which is in fact a service between Great Britain on the one hand, and Europe and the East generally on the other, is much in need of improvement. There are now, exclusive of the routes by Ostend and Antwerp, 310,000 passengers a-year to be provided for, of whom 142,000 travel by Calais, as the mail route; and those numbers are capable of great augmentation on greater facilities and increased comfort being afforded. The existing steamers, restricted as to their dimensions for want of better pier and harbour accommodation, are not proportionate to the importance of the service. Larger vessels, with less movement in rough weather, more shelter, and better accommodation generally, would do much to mitigate the discomforts of the sea passage; and even contemplating the successful issue of a tunnel project, say in 10 or 15 years, these improvements are much required, and should be effected in the meantime. But larger vessels cannot be employed for a fixed service until better provision is made for embarking and disembarking passengers, especially on the French coast. The pier at Dover is not only ready, but has frequently been used for military transport-vessels of the largest size, though certain improvements are required in the jetties for greater convenience in embarkation and disembarkation. The difficulties in the way of fitting the harbour of Calais for the reception at all times of larger vessels are very great, but by a judicious extension of the west pier at Boulogne, similar accommodation might be provided on the French side. At a cost of, say £100,000 at Dover, and £500,000 at Boulogne, the desired object might, apparently, be attained in the most economical and most expeditious manner. By the adoption of steamers capable of moving with equal facility in either direction, the difficulties incidental to turning round in small harbours may be avoided; and the existing harbours at Dover and Boulogne might, with certain modifications, be made available, to some extent, for improved vessels. The question might thus be temporarily solved, if the two governments were not prepared to carry out a larger scheme. If they are prepared to face a greater expense, there is the more extensive project of Mr. Fowler, for constructing, at a cost of two millions of money, special harbours for special steamers; and there can be no doubt that this project presents — whether the railway carriages be ferried over or not—a more comprehensive mode of dealing with the subject. The relative distances may be stated to be:—between Dover and Audresselles, 24, Dover and Calais, 26, and Dover and Boulogne, 30 English miles; while the passage to Boulogne, though longer, is admitted to be better than that to Calais. Either by the construction of new harbours at Dover and Audresselles, at a cost (as estimated by Mr. Fowler) of £2,000,000, inclusive of steamers, or by the improvements above suggested at Dover and Boulogne, at a cost of £600,000, exclusive of new and improved steamers, the immediate object should be to provide an improved fixed service, irrespective of wind and tide, between London and Paris in eight hours; and it would appear to be desirable now to refer the whole matter, through the Foreign Office, for the consideration of the French government, with a view, perhaps, to the appointment of an international commission, in which that government would, no doubt,

readily acquiesce, and without which the important interests involved could not be authoritatively dealt with, nor the general question satisfactorily decided."

The *Times* of the 29th July, in commenting on Capt. Tyler's report, says:—

"The Channel between Dover and Calais remains to be overcome, and there is no lack of schemes by which that purpose may be accomplished—schemes of chain and tubular bridges, of submarine tunnels, of tunnels to be laid on the bed of the sea, of tunnels on the 'pneumatic system,' on the 'Eolian system,' of marine viaducts to be constructed with iron girders on 190 towers, at 500 feet intervals, and at a height of 500 feet above the sea level—the latter undertaking to be effected at the cost of only £30,000,000. All these projects have been examined by Captain Tyler in his report on 'Improvements in the Channel Passage,' just laid before the House of Commons, and he has been led to the conclusion that while 'he cannot convince himself of the feasibility of any bridge scheme,' he would deem it wise 'to test the practicability of a tunnel.' The tunnel, however, if at all possible, is a design which it would take ten or fifteen years to bring to maturity; and, in the meanwhile, it is natural to wish that some immediate improvement should be introduced into the present mode of communication. The number of passengers crossing the Channel, between the French and English ports, averages 316,000 yearly, and of these 142,000 give the preference to the Dover and Calais route. Great as is the intercourse between England and the Continent, however, with the present means of communication, it is clear that a new impulse would be given to it if greater facilities and increased comfort could be secured. That the present means of communication admit of very considerable improvement is a fact about which many of us have frequent opportunities of satisfying ourselves. The gallant little steamboats plying between Dover and Calais, or between Folkestone and Boulogne, are very possibly the best that could be contrived under the circumstances. They have to contend against the most capricious of seas, and acquit themselves with perfect safety and praiseworthy punctuality, in spite of violent gales and the darkness of wintry weather. With such shallow ports as we have, especially on the French coast, it is impossible to employ vessels drawing more than seven to eight feet of water; and it is with difficulty that even these can sometimes get into harbour or land their passengers. Every one feels how much the discomfort of the sea passage would be mitigated by the use of larger vessels, with less movement in rough weather, more shelter, and better accommodation in every respect; and all this could be effected even while we waited for the eventual accomplishment of a tunnel scheme; precisely as the Summit Railway over Mont Cenis is already a great improvement on the old diligence, and enables us to bear with patience the delay that still separates us from the opening of the Alpine tunnel. In order that larger vessels may be applied to the Channel service, it is necessary that better ports than any in existence should be provided; and it is with that view that Capt. Tyler has been instructed diligently to survey the coasts on either side. The shifting sand and the travelling shingle raise almost everywhere serious obstacles to free navigation. Captain Tyler feels convinced that it is futile to attempt any improvement at Calais; but he thinks that, by an outlay of £100,000 at Dover, and £500,000 at Boulogne, it might be possible so to prolong the piers of both those harbours as to allow steamers of a sufficiently large size to approach them in all weathers. Boulogne, however, is only convenient to travellers between London and Paris, while Calais has the advantage of being the great centre of communication, by way of Brussels and Cologne, with the Rhine, the North of Europe, and Northern and Southern Germany. Although Captain Tyler, as a step in advance, recommends the Dover-Boulogne route, he also adds that, if the two governments are not unwilling to carry out a far larger scheme, they can do no better than give full development to the project of Mr. Fowler, which has already been under examination for the last six or seven years."

After describing Mr. Fowler's scheme, as given in Captain Tyler's report, the *Times* goes on to say:—"There is nothing absolutely new in Mr. Fowler's project, and the only wonder is that so many years should have elapsed before an attempt was made to apply to the British Channel on a large scale that system of railway ferry-steamers which has already been so long in operation in America, on the estuaries of large rivers and on the inlets of great lakes. At the time of the Danish war of 1864, the idea of introducing these large ferry-boats for the traffic over the Great and Little Belts was already attained at Copenhagen, and if the plan was not carried into effect it was owing only to the disastrous issue of the national contest, and the change in the destinies of the Elbe Duchies. With a good, well-sheltered harbour, and a pier jetting out into deep water, and steamers with a rudder at each end and a steering apparatus on the paddle-box platform, the embarkation and disembarkation of a railway train, however long, present no difficulty and cause no delay. But, after all, it would matter little whether the railway carriages were ferried over or not, and the usefulness of the scheme in that respect must also depend on the gauge of the lines on either side of the Channel. What is of greater moment is 'an improved harbour at Dover and a new harbour south of Cape Grisnez.' It is the thorough independence of any consideration of wind and sea; the extra comfort to the passengers afforded by the accommodation of large vessels, the regularity of the service, the economy of time, the almost total immunity from the great scourge of sea-sickness, the safety from drenching showers and cutting winds at landing, the avoidance of a dark walk or of the omnibus drive from the landing-place to the station, of the delay, the hurry, the vexation, confusion, and annoyance inseparable from a first experience of either French or English soil, which Mr. Fowler's plan promises to secure, and which we hope to see secured."

APPLICATION OF SEWAGE IN FRANCE.

The City of Paris has recently terminated a series of experiments, which have occupied two years, in the direct application of sewage water, and also in the purification of the same, and the application of the solid deposit and the partially purified water. The experiments were entrusted to engineers of *ponts-et-chaussées*, and those made on the ground were checked by others, carried on with great care, and at fixed intervals, in the laboratory. The results are embodied in an elaborate report, by MM. Mille and Durand Claye, which has been presented to the Academy of Sciences. The experimental establishment was situated at Clichy, within a few hundred feet of the mouth of the great sewer, which there pours the entire sewage of the city into the Seine. The amount of the sewage is, in round numbers, 200,000 tons per day; and although the contents of the cesspools of Paris are not allowed to pass into the sewers, the condition of the river is already much complained of; the mud on the banks emits noisome gases, while the mineral matter forms bars, which constantly have to be removed by dredging. The experimental works employed one four hundredth part of the whole amount of sewage passing through the collector.

In the first place, vegetables of various kinds, including melons, fruit, and flowers, were cultivated in ridges, the sewage water being allowed to circulate in every direction in deep trenches, so that the fertilising matter went direct to the roots of the plants, and never touched their leaves. Patches of grass were cultivated by direct irrigation, and the results were highly successful. In the winter, large quantities of sewage were pumped over

spare ground—a poor, virgin subsoil—and this being afterwards planted with vegetables, also gave a very satisfactory result. One of the most effective experiments was made on a piece of wheat land, half of which was manured with the precipitated sewer matter and the other half with common farm-yard manure. The extent of land was exactly the same in each case, and the quantity of manure the same, namely, fourteen tons per acre, and the results were curiously similar, the quantity of wheat in each being the same, and the quality identical; the only difference was that the farm-yard manure gave a rather larger value in straw, to the extent of a few shillings per acre. The most careful analysis exhibited no difference whatever in the grain, and the straw was simply two inches shorter in one case than the other.

The value of the whole of the sewage of Paris is estimated theoretically at £280,000 per annum, the precipitated matter representing three-sevenths of that sum, and the purified water the remainder. The engineers engaged on the work are of opinion that direct application and purification must go hand-in-hand, and the cost of distribution and purification together is set at from two to three centimes (about one farthing) per ton. The Paris sewage, not containing the cesspool matter, is not rich; it contains only about six pounds of solid matter per ton, of which four pounds consist of mineral matter. The purification is performed by means of alum, the quantity employed being rather less than seven ounces per ton, and the result is that the precipitate contains nearly all the mineral matter, three-fourths of the organic matter, with the phosphoric acid, &c., in all four pounds, while the purified water retains the remainder of the nitrogen, all the alkalies, with a small amount of organic and mineral matter.

These first experiments have been brought to an end, and a new one was commenced on a much larger scale. On the opposite side of the Seine is a large tract of land, very poor, and now yielding miserable crops of cereals and other produce. A main is being laid across a bridge now building, to convey one fortieth part of the whole sewage to this sandy plain, and the farmers will be supplied for a time with the sewage water gratis, in order to fix, in a practical manner, its fertilising value. The first experiments have cost the city about £10,000, and the future expenses will be very large, but the object in view is one of great importance, and is being carried out with great determination and skill. It is believed that this arid plain may be converted into valuable market gardens, which yield a good revenue near Paris, while corn gives miserable results. It has been proved, in fact, that land producing only 800 to 900 francs per hectare can be made to yield, without impoverishment, 4,400 francs in vegetable, by the application of sewage. If this new experiment should succeed, as it promises to do, the next question is how to make similar use of the other 39-40ths of the sewage; and this includes the very serious question of finding customers for the precipitated matter, which is found in practice to be of the value of eight shillings per ton. Failing this, the next question would be to find economical means of conveying the sewage to a distance, for irrigation of the crops during the summer months, and for natural purification and deposit of the fertilising matter on the land during the winter. The French engineers have studied with attention all that has been done in England and Scotland, and the experiments in which they themselves are now engaged cannot fail to assist materially the solution of this important problem of returning to the soil the living principles of which it has been despoiled.

Manufactures.

Mining School of St. Etienne.—The object of this school is the training of young men for directors of works, inspectors, and foremen. The education is gratis, and includes, besides the working of mines, knowledge of minerals and mineral deposits, the art of assaying and treating ores, the elements of mathematics, the most essential principles of resistance, the nature and application of materials employed in the construction of works connected with mines, metallurgical works, tramways and roads, book-keeping by double entry, surveying, and plan-drawing. Pupils, on leaving the school, receive diplomas of capacity, according to the degrees of their proficiency. Pupils are admitted between the age of sixteen and twenty-five, after an examination in the following subjects:—The French language, arithmetic, geometry, algebra, rectilinear trigonometry, descriptive geometry, and chemistry (as in the examination for the degree of bachelor in science) natural philosophy, the elements of linear and free-hand drawing, and the working of problems in descriptive geometry. Candidates are first examined by a mining or other engineer, and, secondly, by the council of the school. A report is then made to the Minister of Agriculture and Commerce, who decides on the number to be admitted to the school.

Commerce.

French Brandy.—Cognac, with its brandy distilleries, and its 24,000 inhabitants, is said to be one of the wealthiest towns in the world, in proportion to its size. The quantity of brandy exported from Tounay-Charente, in 1868, was 9,187,416 gallons, nearly the whole of which was exported to the United Kingdom. In 1863, the exportation was only 3,988,358 gallons; in 1866, it reached 11,562,210 gallons; and, in 1867, the quantity was 9,770,420 gallons. In recent years there has been a large quantity shipped in bottle instead of in casks, and although the brandies exported in 1868 show a slight diminution compared with 1867, yet the number of cases containing bottled brandy shipped has increased from 558,086, in 1867, to 627,603, in 1868, of which 576,989 were sent to the United Kingdom. The least quantity contained in a case is 12 bottles; many have more, but, reckoning only 12 in a case, the exportation would amount to 7,500,000 bottles. The brandy exported from Charente, in 1868, is valued at £1,887,678, of which £1,733,854 was conveyed in British bottoms, and £153,824 in foreign, the latter mostly to Australia. Notwithstanding the slight diminution in the quantity last year, there was an augmentation in value. The vintage of 1868 was severely checked by some late frost, and the unexceptional dry summer operated in the same direction; but when the grape was subjected to distillation, the alcohol contained in the juice was found to be considerably above the average, and the brandy produced gave a given quantity proportionally large. It is, therefore, believed that the exports will continue on an extensive scale in the present year.

Colonies.

The Jamaica Botanical Gardens and Cinchona Plantations.—A report on the progress and condition of the botanic garden for last year, by Mr. Robert Thomson, superintendent, has been kindly forwarded to the Secretary of the Society of Arts, by the Secretary of State for the Colonies. From this it appears that from the Castleton Garden, during the year, nearly two thousand plants have been distributed. The number of species, however, are comparatively few, partly owing to the infancy of the establishment, whereby the majority of the species have not attained to the period of reproduction, and partly owing to the paucity of species of which the garden consists. Indeed, with regard to ornamental species, the garden possesses

but few not already commonly diffused over the island. Now that the permanency of the present site is ensured by the government, there will be no obstruction to the large importation of a liberal assortment of all plants that are likely to be turned to account as economic products or as horticultural species, and Dr. Hooker, of Kew-gardens, having kindly offered his assistance and influence, the garden will thus soon be enriched and elevated to a new sphere of usefulness and efficiency. Among the plants introduced during the year is one of ipecacuanha, which is extremely rare, and a very shy grower. A Ward's case of Assam tea, containing upwards of six hundred plants, arrived in excellent condition from India, *via* the Colonial-office; an experimental two-acre plantation of this will be established in a few months. Manilla hemp, previously cultivated here, but now lost, has been re-introduced, and *Musa ensete*, the most magnificent of the banana tribe, attaining a height of forty feet, with leaves twenty feet long. The black-pepper, since its introduction last year, has propagated to thirty plants, and the jalap to about twenty plants. A run of virgin forest land, containing six hundred acres, was acquired early in 1868, for the purpose of cinchona plantations. This property, in elevation, ranges from four thousand feet to six thousand feet above the sea, situate on the southern slope of the Blue Mountain range, on its western declension, distant about twenty-four miles from Kingston, and embracing a great variety of aspects, with several streams or small rivers, and with excellent soil, admirably adapted to the requirements of the cinchona. Possession was obtained in May last year, and operations commenced, in the felling and clearing of the forest to the extent of fifty acres, which was ready for being planted out in August. During the lapse of these months, a violent drought, such as has been seldom witnessed, prevailed over the higher mountains, but which was most propitious in accelerating the preparation of the land. In September and October, upwards of forty acres were planted with fine species, all of which have taken kindly to the soil; indeed thousands have, in this short time, grown five to six inches. The number of plants now permanently planted out is about twenty thousand, which it was expected would be augmented to thirty-five thousand during the present year. A neat and substantial green-house, capable of accommodating about eight thousand young plants, also a hot-pit, heated by a furnace and flue, thus affording the requisite command of bottom-heat, to render possible the propagation, from cuttings, of some two thousand plants a month, have been erected, at a height of four thousand eight hundred feet above the sea, and placed adjacent to the site intended for the house for the superintendent. A shed, fifty feet long by twelve wide, has also been built for the accommodation of labourers. During the year seeds of the following kinds of cinchona have been received from Ceylon, through Dr. Hooker:—*C. succirubra*, *C. officinalis* and *C. pahudiana*. Of the first-mentioned species, owing to the large extent already planted, eight thousand to ten thousand plants were advertised for sale in July, 1868, but the announcement of sale was not generally responded to, hardly two thousand plants having been applied for. This announcement contrasts unfavourably with the first notification of the sale of cinchonas in India, and at a price one hundred and fifty per cent. higher than those offered in Jamaica. Steps have been taken, or are about to be taken, by the Indian government to commission an agent to proceed to New Granada, to collect all the remaining valuable species not yet introduced into that country. Jamaica will, doubtless, as hitherto, share in profiting by this new acquisition of several important kinds. The Madras and Bombay Cinchona Commission, appointed to ascertain the febrifuge value of alkaloids other than quinine, have concluded, from the data before them, that the alkaloids hitherto but little valued in medicine (cinchonine, cinchonidine, and quinidine), are scarcely, if at all, inferior as therapeutical agents to quinine. What the exact differences may be in their physiological and therapeutical action is a question, the answering of which may fitly be deferred until more data have been collected in reference to the new alkaloids.

Road-making in South Australia.—Very large sums of money have been spent on the main roads of this colony, which now possesses, perhaps, the finest roads in all Australia; and it is now stated that the keeping of the roads in repair will tax the revenue of the colony to the extent of £50,000 annually, and that a corresponding sum will be required for the construction of new roads. It is suggested that, where new country is to be opened up for agricultural purposes, it would be cheaper to construct light railways, with cheap macadamised roads as feeders, rather than to employ expensive metal throughout.

Cultivation of Beet in Tasmania.—A Hobart Town paper says that considerable interest is at present being taken in that city with regard to the cultivation of beetroot for the manufacture of sugar. A sample of very good quality had been shown at an agricultural show, and it is generally believed that the climate and soil of Tasmania are favourable to the growth of root-crops, and the Royal Society of the colony are now instituting inquiries as to whether the manufacture of sugar from beetroot could profitably be carried on. A committee appointed last session to consider what manufactures should be encouraged by government, reported favour upon beetroot sugar, and recommended that upon every 500 tons of sugar manufactured from beetroot by one manufacturer in one year, a bonus of £500 should be given, and a similar amount guaranteed on the same conditions for three years from the commencement of the manufacture. It is very likely that the subject will soon be practically taken up, and steps adopted for the manufacture in Tasmania.

Sheep Stations in New South Wales.—A little more demand for sheep stations has recently taken place. One or two purchases of sheep properties have been made, though at a considerable reduction in price, buyers seeming only inclined to purchase where they can secure bargains.

Railways in Victoria.—The following returns from the railway department of Victoria show the gross revenue of the Victorian railways to the following dates, from 1st January of each year:—

	£	s.	d.
15th June, 1865	247,009	3	11
21st ,, 1866	262,089	12	4
20th ,, 1867	247,028	15	1
18th ,, 1868	258,868	1	4
17th ,, 1869	259,789	1	8

The returns of the Hobson's Bay and Melbourne United Railway, up to 10th June, show a steady improvement, the aggregate from the beginning of the year amounting to £61,118 10s. 6d., against £59,833 9s. 11d. for last year, showing an increase of £2,285 6s. 7d.

Quartz Mining in Victoria.—Quartz mining seems to be taking the place of alluvial, and considerable attention has of late been turned to it, and, according to the statistics, it appears with good reason. The total number of persons engaged in mining is 67,991, of whom 52,537 are working the alluvial, and 15,454 the quartz mining, the total yield produced being 341,716 ounces, of which the alluvial produced 21,643 ounces, and the quartz reefs 125,372 ounces, or an average of 4 ounces 2 dwts. for each person engaged in alluvial workings, and the average to each quartz miner is 8 ounces 2 dwts., or nearly double that of the alluvial miner.

Queensland Imports and Exports for 1868.—The total imports amount to £1,880,625, and the exports to £2,086,738, the excess of exports over imports being £206,113. This return, however, is incomplete, as the returns of the imports and exports from Sweer's Island, the port of the Gulf country, are not to hand; but though they may affect the actual figures, yet they will

not be sufficient in amount to affect the general result. As might be expected, the largest imports were at Brisbane, where the receipts were £1,271,536. The following return shows the countries from which the principal imports are received:—

Great Britain	£431,658
Australian Colonies	1,443,562
New Zealand	500
South Sea Islands	5
South America	4,900
Total	£1,880,625

The statement below shows the countries to which the exports from the colony have been made, and the amount in each case;—

Great Britain	£505,277
Australian Colonies	1,579,494
New Zealand	900
New Caledonia	870
South America	46
China	1
South Sea Islands	144
Guam	6
Total	£2,086,738

Notes.

Bread Making.—In his address to the Chemical Section of the British Association, Dr. Debus said:—"A very important paper has been published by Professor Liebig on the improvement of the nourishing qualities of bread. Certain quantities of phosphates and other salts form necessary ingredients of wholesome food. Now, it is well known that most of these salts which exist naturally in wheat remain with the husk. Liebig proposes to add salts, of a nature similar to those remaining in the husk, to the flour, and, at the same time, to substitute for the carbonic acid developed by fermentation, gas liberated from iodic carbonate. The bread prepared according to Liebig's recommendation is said to be of excellent quality, and to exceed in value bread made by the ordinary method."

New Copying Ink.—A German chemist gives the following recipe for copying ink:—One ounce of extract of Campeachy wood dissolved in about five gallons of hot water, with the addition of a quarter of an ounce of crystallised carbonate of soda. When the solution is completed, add an ounce of ordinary glycerine of commerce, of specific gravity 1·25, 15 grains of neutral chromate of potash dissolved in a little hot water, and a quarter of an ounce of gum powdered and reduced to mucilage by means of a little water, the whole mixture to be well stirred together. This ink is said to keep good for an indefinite time, in closed bottles, to have no effect on steel pens, and to copy well, even after the writing has been done for a considerable time. It has this peculiarity, however, that it will not copy by pressure. The method is to moisten the copying paper in the usual way, lay it upon the writing, cover the former with a sheet of smooth writing paper, and rub the latter with a paper-knife, using a moderate amount of pressure.

Library of the British Museum.—During the past year 42,331 volumes and pamphlets were added to this library (including books of music and volumes of newspapers), of which 992 were presented, 6,099 were received in pursuance of the laws of English copyright, 346 were received under the international copyright treaties, and 34,894 were acquired by purchase. There were added also 33,403 parts of volumes (or separate numbers of periodical publications and of works in progress). A total of 1,145 sets of newspapers were received from the Inland Revenue offices of the United Kingdom, of which 131 were published in Scotland, 138 in Ireland, 238 in London, and 638 in the rest of England. Of music, 2,121 pieces were acquired, each piece complete in itself, of which 1,527 were received by English, and 576 by international copyright, and 18 were purchased. Of 779 portions of musical works in progress, 473 were received by English, and 306 by international copyright, and 253 works of music of greater extent than single pieces were also acquired, comprising 25 by English, 66 by international copyright, and 162 by purchase. A total of 5,773 articles were received in the department, not included in the foregoing enumeration of volumes and parts of volumes, consisting of playbills, single pieces of music, broadsides, songs, ballads, and other miscellaneous items, giving a grand total of 81,507 articles received during 1868 in the department.

Education of the Agricultural Poor.—The *Saturday Review* (28th August) says:—"All the friends of the agricultural poor agree that to educate them better is the first thing needful. The two main questions are, what the education given shall be like, and how it shall be provided. Amongst the poor, as in every other class, there are a few clever boys, and a great many—a very great many—stupid boys. No scheme of education will deserve to be called national if it does not secure a chance in the world to the clever children of the poor; and it was one of the main merits of Mr. Forster's Endowed Schools Bill, last session, that it paved the way for carrying out a great scheme, under which such a chance would be in the reach of the few among the children of the poor who possess exceptional ability. Nothing would tend to comfort and animate the poor so much as the certainty that they were not born under a fatal spell that condemns every one of them, whatever may be his natural gifts, to equal and inevitable obscurity. And in England this is especially wanted. For the Church of England is the only Christian Church that cannot offer the poor one way of exercising a calling above that of the day-labourer, by admitting them into the ranks of the ministry. It is quite idle to ask that the Church of England should alter its system, for the great excellences of the Church are bound up intimately with the requirement of a standard to which, as things now are, no poor man can attain. The great mass of the poor can, of course, only learn what is compatible with early hard work. But even here it may be a great mistake to set the standard too low, and to pronounce that English lads are inherently incapable of an education such as that which is the pride of the poorest Scotchman. How the education is to be provided is a difficult question, which will be debated warmly enough next next year, and on which we need not now enter. The only two postulates with which we must set out are, that an education such as the wisest and most experienced educators of each generation think the best and most suitable shall be offered to every girl and boy in England; and that, somehow, the money that is requisite, however large it may be, must be found. If we once enter on the discussion with these two bases as beyond question, it cannot be an insuperable puzzle to find out how much the poor can learn, who is to teach them, and who is to pay the cost."

Proposal to Illuminate Beacons by Electricity.—It appears, by the *Scotsman*, that, for some time past, Mr. T. Stevenson, C.E., has been engaged in prosecuting a series of experiments, with the view of testing the practicability of illuminating beacons and buoys at sea by the electric light, produced by means of a battery on the shore. These experiments have been attended with a remarkable degree of success, and were conducted in presence of deputations from the Board of Trade, the Trinity-house, and the Commissioners of Northern Lights. With the view of having this application of electricity thoroughly tried, Mr. Stevenson has had a submarine cable laid between the East Breakwater of Granton Harbour and the Chain Pier at Trinity. The operator occupies a station near the centre of the breakwater, and the light is shown at the point of the pier, the current being thus transmitted a distance of fully

half-a-mile. The light is shown in front of an ordinary holophote reflector, and appears to be thoroughly under the control of the operator.

Means of Ascertaining the Age of Documents.—A communication has been made to the Academy of Sciences of Paris by M. F. Carré, which may be of use in proving the age, or in detecting forgery, in the case of written documents. The methods consist either in taking a press copy of the manuscript, by means of a weak solution of hydrochloric acid, or in submitting it for a considerable time to the action of the same solution. When the ink of the writing is very old, it is almost unaffected by acids. When not more than eight or ten years old, a press copy of the writing may be obtained with the aid of a solution containing one-twelfth part of common hydrochloric acid of commerce, almost as easily as with water and fresh manuscript. The power of taking copies in this way decreases in proportion to the age of the manuscript; after thirty years the copy is usually illegible, and a manuscript bearing date 1787 produced only a few traces almost imperceptible. The process of washing in the solution produces a reverse effect. Writing which had been executed for periods varying from a few months to ten years disappeared completely after remaining a few hours or a few days in the same solution, while writing thirty years old remained legible after fifteen days' immersion. Oxalic, sulphuric, or nitrous acid produces precisely the same results. The first mode is convenient for obtaining copies which have become impossible with water alone, and the little acid that remains on the paper may be neutralised by holding the manuscript for a few seconds over a vessel containing an aqueous solution of ammonia. The second process, of course, is destructive in its action, except in the case of old documents.

Lighting of Railways.—According to the American journals, a novelty in railway management is to be introduced by the Erie Company, who propose to illuminate the whole line of that road by night by electric lights at the ferries, in the tunnels, on all dangerous curves, and on every engine. Mr. E. C. Morse, who has charge of the matter, states that he has made several important improvements, among others a plan for preserving the carbon points from wasting away, and keeping them for months in a good condition, a self-sustaining battery, and an invention by which the turning of the wheels of the engine shall collect electricity for use in illumination. There will be a light at each end of the ferry, which, it is believed, will make a collision practically impossible on the darkest and foggiest night. Even with the diminution of light caused by the jarring of the locomotive, it is estimated that the head-lights will show the track to the engineer on a straight line for three miles.

Patents.

From Commissioners of Patents' Journal, September 3.

Grants of Provisional Protection.

Alcoholic liquors, distilling—2490—W. Byrne.
Artificial fuel—2413—D. Barker.
Bats for felting and other purposes—2492—L. B. Fortin and J. Ferrabee.
Blasting compounds, explosive—2500—P. A. Blake.
Bullets, &c., apparatus for affording protection from—1983—J. Stringfellow.
Carriages for locomotion by manual labour—2451—R. H. Charsley.
Carriages, &c., apparatus for applying electro-magnetism as a motive power to—2485—J. Jones.
Caustic ammonia and ammoniacal salts—2482—F. Braby.
Cloth, &c., manufacturing—1219—P. R. Hodge.
Combing machines—2504—N. Delandtsheer.
Copper, extracting from its ores—2503—T. Gibb and C. Gelstharp.
Denture or appliance for carrying and supporting artificial teeth in the mouth by suction—2437—G. Ash.
Feet, machinery for manufacturing coverings for the—2479—H. N. Moyon and J. E. Lemercier.
Felting, shackle and roller end for hardening machines for—2507—T. Whitehead.
Fire-arms, &c., breech-loading—2427—W. Richards.
Flax, &c., spinning—2449—J. Lawson and E. G. Fitton.
Flax, &c., machinery for breaking the woody parts of—2516—J. E. Hodgkin.
Food, preserving articles of—2345—E. Beanes.
Furnace doors—2467—T. Parkinson.
Furnaces, &c.—2440—H. Pinkus.
Gas—1683—H. Holdrege.
Gas lamps, posts for—2509—W. R. Lake.
Gas retorts, &c., charging and discharging fuel in—2445—H. A. Bonneville.
Glass houses—2484—S. Robinson.
Iron, &c., welding plates of—2487—W. S. Sutherland.
Kilns for burning bricks, &c.—2439—J. Mitchell.
Ladies' panniers or bustles—2296—T. W. Lockyer.
Lead, producing white pigments from—2443—J. G. Dale & E. Milner.
Leather, utilising waste—2481—J. Blakey.
Life buoys—2496—G. W. Morgan.
Lifting jacks for lifting railway rails—2415—J. Deas & R. C. Rapier.
Liquids, measuring, &c.—2491—H. J. H. King.
Locomotive engines and carriages—2457—R. F. Fairlie.
Looms—2229—W. K. Stock.
Maps, &c.—2455—J. Williams.
Marble, &c., composition in imitation of—2431—W. Matt.
Metals, machinery for forging, &c.—2473—J. Mitchell.
Motive-power, obtaining—2476—J. J. E Mayall.
Motive-power, applying—2383—E. A. Curley.
Motive-power, obtaining—2508—W. R. Lake.
Ores, &c., apparatus for crushing, &c.—2411—W. Davis.
Paint, manufacturing—2493—A. V. Newton.
Patterns for antique lace making, &c.—2402—J. B. Austin.
Pen-holders—2459—W. R. Lake.
Railway trains, communication in—2417—H. Hudson.
Railway trains, communication in—2447—S. Harvey.
Scents, &c., obtaining from flowers, &c.—2039—W. Pidding.
Scissors for gathering flowers and fruit—2441—J. Blyde.
Screw propellers—2486—W R. Lake.
Sewing machines—2477—W. Campion.
Ships, compositions for coating the sides and bottoms of—2418—D. A. Gibbs.
Ships, extinguishing fires in the holds of—2494—W. Allan, W. Payne, and A. B. Fraser.
Slide valves—2478—A. Gilchrist.
Smoke, consuming—2429—J. Kenyon.
Soap, &c.—2328—J. T. Way.
Steam boilers—2488—A. Wiggzell.
Stone, &c., cutting and dressing—2495—A. Neill.
Subaqueous ways, construction of—2512—Z. Colburn.
Textile fabrics, manufacturing—2253—R. G. Lowndes and J. Reid.
Textile fabrics, &c., apparatus for plaiting—2419—E. J. Grabham.
Toilet quilts, &c.—2497—J. Barlow.
Vehicles, springs for wheeled—2499—A. M. Clark.
Velocipedes—2514—H. Taylor.
Velocipedes—2498—F. Coote and F. W. Cranch.
Window blinds—2461—J. Checketts.
Wood, &c., imitations of and substitutes for—2510—J. H. Johnson.
Wool, &c., machinery used in the treatment of—1749—J. and S. W. Varley.
Wool, &c., machinery for carding, &c.—2505—H. A. Bonneville.

Inventions with Complete Specifications Filed.

Braiding machines—2528—W. R. Lake.
Fibrous materials, machinery for carding, &c.—2537—W. R. Lake.

Patents Sealed.

654. A. A. L. P. Cochrane.
667. C. Tighe.
669. F. Windhausen.
674. W. B. Waterlow.
677. R. Badger.
687. J. A. McElroy.
831. W. T. Sugg.
898. T. Shakespear & G. Illston.
1055. W. Powell.

From Commissioners of Patents' Journal, September 7th.

Patents Sealed.

694. L. M. Ruiz.
695. H. Tylor.
723. R. M. Caffall and D. Miller.
724. J. Henderson.
729. W. Walker.
731. B. Britton.
733. J. Sax.
740. D. Johnson.
744. G. Glover.
748. C. H. Cooper.
769. C. E. Brooman.
770. L. Labadie.
773. H. C. Bartlett and A. G. Southby.
819. C. F. Claus.
827. A. de Pindray.
828. W. R. Lake.
844. W. R. Lake.
871. M. Sigler.
906. F. Hurd.
913. J. T. Calow.
933. B. J. B. Mills.
998. H. A. Fletcher.
1243. A. Borgnet.
1312. L. Isaac.
1400. G. T. Bousfield.
1508. S. W. Clark & W. R. Sykes.
1900. W R Lake.
1905. W. Clarke and E. Walker.
2092. J. Dewar
2149. J. W. Ormiston.

Patents on which the Stamp Duty of £50 has been paid.

2246. J. Owens.
2287. W. P. Bardell & W. Powell.
2266. C. E. Brooman.
2297. J. Asquith & J. W. Asquith.
2304. C. E. Brooman.
2308. C. Catlow.
2294. T. Berney.
2277. W. T. Sugg.
2316. W. Clark.
2364. C. P. Stewart and H. Chapman.

Patents on which the Stamp Duty of £100 has been Paid.

2467. W. A. Richards.
2476. A. J. Alderman.
2491. G. Ritchie.

Journal of the Society of Arts.

FRIDAY, SEPTEMBER 17, 1869.

Announcements by the Council.

The Whitworth Scholarships.

The following is a list of the successful candidates (with their ages, occupations, and the number of marks they obtained), who have been reported to the Science and Art Department as entitled to the ten Whitworth scholarships of £100 a-year each :—

Greenwood, William H., aged 23, engineer, student at the Mechanics' Institution, Manchester, 143 marks.
Hearson, Thomas A., aged 23, engineer, student, Royal School of Naval Architecture, 137 marks.
Hopkinson, John, B.Sc., aged 19, student at Cambridge University, 134 marks.
Elgood, Thos. S., aged 24, mechanical engineer, Leicester, and Owen's College, Manchester, 127 marks.
Greenhill, Geo. A., aged 21, student at Christ's Hospital School and Cambridge University, 116 marks.
Brittle, John R., aged 23, engineer, student at Sir Walter St. John's School, Battersea, 113 marks.
Philips, Thomas W., aged 23, student at British School, Millwall, and Royal College of Science, Dublin, 100 marks.
Sennett, Richard, aged 21, engineer, student at the Royal School of Naval Architecture, 98 marks.
Buckley, Robert B., aged 21, engineer, student at Merchant Taylors' School, 97 marks.
Leeds, Charles E., aged 23, B.A. (Oxon), student at Oxford University, 96 marks.

Improved Cabs.

The Council of the Society of Arts offer the following medals for improved hackney carriages specially suited to the metropolis :—

The Society's Gold Medal for the best and most convenient open hackney carriage for two persons.

The Society's Silver Medal for the second-best ditto.

The Society's Gold Medal for the best and most convenient closed hackney carriage for two persons.

The Society's Silver Medal for the second-best ditto.

The Society's Gold Medal for the best and most convenient hackney carriage for four persons, either open or closed, or both.

The Society's Silver Medal for the second-best ditto.

Lightness of construction, combined with adequate strength and durability, will be especially considered in making the awards.

The awards will be made after actual trials of the carriages extending over a certain period.

Communications describing the carriages must be sent to the Secretary of the Society of Arts before the 1st January, 1870, the carriages to be sent to a place hereafter to be appointed.

The Council also offer the Society's Silver Medal for the best instrument, to be affixed to a cab or other hackney carriage, for indicating the fare as between the passenger and the driver, whether by registering the distance travelled or otherwise, and which instrument shall also indicate, for the convenience of the cab-owner and of the driver, the total distance travelled during the day and the total amount earned. The instruments competing, with full descriptions of their construction, to be sent to the Society's House before the 1st January, 1870.

Competitors may, at their option, sign their communications, or may forward with them sealed letters containing the name and address of the writer.

The Council reserve to themselves the right of withholding all or any of the medals, in case none of the carriages or instruments possess, in their opinion, sufficient merit.

In the trials of the several carriages, the small amount of vibration and noise will be duly considered by the judges.

Designs for Channel Steamers.

The very defective state of the accommodation afforded by the Channel steamers, plying between this country and the Continent, having been brought under the notice of the Council, they have determined to offer the Gold Medal of the Society, and the large Silver Medal of the Society, for the best and the second-best block model of a steamer, which shall afford the most convenient shelter and accommodation to passengers on the deck of the vessel crossing the Channel between France and England. The steamer is not to exceed in tonnage and draught the best vessels now in use between Folkestone and Boulogne, and the model must be on a scale of a quarter of an inch to a foot. The models, marked in cypher, are to be sent in to the Society of Arts' House, John-street, Adelphi, on or before the 1st November, 1869, with a sealed envelope, giving the name and address of the designer.

The Council reserve the right of withholding either or both medals, in case, in their opinion, the models sent in do not possess sufficient merit.

The following particulars of the South-Eastern Channel steamers, *Victoria, Albert Edward*, and *Alexandra*, are given for the convenience of competitors, but it is not intended to confine the designs to them, except as to tonnage and draught :—

Length between perpendiculars, 200 ft.
Breadth of beam, 24 ft.
Depth underside of deck amidships, 12 ft. 6 in.
Draught of water, 7 ft.
Bow, clipper.
Stern, elliptic.
Rig, polacca with two masts, lug foresail, gaff mainsail, staysail, and flying jib.
Engines, oscillating.
Paddle wheels, 17 ft. 6 in. diameter.
Tonnage, 568 tons.
Speed, 17 miles an hour.

Subscriptions.

The Midsummer subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of Institutions.

EXAMINATION PAPERS, 1869.

(*Continued from page* 807.)

The following are the Examination Papers set in the various subjects at the Final Examination held in April last:—

DOMESTIC ECONOMY.

THREE HOURS ALLOWED.

1. Write a letter addressed to a young couple about to keep house, on an income of £200 per annum, mentioning the amount of weekly expenses they should incur, the number of servants and the general household arrangements, so as best to secure an economical and comfortable dwelling.

2. Describe the necessary fixtures and fittings in a sitting-room and bed-room in an ordinary tradesman's house, naming the prices at which the articles mentioned may be procured.

3. A tradesman's household consists of a man and wife, three young children, and two maid-servants. Give an estimate of what ought to be the weekly expenses in coals, meat, bread, washing and grocery, stating the cost under each of the heads separately.

4. What are the usual taxes which a person possessing and inhabiting a house rated at £50 per annum, would have to pay?

5. Mention the best methods of promoting a vigorous development of the bodily frame in boys, due attention being paid at the same time to their intellectual progress.

6. Mention some of the ordinary ailments to which young children are liable, and the best means of treating them in the absence of a medical man.

7. Write a letter of advice to a nurse, detailing the best methods of performing the duties of attendant on the sick.

8. Mention some faults commonly committed by laundry women, the causes to which they are attributable, and the effects they produce upon the appearance and quality of clothing.

9. Explain clearly the uses and properties of soda and soap.

10. How may the following articles of food be prepared, so as to be both economical and palatable: oatmeal, rice, fish.

11. Compare the advantages of linen, cotton, and woollen clothing, with regard to durability, health, and economy.

12. State what are the usual adulterations of milk, and how they may be detected.

13. State what are the usual adulterations in sugar and cayenne pepper, and how they may be detected.

14. State what are the usual adulterations in pickles, preserves, and bottled fruits, and how they may be detected.

15. Describe the best treatment for sprains, slight wounds, and whitlows.

16. Mention the precautions to be observed in rearing and fattening fowls and geese.

17. What would be the expense of lining a cistern 3 feet 6 inches long, 2 feet 8 inches wide, and 2 feet deep, with sheet lead of 6 lbs. to the square foot, estimating the lead at 18s. 8d. per cwt?

18. What would be the cost of painting six doors on both sides, the dimensions of each door being $6\frac{1}{2}$ feet by $3\frac{1}{2}$ feet, at 8d. per square yard?

19. How much will the turfing of a round plot cost at 4d. per square yard, if the diameter be 180 feet, and a circular fountain 18 feet in diameter be left in the middle?

20. A person twenty-seven years old saves £10 yearly, and puts it out to interest at £3 per cent., what will his savings amount to in twenty-three years?

POLITICAL ECONOMY.

THREE HOURS ALLOWED.

1. Define wealth. Explain what are the three requisites for the production of wealth, and describe with particular distinctness the assistance which is rendered to the production of wealth by capital.

2. Show that it is fallacious to consider that capital is synonymous with money. Explain the difference between fixed and circulating capital. How does it happen that labourers are sometimes temporarily injured by the introduction of machinery?

3. How does the division of labour increase the productiveness of labour? Did Adam Smith omit to enumerate any of the advantages which result from division of labour? Explain what is meant by the simple and complex co-operation of labour, and briefly describe Mr. Wakefield's theory of colonization.

4. Trace the connection between an increase of population and the value of agricultural produce. Give a brief description of Ricardo's theory of rent.

5. On what circumstances depends the accumulation of capital? Briefly describe the leading economic features of the following countries: England, India, Australia, the West Indies, and the United States. Why does not high farming pay in America?

6. Upon what depends the average rate of wages? Show that the labourers cannot be permanently benefited, but will ultimately be injured, by any agency which temporarily raises wages, by reducing the profits of capital.

7. Show that the rate of profit varies inversely with the cost of labour, and explain the three circumstances upon which the cost of labour depends. How is it that the rate of profit is extremely high in such a country as Australia?

8. Define the difference between value and price, and prove that there cannot be a general rise or fall in values. Show that it is incorrect to assert that the price or value of a commodity depends upon a ratio between demand and supply. State the three classes into which commodities must be divided, when considering the causes which determine their price or value; and show how the price or value of a commodity is determined according as it belongs to each of these three classes.

9. Describe Adam Smith's four rules or canons of taxation. State the difference between direct and indirect taxation, and describe the particular inequalities which belong to each of these systems of taxation.

CIVIL GOVERNMENT AND THE LAWS OF ENGLAND.

THREE HOURS ALLOWED.

(*From Creasy, on the Rise and Progress of the English Constitution.*)

1. What were the origin and object of the division of the country into counties, hundreds, and tithings, and what was the original constitution and subsequent alteration of the County Court?

2. What were villeins, and give a short sketch of the history of villenage?

3. What were the origin and development of trial by jury, and how far is it founded upon Magna Charta?

4. What have been the different conditions of the right of voting in counties down to the last Reform Act, inclusively?

5. What is a bill of attainder, and when and why was that mode of proceeding first introduced?

6. What were the chief points at issue between Charles the First and his Parliament, as shown by the terms of the Petition of Right? What were the form and effect and the history of that petition?

EXTRA QUESTIONS FOR THOSE WHO ASPIRE TO A FIRST-CLASS CERTIFICATE.

(*From the 3rd and 4th Books of Stephen.*)

1. What are the rights of a husband upon the property of his wife?—and in what cases has the wife a power to bind her husband by her contract?

2. What are the laws now in force for enforcing conformity with the Church of England, and upon whom are they binding?

3. What are the different sorts of corporations, and to what different jurisdictions are they subject?

4. What provision is now made by law for the repairs of highways?—and in what cases is the law productive of hardship?

GEOGRAPHY.

THREE HOURS ALLOWED.

1. Describe briefly the chief natural features of Great Britain, especially with reference to the distribution of the high grounds, and the direction of the principal rivers.

2. State, in the case of England and Wales, the principal localities of mineral wealth, and especially of the more important coal fields. What branches of manufacturing industry are identified with the latter?

3. Name, in succession, the principal seaports of the Mediterranean, Black, and Baltic Seas, stating the country to which each belongs, and any notable condition of its locality—as at the head of any gulf, mouth of any river, &c.

4. Draw a map, either of France, Italy, or Russia in Europe, showing the high grounds, river-basins, and principal towns.

5. Give a brief description of the great natural features of Germany (*i.e.*, of the whole of Germany, without reference to political divisions), or else draw a map of that country, showing the mountains, rivers, &c.

6. What portions of Germany are comprehended within the present North German Confederation? What change from the political *status* prior to the war of 1866 did its formation involve? And what gain of territory accrued to Prussia by the alterations then made?

7. State, in general terms, the extent and population of the present Dominion of Canada. What great provinces does it include, and what city forms the capital of the whole? Describe the more important natural features of the whole region.

8. Describe briefly the characteristic natural features of the Australian mainland. Say what colonies are embraced within it, and name the capital of each.

9. State the localities of the following places:—Kurachee, Zanzibar, Yokohama, Algoa Bay, Monte Video, Bahia, Callao, Mobile, Chicago, Batavia, Masulipatam, and San Francisco.

10. Say what are the characteristic productions and chief commercial resources of the following countries respectively:—Brazil, United States, European Russia, Italy, Egypt, Sweden and Norway, Belgium, and the East Indian (or Malay) Archipelago.

11. What are the chief conditions by which climate (especially as regards temperature) is regulated? Account for the fact that correspondent belts of latitude do not necessarily involve correspondent temperatures, either annual or seasonal.

12. Of the great orders of mammalia (*carnivora*, &c.) some are wanting in the native zoology of America and Australia, while others are peculiar, or nearly so, to those divisions of the earth; state the leading facts in these regards. Also give some like instances of contrast in respect of the food-plants indigenous to the Old and New Worlds respectively.

ENGLISH HISTORY.

THREE HOURS ALLOWED.

1. When was this island first visited by the Romans? Where were their chief settlements? What did they do towards its civilization?

2. In what parts of the island did the Anglo-Saxons first settle? From what part of the Continent did they come? Draw a contrast between them and the Romans.

3. At what time did the consolidation of the Saxon Heptarchy, as it is called, take place? Under what king? Mention the names of some of the more illustrious Anglo-Saxon monarchs from the consolidation of the Heptarchy to the Conquest.

4. What usages, social and political, did the Anglo-Saxons introduce?

5. In what way were the Normans allied to the Anglo-Saxons, and in what respects did they differ from them?

6. What institutions did the Romans bring with them? Contrast their character with that of the Anglo-Saxons.

7. Give a brief account of the Constitutions of Clarendon, and state the occasion to which their origin was due.

8. Under which of the Plantagenet kings did the people gain the greatest amount of political liberty, and why?

9. What is meant by the expression, "The Houses of York and Lancaster?" Give a brief account of the origin of this famous division. What permanent impression did it leave on English history?

10. Give the dates of the following:—1. Itinerant Justices. 2. Origin of the House of Commons. 3. The Provisions of Oxford. 4. The death of Mary Queen of Scots. 5. The Court of High Commission. 6. The Petition of Right. 7. The trial of the Seven Bishops. 8. The Battle of Dunbar. 9. Solemn League and Covenant.

11. Give a brief account of the state of parties in England in the year 1644.

12. Give a short account of the Bill of Rights.

13. Under whose management were our possessions increased in India? and how were they lost in America?

14. Under what reigns will you place:—1. The invention of Printing. 2. Declaration of American Independence. 3. Conquest of Ireland. 4. Union of Great Britain and Ireland. 5. Roman Catholic Relief Bill. 6. Milton's Paradise Lost. 7. Robinson Crusoe. 8. Gulliver's Travels. 9. Shakespeare's Henry IV. 10. Clarendon's History of the Rebellion. 11. Spenser's Faery Queen. 12. Magna Charta?

SPECIAL.

(*a.*) Give an account of Anne's behaviour during the troubles of her father James II.

(*b.*) By what ministers was she successively governed? Give a short account of each of them.

(*c.*) What was the cause of Dr. Sacheverell's trial? To what results did it lead?

(*d.*) Mention the names of those who were eminent as politicians, generals, or authors, during this reign; and for what actions or writings they were specially distinguished.

(*e.*) State from what authorities your information is derived.

(*To be continued.*)

DISTRICT SCHOOLS FOR PAUPER CHILDREN.

By George C. T. Bartley, Esq.

V.—THE INDUSTRIAL SCHOOLS, LIVERPOOL.

This is not, strictly speaking, a district school, as it belongs only to the parish of Liverpool, but that parish being of so extensive a nature, the schools are, to all intents and purposes, of the same description as those institutions already considered. During the year ending March, 1868, the number of scholars was 1,290. In the following statistics the cost of the new infant schools

and alterations at Kirkdale have not been taken into account, as they were at the time only in progress, and could not, therefore, be considered as part of the school system.

I.—Cost of Officers and Servants.

Description of officer.	Salary.	Estimated cost of rations.	Total.	Cost per head for each child in the school.
	£ s. d.	£ s. d.	£ s. d.	£
1.—*General Staff.*				
Governor and Matron ...	300 0 0			
Assistant do. do. ...	100 0 0			
Chaplain	250 0 0			
Clerk and Storekeeper...	50 0 0			
Clothing Storekeeper ...	20 0 0			
Watchman	47 14 0			
Servants	298 1 11			
Clothing for ditto.....	132 15 10			
	1,198 11 9			
2.—*Nurses.*				
Head infirmary	30 0 0			
Under nurses	214 7 9			
	244 7 9			
3.—*Medical.*				
Surgeon	125 0 0			
4.—*Teachers.*				
Head schoolmistress.....	75 0 0			
Assistants	176 16 0			
Assistant masters	226 4 7			
Boys' pupil teachers ...	26 10 0			
Girls' do. do.	11 11 0			
	516 1 7			
5.—*Industrial Teachers.*				
Bandmaster	66 5 0			
Drillmaster	63 11 0			
Tailor	69 12 8			
Baker	75 8 6			
Engineer..	63 8 0			
Joiner	63 12 0			
Shoemaker	71 9 0			
Gardener	60 19 0			
Industrial mistress	30 7 9			
Sewing.....	20 0 0			
Laundresses	62 4 11			
Cooks	25 10 0			
Blacksmith	65 13 0			
Plumber	67 10 0			
	805 10 10			
Total cost of rations to officers		*1,711 9 10		
Grand Total	2,889 11 11	1,711 9 10	4,601 1 9	3·573

II.—The Cost of Maintenance.

In the report issued to the public, this heading is divided into two, viz., provisions and necessaries; but what is embraced under each category is not given, nor is it very easy to determine. The total amount expended is £7,878 5s. 7d., which is undoubtedly very low, and gives an average cost per head of £6·107 per annum. This is less than two thirds that of the school at Hanwell. The difference may be accounted for, to a certain extent, by the average cost of the common necessaries of life being somewhat lower in Liverpool than in London, though this alone is not nearly sufficient to explain so great a discrepancy.

III.—The Cost of Clothing.

In this particular also the school bears a favourable comparison with others, the total amount spent being but £2,195 1s. 2d., or as little as £1·701 per head per annum.

* As the number of servants, masters, &c., is not given in the report, which is to be regretted, it is not possible to divide this sum, as has been done in the other schools.

IV.—Miscellaneous Expenses.

This item amounts to £3,400 9s. 6d. (including £506 4s. 6d. for the outfits of children on leaving the school for situations), or at the rate of £2·636 per head per annum. In the published accounts of the school every detail of expenditure is stated, and the manner in which the accounts are drawn up by the authorities of the Liverpool parish might form a pattern for the other schools of a similar description. The miscellaneous item is usually the one which regulates the cost of the school, as, though the other headings vary considerably, the tendency is to increase this, and to charge unnecessary luxuries under it. It may be remarked as a sign that the children here are healthy, and do not require a large amount of physic, from the fact that the sum expended in drugs, &c., amounted to but £56 10s. 1d., or not much above tenpence each child during the whole year.

V.—Farm Expenses.

This item, it is to be regretted, disappears, as the children are not employed on farm labour at all. Although it may be a question whether their labour in this branch is commercially remunerative, yet there can be no doubt but that, as a means of physical training, a farm forms a most valuable addition to an industrial school.

VI.—Rent and Repayment of Cost of Building.

This item is also very low in the Liverpool school, amounting to £1,209 16s. 1d., of which sum £1,000 was for repayment of loans. The cost per head is, therefore, £·938.

The general summary of the cost of each child per annum in this school is, therefore, as follows:—

1. Staff	£3·573
2. Maintenance.....	6·107
3. Clothing	1·701
4. Miscellaneous	2·636
5. Farm	—
6. Rent and redemption of buildings	·938
Total	£14·955

Although the total is not quite so low as the South-East Shropshire school, yet it is so much cheaper than most of the other large district schools, that it may be useful to compare the cost of each, reduced to a weekly standard of pounds, shilings, and pence, which is perhaps more readily appreciated than the yearly cost, given in decimal fractions of a pound.

	Hanwell.	Sutton.	Norwood.	South-east Shropshire.	Liverpool.
	s. d.	s. d.	s. d.	s. d.	s. d.
1. Staff	3 1½	1 6	1 7	1 2½	1 4¾
2. Maintenance	3 7¾	1 10¾	3 4¾	2 7¾	2 4
3. Clothing	0 8½	0 8¾	0 7¾	0 6¼	0 7¾
4. Miscellaneous	1 9¼	0 11¾	0 5¼	0 6½	1 0
5. Farm.....	0 4½	0 2¾	0 3	...	...
Total cost per week for each child, not considering rent ...	9 7½	5 4	6 3¾	4 11	5 4
6. Rent and redemption of buildings	2 2	1 7½	1 0	0 4½	0 4¼
Number of children in the school .	1,051	1,177	810	173	1,290

AMSTERDAM EXHIBITION.

Various arrangements have been made to assist and direct workmen who visit the Amsterdam Exhibition. There is a sub-committee specially for foreign workmen, consisting of the following:—Messrs. C. A. Cremmelin, N. G. Pierson, A. C. Waller; Alex. Daniels, Zwanenburgerstraat, P. 185, secretary. The conductors of workmen, or workmen separately, either Dutch or

foreign, may apply personally or by letter to the secretaries in case advice or assistance be required.

There is also an inquiry office in the front square of the Exhibition, for the convenience of foreign visitors, at which every kind of information is given gratis. Tickets may be had there for admission to the dormitories, and to public and private remarkable institutions. Letters should be addressed to the inquiry office of the International Exhibition.

On the appointed days (usually Tuesday, Wednesday, Thursday, and Saturday) admission tickets for the Exhibition are to be had there, on presentation of the tickets signed by the local committee.

On the premises of the Exhibition there is an exchange-office, at which foreign specie may be exchanged for Dutch money, according to the course of exchange.

In the vicinity of the inquiry-office guides will be stationed, appointed by the committee, and under the superintendence of the police. The guides are provided with a ticket showing their due appointment, and the tariff of charges, which are very low, and beyond which they are not entitled to charge. In case of dispute, application is to be made at the inquiry office.

Workmen's lodgings have also been arranged in the immediate vicinity of the Exhibition premises. A wooden dormitory has been built, consisting of two rooms connected with each other, with accommodation for 100 persons. Each room has a passage in the middle, on each side of which are small recesses with two bedplaces. Those who wish the concierge to keep their luggage for them have to pay 1d., however long or short their stay. The charge for one night in the dormitory is 1s.

Further on the Singel, near the Heilige Weg, a large room (the Militia room) has been fitted up as a dormitory. In this room 80 beds, &c., have been placed. There the charge per night is 8d. each.

A ticket of admission is required for each room in particular. These tickets may be had at all times during the day, at the inquiry-office only, at the entrance of the Exhibition grounds.

On the premises of the Exhibition a refreshment-room for the people has been fitted up. The entrance is at the side of the public road, and on that of the Exhibition. A cheque is to be had at the entrance, to be given in payment in the refreshment-room. The cheques are worth 4d. and 8d. The breakfast consists of 2 rolls and a cup of coffee, 4d.; supper the same; dinner of a portion of meat, potatoes, and vegetables, for 8d. Breakfast, dinner, or supper may be had *à la carte*. The cheque is handed in payment, and, if deficient, the money added.

The refreshment-room is open from 7 a.m., till 10 p.m. (on some evenings till 11 p.m.).

WHITWORTH METAL.

It is well known to mechanicians that Mr. Whitworth has been long engaged in testing a new process of making and casting iron or steel, which he has invented with the view of getting rid of all those accidents which arise from the air-bubbles found more or less in all iron castings, and not removeable by any amount of hammering. Mr. Whitworth has now perfected a mode of casting metal which renders it so homogeneous that it resists any given forces which can be brought to bear upon it. The following notice, from the *Times* of 31st August last, gives an interesting account of the application of the Whitworth metal to ordnance. The notice is written by an officer of the Royal Artillery, thoroughly acquainted with the subject:—

"Mr. Whitworth has long been known as a mechanician of the highest order. To him is due the accuracy with which machinery may now be made to turn out work almost perfect in its beauty and precision of dimensions. When once the transference of circular into direct or eccentric motion and the converse was achieved, it was easy to devise a thousand means of carrying the discovery into practice, and, theoretically, of producing any, even the most delicate forms. But the main difficulty had still to be surmounted. The machines themselves were imperfect in dimensions. There was no such thing as an exact plane in existence, much less an exact sphere, or cylinder, or cone. Every part of every machine was really rough and uneven in surface, however precise it might appear to the naked eye, and it is clear that wheels of imperfect roundness, turned by equally imperfect shafts, working in imperfect beds, could never turn out perfect productions. The defects continued to reproduce themselves, for the parts of new machines were made by the old ones. A beginning had to be made somewhere. Mr. Whitworth set to work to make plane surfaces of mathematical accuracy. First manufacturing three flat pieces of hard metal as exact as was possible by the ordinary means, he then rubbed two of their surfaces together till there remained no perceptible friction. He then took the third and worked it on to the two others, continuing the process till the three were so equal that, if any two of them were laid one upon the other, they touched nowhere, the upper one floating on an extremely thin film of air between them, without friction. If the edge of the upper one was pressed on the lower surface and pushed along it, followed by the body itself, there was no air between, and the two adhered together, held fast by the pressure of the atmosphere above and below. Here was the germ from which sprang exact spheres, cylinders, and wheels, the parts of machines which could be relied upon. Henceforward there was no limit to the preciseness of the productions, except the wearing of tools or of the machinery itself. But a finer test of the work was required than any then in existence, so Mr. Whitworth designed a measuring instrument, capable of marking faults for correction even if they did not exceed the one millionth of an inch. So the work produced and the parts of the machines could be rigorously tried, and many a new flight could be taken in the region of mechanics.

"When the demand came for small arms and cannon of longer range and closer shooting, Mr. Whitworth carried out a series of experiments for the government, laid down what he considered to be the laws governing the rifling of barrels and the shape of projectiles, and produced a rifle which attained results hitherto unknown. He proceeded to apply the same principles to artillery, and competed with Armstrong for the position of first artillerist in the world. But his rival had already not only designed but built a large number of guns, fulfilling in their construction the demands of practical soldiers, as well as those of scientific artillerists. The ground was already occupied, and when it was found that neither inventor could claim any very decided superiority over his antagonist, the strong practical objection to complication of guns and ammunition, by the adoption of two complete systems side by side, was, very properly, allowed to weigh against Mr. Whitworth. If the public service be the first consideration, many an ingenious inventor may find that there is no room for his works, though he may well deserve a handsome acknowledgement in one shape or another.

"Since the days of the Armstrong and Whitworth Committee, Mr. Whitworth has never dropped the subject of artillery. It was not enough for him to be acknowledged as the first machinist in England, he must also be accepted as in the front rank of artillerists—a desire which he shares in common with many others. Such an end is only to be attained by the manufacture of reliable heavy rifled guns, such as 300, 400, 500 pounders, or pieces of even higher calibre, and Mr. Whitworth was long unsuccessful in producing anything higher than a 7-inch gun. His system of gunnery is acknowledged by himself to be very severe upon the piece from which his long projectiles are fired, and we have more than once heard from his own lips that he sought in vain for a material which could be relied

upon, and produced in sufficient quantities. He adopted a mild steel as the metal theoretically most adapted to withstand both strain and wear, but he found, as all makers of steel guns have found, that the greatest care was unavailing to produce trustworthy steel tubes in large quantities and of large sizes. Many a fair-seeming piece of a gun would stand steady strains perfectly, but crack when the sudden shock of fired gunpowder occurred within it. So much material could not be wasted without increasing the cost of that which was sound, nor could guns be produced rapidly or in large quantities. The English government would hardly accept 9-inch guns costing £3,200 each, except for purposes of experiment, when pieces of equal calibre could be bought from Armstrong for considerably less than half the price, or manufactured in the Royal Arsenal, on Fraser's still cheaper system, for little over a fourth. Two such guns were purchased before the late Conservative government came into office, and their shooting was, what Whitworth shooting has always been, extremely good. The experiments with them seem to hang fire, chiefly, we believe, on account of some lack of harmony between Mr. Whitworth's idea of fair experiments and those of the Ordnance Department in the War-office.

"The subject would have been of little importance, but for a most interesting and valuable attempt of Mr. Whitworth to solve the one great problem of artillerists, by producing guns at once strong, cheap, and capable of being manufactured in large quantities. In spite of all researches, the reasons for the peculiar qualities of steel are still doubtful, but the most important and undesirabe quality, that which breaks the hearts of gunners, is the uncertainty of the metal. Of two tubes manufactured at the same place, about the same time, by the same workmen, one may stand 1,000 rounds, and the other burst destructively at the first or fiftieth round, sometimes without the slightest warning.

"One reason given is, that bubbles of gas formed in the molten steel before it is set are retained by the thickening fluid, and perpetuated as flaws in the ingot, no matter how severe a hammering it may have had. Mr. Whitworth claims to have succeeded in getting rid of these gas or air bubbles entirely by the application of immense pressure to the mass of molten metal while cooling. He has four qualities of this steel, or "Whitworth metal" as he calls it. They are known as yellow (having most carbon), blue, brown, and red, the red being the most ductile. He has tried many experiments on a small scale, and considers himself to be justified in declaring that he will now be able to make heavy guns perfectly trustworthy at a price of about £120 a ton, or one-fifth higher than Sir W. Armstrong's present prices, and rather more than half his own old ones. A 9-inch gun would cost £1,800, but then its projectiles would be heavier, and its power greater than its rival of the service pattern. Mr. Whitworth is pre-eminently an advocate of small bores in guns as well as rifles, being ready to sacrifice many practical advantages for good shooting. He now asserts that he throws to the winds all fear of his guns bursting. Instead of seeking for powder of less severity, his only wish is to find means of igniting it more rapidly, and he is making preparations for the construction of 27-ton guns, or even pieces weighing over 43 tons.

"It may be that Mr. Whitworth has achieved a task which would certainly lead to the adoption of his metal for the inner tubes, at least, of all guns, whatever might be their system of shooting; but the experience of all practical artillerists denies them permission to accept experiments on a small scale, as applicable to heavy guns, in which the force of the explosion is vastly multiplied, possibly even altered in its mode of action. The Government possesses two heavy Whitworth guns, but they are not made of the new metal, except in very small proportion applied to the exterior of the piece. They may be very useful to test ammunition, system of rifling, and so on, but their lasting qualities will prove nothing as to the strength of the new metal for guns, because they are made of the old metal. We understand that the superintendent of the gun factories applied to Mr. Whitworth for inner barrels, but was answered that the whole system or nothing must be taken. This seems a little obstructive; but here is a man of reputation asserting that he has the power of producing metal of extraordinary strength, and that he has actually commenced to make two 11-inch guns calculated to fire shells of 960 lbs. If he will not allow his material to be tried as part of the government ordnance, we cannot but think that it would be worth while to order one gun from him, embodying his newest ideas, and test it in every way without competition, for it seems that in this way alone can the authorities arrive at truth regarding the strength of the Whitworth metal as applied to heavy guns. It should be distinctly understood that Mr. Whitworth's system of charges and projectiles is acknowledged by him to be extremely dangerous to the endurance of the pieces of ordnance themselves, and must be rejected unless he can find material to bear the severe strain put upon it. If the new metal fails, his case falls to the ground; but it is surely worth a trial.

There is, however, another experiment possible to be carried out with the two costly guns now in the hands of the authorities. Mr. Whitworth insists that flat-headed shot or shells, very long, and therefore containing a large bursting charge, are the proper projectiles to fire at iron plates, especially when the target stands obliquely to the line of fire. We have inspected certain plates containing holes pierced or punched by flat-headed projectiles fired from the Whitworth 1¾-in. gun of 7 cwt. A plate of equal thickness with the shell was completely pierced at an angle of 45 degrees, and with a charge of 10oz. At an angle of 65 degrees the shell did not pass through, but made a ragged hole. At right angles it passed easily through a 2½-inch plate. A service gun of equal weight would have a calibre of three inches, and be capable of piercing at least the 2½-inch plate directly, probably a 3-inch plate. But it is not with these tiny pieces of ordnance that artillerists' attention is now chiefly occupied, at least out of England. The great point is to make guns and projectiles that will pierce iron-clad ships at all sorts of angles. The rough-and-ready rule with our service guns is, that a shot or shell will pass through an iron plate somewhat thicker than its own diameters; 9-inch projectile through more than a 9-inch plate, &c. But Mr. Whitworth contracts the diameters of his projectiles for the same weight both of gun and ammunition. He makes his shells long and narrow, so the rough rule has no application to them. We should very much like to see what target would be pierced by the Whitworth guns with Whitworth flat-fronted projectiles, and at what angle. The experiment is surely worth the small sum of money it would cost. It is of no use to point to experiments made with 2-inch guns. All working artillerists have been disappointed, over and over again, at the difficulty of getting big guns to do as well, in proportion to their bulk, as small ones. But there are the big guns, why not try the long, flat-fronted projectiles? When the question comes before Parliament it is sure to be made as foggy as possible. Let us try for once to state it clearly.

"Whitworth's system of artillery consists essentially in small-bore guns with long projectiles. The twist of the rifling must be rapid, because otherwise the long projectiles would turn over. All this involves a great strain upon the interior of the gun. Until now he has not succeeded in making heavy guns to stand this strain, except in small numbers, at a prohibitory price. He now asserts that he has found the material he has so long sought; but there is, as yet, no heavy gun in existence made of this material. We say, let him make one, and let it be tried. Then, there is that other question of his shells, which has nothing to do with the gun question,

and may be settled by firing some projectiles out of the costly pieces now in possession of the Government. If the shells succeed, it will be interesting to know whether Mr. Whitworth can really make guns at a reasonable price capable of firing them. Then will come the last question, perhaps more difficult still to answer, where can such guns be placed without involving such a complication of ammunition and stores as would be detrimental to the public service? We hold that Mr. Whitworth has made out a case for experiment."

CHANNEL PASSAGES BETWEEN ENGLAND AND FRANCE.

Mr. John Grantham, C.E., writing to *Engineering*, says:—

"While so many magnificent schemes are being designed to improve the communications between England and France, while plans for new harbours, tunnels, bridges, and ferry-boats to carry trains are being proposed, the possibility of turning the present system to account in making an efficient means of transit seems to be lost sight of.

"The railways, both in England and France, are excellent, and, on both sides of the Channel, they are now run to the piers alongside the steamers; the only question to deal with is the transfer of the passengers and their luggage from one railway to the other with the least possible delay and discomfort.

"Now, as regards the time, let us take a similar case, and ascertain what is done with the Irish mail. A train arrives at Holyhead pier with a load of passengers and luggage, and in seven minutes, on the average, the steamer starts. On arriving at Kingstown, from the time the engines of the steamer are stopped till the stages from the shore are in their place, the time required is two minutes. We also have proofs that steamers may be constructed which shall carry the largest amount of passengers with great comfort, with very little motion and with scarcely any exposure, across from Dover to Calais in little more than an hour, and that the present harbours are sufficient to accommodate such vessels; so that it is quite possible to start a train on one side in an hour and a-half after the arrival of the train on the other, without any undue haste or discomfort. This supposes that, in addition to suitable boats, proper sheds are erected on the piers, with all modern appliances for the safe and rapid transfer of the passengers and luggage. It is, however, not intended as an argument to show that improvements in the existing harbours are not called for; on the French side these are very defective, and it is to be hoped that sufficient pressure will be put on the government, to cause them to give increased facilities at Calais or Boulogne.

"But in the meantime, and as an instalment of what must be done as regards the vessels, even should the harbours in France be improved, a proposal has been made by the writer to the South-Eastern Railway Company, and alluded to in Captain Tyler's report to the Board of Trade, to build suitable steamers for this service, and to provide other facilities which shall remove most of the grievances so justly complained of by the public.

"The railway companies have perhaps been wrongfully accused of neglecting the interests of the public, in not providing more efficient accommodation; they have, doubtless, been guided by the very prevalent impression that nothing effectual could be done until the French harbours were improved. There is, however, ample proof that such vessels as are now proposed may safely be worked, and, if employed, add considerably to the number of passengers who would cross the Channel.

"The vessel, as proposed, would be 400 ft. long, 45 ft. beam, and 600 nominal horse-power, to be built of steel, and to draw 6 ft. 6 in. water, and to steer from either end, to avoid the necessity of turning; the lower part of the ship to be cellular, so as to avoid the danger of sinking if injured by a collision, and to add to her strength. This cellular portion is 6 ft. in depth; over it would be the main saloons, these to be 10 ft. in height, and provided with ample accommodation for reclining in bad weather; good refreshment tables also would be provided, with light and air, to avoid that gloom and closeness so painful to landsmen when on board ship. Between the paddle-boxes would be a promenade deck, 100 ft. long, on the extremities of which would be the houses from which the vessel would be steered. To strengthen her amidships, with the least amount of weight, there would be provided four open longitudinal girders, about 250 ft. long, so arranged as to cause very little obstruction on the ship, and longitudinal bulkheads, about 90 ft. long, would run through the engine compartment. In addition to these precautions, the plates of the sides would be extended up, and form the inner side of the paddle-box, drawn off towards the ends at the same angle as the trussed girders.

"To facilitate the transfer of the passengers and luggage from the piers to the ship, wide and ample means are provided, at three different elevations, to receive the stages from the shore. The lowest of these is on the level of the main-deck; the next is on the level of the promenade deck, and the upper one is on the paddle-boxes or on the captain's platform; so that, whatever should be the state of the tide, the stages may rest on the top of the piers, and nearly level. On the piers should be erected sheds, under which the trains should run, as in ordinary railway-stations, to be well enclosed and lighted, so that but little delay or discomfort would arise.

"The staircases leading from the promenade platform to the deck should be easy, wide, well-lighted, and sheltered.

"The great bulk of the luggage would be stowed in trucks, the bodies of which would be hoisted by hydraulic cranes on to the deck, and again lifted off on the other side, and placed on wheels provided for them. An ordinary train might thus be transferred in about five minutes, with no exposure to the passengers or injury to the luggage.

"In all this there is no novelty introduced; all that is proposed may be seen in operation in other places. The only question that can be raised is as to the facility of working a vessel, such as is here described, in and out of the harbours. For experience in this, we refer to the American steamers, which, it is affirmed on all sides, are managed with wonderful precision. These vessels have in some instances exceeded 400 ft. in length. Those on the rivers draw 5 ft. and 6 ft. of water, and those which put to sea vary from 7 ft. to 10 ft.; but all are of immense height out of water, the wheel-houses of some being upwards of 40 ft. above the water-line. The vessel now proposed, though drawing only 6 ft. 6 in., will not exceed 15 ft. above the water-lines at the ends. Long vessels steer much more steadily in heavy weather than short ones, and will, therefore, enter such harbours as Calais or Boulogne with more safety than the present vessels, and, when fairly entered, there is time to bring them to a standstill before reaching their berths.

"In proposing this plan for crossing the Channel, it is unnecessary to allude specially to any of the plans designed by others. It may, however, be well to give the writer's reasons for not having contemplated in this vessel the system of carrying the trains across on the deck of the steamer, a plan frequently proposed and carried out in some places, but not under similar circumstances. The reasons are numerous. First, and most serious, is the necessity of placing the vessel in a position of perfect stillness before taking the trains on or off the ship. This involves new harbours on each side, with dock-gates and breakwaters to protect them. Secondly, the large ships necessary to carry the trains will take a long time in bad weather before they can be placed in position and the gates closed. Thirdly, very

few persons would remain in the carriages when being put on board, and, in the event of sea-sickness, they could not be allowed to remain, so that the passengers must have time to leave the carriages and walk on board. Lastly, the large outlay in forming the harbours, appliances for shipping the trains, and the extra cost of the ships, together with the cost of working them, render it probable that the railway company would not adopt the system if prepared.

"If the plan proposed by the present writer is practicable, there is an immediate remedy for the great and most serious evils so long felt to exist in this great highway of nations, the most important thoroughfare in the world."

PARIS IMPROVEMENTS FROM 1852 TO 1868.

The improvements that have been made in Paris since 1852, remind one of the saying of the Emperor Augustus, that he found Rome built of brick and left it in marble. The following are the principal improvements which have been made in the city of Paris during the last sixteen years:—

Streets.—In 1852, the total length of the streets were 384 kils.; this length is now reduced by the reconstruction of a great part of the city, by forty-nine kils., to 335 kils. This comparison, however, gives no idea of the improvements that have been made in a sanitary point of view, neither does it show the increased facilities afforded for traffic. In 1852, the total area of the 384 kils. of streets in Paris was only 4,530,000 square metres, giving an average of twelve metres in width for each street. The area of the forty-nine kils. of streets which have been suppressed was only 325,000 square metres, or seven metres in width on the average. The streets in the zone which was taken within the limits of the city of Paris in June 1859, in spite of the numerous imperial and departmental roads and highways which crossed them in all directions, had only a total area of about 504 hectares, and averaged in width thirteen metres. On the other hand, the 95 kils. of new streets which have been opened in old Paris cover an area of 2,332,000 square metres, and average in width twenty-four metres; and whilst they have only increased about one-quarter in length, their area has been more than doubled. In the suburban zone, the forty-one kils. of new streets which have been opened cover an area of 769,000 square metres, and average in width eighteen metres. About nine kils. of new streets have also been opened by private individuals, averaging twelve metres in width; their total area is 110,000 square metres.

The total length of the network of streets in Paris now amounts to 850 kils (527 English miles) in length, and cover an area of 12,291 hectares (30,358¾ English acres). Of this, 136 kils. (84½ English miles), covering an area of 310 hectares (765¾ acres), have been opened during the last eleven years. The total area of Paris is now 7,802 hectares (more than 30 square miles), of which old Paris covers an area of 3,402 hectares, and the suburban zone, recently annexed, 4,400 hectares.

In 1852, there were 287 kilometres of footways, covering 730,000 square metres, in Paris proper; there now are 746,700 metres in length, and 1,601,000 square metres in area. In the suburban zone, at the time of annexation, there were 136,805 metres of foot pavements, covering an area of 341,600 square metres. Now this has been increased to 341,594 metres in length, and 1,365,550 square metres in area. This shows an increase of 459,700 metres in length, and 87 hectares in area for old Paris, and of 204,799 metres in length, and 102½ hectares in area for the suburban zone; making a total increase of 663 kilometres in length, and 189 hectares extent. The total length of the foot pavements is now 1,088 kilometres (674½ English miles), and their area is 296 hectares (731 acres).

As regards the plantations and avenues, which previous to 1852 were 38,520 metres in length, and covered 410,000 metres in old Paris, and 26,570 metres, with an area of 310,850 square metres, in the suburban zone, these now measure 83,498 metres in length, and cover an area of 806,000 square metres in old Paris, and 112,953 metres, with an area of 937,000 square metres in the suburbs; showing an increase of 44,978 metres in length, with an area of 396,000 square metres, in the former, and 86,382 metres, with an area of 626,750 square metres, in the latter, making a total of 130 kils in length, and covering an area of 102 hectares. Previous to 1852, the number of trees planted in the streets of old Paris was 32,000, and in the suburban zone 18,466, making a total of 50,466. Now there are 95,577 trees, of which 55,824 are in old Paris, and 39,753 in the suburbs.

The Bois de Boulogne and de Vincennes have not only undergone a complete transformation, but have also been enlarged; the area of the former is 847 hectares (2,092 acres), and that of the latter 800 hectares (1,976 acres). The handsome new park recently opened on the Buttes Chaumont covers 25 hectares (61¾ acres), that at Montsouris 18 hectares (44½ acres), and, lastly, the Parc Monceau, which has been for several years past a model of good order, 8½ hectares (21 acres).

Twenty-one new squares have been opened since 1852, and occupy an area of 9 hectares (22¼ acres).

Considerable improvements have been made in the Champs Elysées, and in the Avenue de l'Observatoir. The former has an area of 18½ hectares (45¾ acres), and the latter 3 hectares (7½ acres). The new Avenue de l'Imperatrice is 12 hectares (29½ acres), the Boulevard Richard Lenoir 5 hectares (12½ acres), and the Place du Roi de Rome 23 hectares (56¾ acres).

Bridges.—Between 1852 and 1868, the Ponts Napoleon, Solferino, de l'Alma, and the Pont du Point du Jour have been built. The Ponts de Bercy, d'Austerlitz, Louis Philippe, d'Arcole, Saint Louis et Notre Dame, the Pont aux Doubles, the Petit Pont, the Pont au Change, the Pont Saint Michel, and the Pont des Invalides. The Pont Neuf has been completely restored, and the right of toll of the Pont de Grenelle has been purchased by the town.

Lighting.—Old Paris, in 1852, was lighted by 12,579 street lamps, of which 12,494 were gas, and 85 oil lamps. This part is now lighted by 21,061 lamps, of which 20,781 are gas, and 280 oil lamps, being an increase of 8,482 lights.

The suburban zone, in 1860, was lighted by 2,484 gas and 434 oil lamps; there are now 11,539 gas and 1,252 oil lamps, being an increase of 9,880 lights.

The total number of lamps used for the illumination of the city, including the suburban zone, is 33,859, of which 32,320 are lighted by gas, and 1,539 by oil.

Water Supply.—In 1852, Paris was dependent for her water supply on the aqueduct of Arcueil which brings 1,000 cubic metres per day of 24 hours from Rungis, and the Canal de l'Ourcq, with the Aqueduct de Ceinture, which distributed 105,000 cubic metres of water from the Ourcq and its tributaries. 7,000 cubic metres of water from the Seine was raised by the hydraulic machine at Chaillot, the Gros Caillon, and at the Pont de Notre Dame. The artesian well at Grenelle furnished 600 cubic metres, making a total of 112,600 cubic metres of water per day of 24 hours for the supply of the city.

At the present time, independent of the 1,000 cubic metres supplied by the aqueduct of Arcueil, the 105,000 furnished by the Canal de l'Ourcq, and the 600 cubic metres by the well at Grenelle, 88,000 cubic metres are raised daily from the Seine, of which 60,000 cubic metres are raised by the new machinery at Chaillot and at the Pont d'Austerlitz, and 28,000 by steam pumping-engines at Maisons-Alfort, Pont l'Anglais, at Auteuil, Neuilly, and at St. Ouen, which have been purchased by the town from the Compagnie des Eaux. An artesian well has also been sunk at Passy, which furnishes 80,000 cubic metres. The water-works of St. Maur have been constructed, and raise 40,000 cubic metres of water from the Marne daily. Two other establishments at Tricbardou,

and at Ile-les-Meldenses, pump up 80,000 cubic metres of water into the Canal de l'Ourcq, and the aqueduct of La Dhuis, which furnished from 24,000 to 30,000 cubic metres per day.

The total water supply now amounts to 350,000 cubic metres in 24 hours. This will further be increased by 100,000 cubic metres when the Aqueduct de la Vanne, with the reservoir at Montrouge, now in construction, is completed, and by two artesian wells which are being bored, one at the Butte aux Cailles, and the other at the Place Hébert.

The five reservoirs, which existed previous to 1852, of Monceau, Racine, Saint Victor, Panthéon, and Vaugirard, were only capable of containing 33,569 cubic metres of water, whilst the storage capacity of those which have been built at Passy, Menilmontant, Belleville, Buttes Chaumont, Charonne, Gentilly, with six other smaller ones, which have been purchased by the town from the Compagnie des Eaux, amount to 210,288 cubic metres.

In 1852, the total length of pipe was 705,360 metres, the greater part of which was of small dimensions, this has, to a great extent, been replaced by pipes of larger size. From 1852 to 1867, 674,640 metres run of new mains have been laid, varying in diameter from forty cent. to one metre, and of this 377,000 metres have been laid in the suburban zone, which before its annexation was badly provided for.

Drainage—In 1852 the length of the sewers in Paris was 107,430 metres, and, with the exception of the "Egout de Ceinture," the dimensions of the largest did not exceed 1·80 in height, and from 0·75 to 0·80 in width. Those of the suburban zone were of still smaller dimensions, and, in 1860, measured 39,300 metres in length. From 1852 to 1867, 197,370 metres of sewer of various dimensions have been constructed, the smallest being 2·30 in height, and 1·30 in width. The sizes of the others vary from 2·40 to 3·90 in height, and from 1·50 to 4·00 in width.

In the suburban zone, 165,650 metres of new sewers have been constructed, and 8,200 metres of collecting sewer outside Paris, to carry the sewage of the city to the Seine, at Asnières and Saint Denis. The greater part of the sewers of small size, both in Paris and in the suburbs, have been rebuilt, and there remain now only 15,840 metres of the old type. There are 242,670 metres of the smallest size (under 2·30 by 1·30) of the new type, and 176,160 of the largest size, provided with tramway and boat, with sluice for flushing them.

Markets.—The great general market of Paris, the Halles Centrales, covers an area of 60,000 square metres. The six pavilions forming the first group have been opened for many years, also the two principal ones in the second group, and two others quite lately. The Marché du Temple, the Marchés Saint Honoré and Saint Quentin have been rebuilt. Fourteen new local market places have been made. The new general abattoir in connection with the great cattle market at Villette has been completed within the last year, and covers fifty hectares (123½ acres). The abattoirs of La Roule, Montmartre, and Popincourt have been suppressed.

FRESH MEAT FROM THE RIVER PLATE.

An experiment of importance towards solving the question as to the possibility of obtaining supplies of fresh meat from the practically boundless plains of the River Plate has been successfully completed. It was stated in the *Times*, in April last, that the government of the Argentine Republic, and also the government of Uruguay, had granted to an English house the exclusive privilege of shipping live cattle from those States for a period of years, with entire exemption from all port charges and Customs duties, and that in the first instance a small trial would be made of the effect of the passage. It now appears that the steamer *City of Rio*, which arrived recently, brought nineteen oxen, which had been shipped at Montevideo, and had been thirty-one days at sea, with, it is said, a short supply of water and scarcely any food but the commonest hay. No casualty had occurred among them, although, from exposure and insufficient treatment, they had become extremely thin. They were hurriedly shipped, without selection, on its being found that the ship could take them, and the price paid at Montevideo was £5 per head, but a contractor at that port offers to supply any quantity at £4 per head, free on board, well prepared, and weighing not less than 800 lbs. each. It is also stated that the steamer by which these were brought had, on her outward passage, taken fifteen English bulls to Montevideo, consigned to Mr. Buschenthal, a large land-owner, which arrived after a thirty-seven days' passage (the distance being about 6,000 miles) not only all well, but, from careful treatment, in better condition than at the date of their embarkation. Of course, these experiences furnish nothing decisive as to the commercial results to be looked for from the trade, but a steamer is now building expressly for carrying it on upon a large scale. This is expected to be ready in about six weeks, and will be followed by others of a similar character.—*Mechanics' Magazine.*

Manufactures.

Woollen Manufacture in Italy.—The following statistics relating to the woollen manufactures are taken from a book recently published by Sig. Alessandro Rossi, entitled, "Dell' Arte della lana in Italia, ed all' estero guidicata all' Esposizione di Parigi, 1867." The number of persons of both sexes employed in the woollen manufacture in Italy is 25,000. The wages range from 70c. to 3f. 50c. per day. The number of spinning-frames throughout the kingdom is 673, and 6,480 looms. The following is the value of the annual consumption, production, and importation of woollen stuffs in Italy:—

	Francs.
Consumption	170,000,000
Production	74,280,000
Imports	86,635,290

Commerce.

Indian Cotton Supply.—A member of the Society, engaged in the investigation of the endemic fever in Bengal, in writing to the Secretary, says:—"It is curious to see how a decimating fever in Bengal re-acts, more or less, upon commerce. Among the cloth manufacturing villages I find that all the cotton thread used for weaving comes from Lancashire, *i.e.*, the cotton goes from this country to Manchester to be spun into thread, and is then brought back here to be woven into native cloth. This is a singular commercial fact, but all the mechanical skill in Manchester either will not or cannot weave a dootie as a native in this country can weave it. Hence the native woven dootie will always command a market until Manchester produces a similar and cheaper or as cheap an article. Then see how a scourging fever acts on trade. In one large manufacturing village (Limuspore), nearly depopulated, the demand for English spun cotton must be at least 70 per cent. less this year than last, and if this were multiplied over a number of villages, the falling off in the demand must assume some magnitude. Probably this may have been one of the minor, unseen, and unrecognised causes at work which added its modicum in bringing about the recent deputation to his Grace the Duke of Argyll, on the subject of the depressed condition of the cotton trade. Again, in another district, I found that, owing to the fever and the causes which produced it, the produce of silk has fallen off from £30,000 a year to £5,000 a year. In some places the fever has made terrible ravages, assuming the form of a plague, and sweeping off almost the entire population."

Pearl-fishery in California.—The value of the produce of the pearl-fisheries on the coast of California, in 1868, is estimated at 40,800 dollars for pearls, and 9,600 dollars for mother-of-pearl; in all 50,400 dollars.

Consumption of Meat at Milan.—The total number of head of cattle slaughtered at Milan during 1868, amounted to 66,000.

Imports of Petroleum at Trieste.—During 1868, twenty-five cargoes of petroleum from America were landed at Trieste, amounting in all to 46,000 barrels and 15,000 cases.

Agriculture and Commerce of Greece.—The production of the land in Greece, were agriculture carried on in that country with the same degree of perfection that it is in Western Europe, would support at least five millions of inhabitants. In 1860, the production of maize, barley, and other cereals amounted to 6,130,690 kilogs. The exports of wine in 1858 amounted to 1,867,680 okes, for the value of £29,708; in 1860, to 4,238,385 okes, for the value of £44,042; and in 1864, to 5,083,127 okes, for the value of £43,035. In 1834, the number of olive trees in Greece was 2,300,000, and in 1860, 7,500,000, with a produce of 5,812,315 okes of oil. Two years later, in 1862, the export of oil was 1,209,732 okes, to the value of £53,700. In 1834, the mulberry trees were 380,000, and in 1860, they had increased to 1,500,000 in number. Until 1859, silk was one of the most important articles of export, but the epidemic disease amongst the silkworms has since considerably diminished the prosperity of this industry. In 1850, 11,805 okes of silk were exported, for the value of £18,500, whilst in 1864, only 2,919 okes were exported, for the value of £7,400. The exports of cocoons have likewise decreased from 1,493,934 okes in 1857, to 32,263 okes in 1864. The value of the exports of tobacco in 1860 was £39,300 for 831,561 okes. During the same year, 20,504 lbs. of cotton, for the value of £440, were exported; and in 1863, the exports amounted to 698,640 lbs., for the value of £27,305; and in 1864, 1,122,741 lbs. for £49,120. Since then the exports of cotton have gradually increased. In spite of the destruction of the forests in Greece, there still remains a large quantity of timber, the property of the state, and, with good administration and roads, might become a source of considerable wealth to the state. The revenue derived from the forests, in 1867, amounted to £16,820. Sheep and goats are also very numerous in Greece, and the quantity of wool exported annually amounts to 5,000 cantari, equal to about 1,107 cwt. In 1860, the number of horned cattle was 158,927. The value of the mines and quarries, in 1867, was £49,700. Greece has been celebrated from the most remote ages for her marble quarries, which are still worked in many parts of the kingdom. The French commercial code was introduced into Greece in 1835. During seven years, from 1858 to 1864, the commerce of Greece increased 40 per cent. for imports, and 10 per cent. exports. The total amount of commerce in 1864 amounted to £3,330,000, the imports being £2,210,000, and the exports £1,120,000. The most important branches of industry in Greece are the silk manufacture, tanning, soap-boiling, iron-working, and ship-building. Cotton was formerly spun and weaved by the peasants in the most primitive manner; now there are several large establishments for spinning cotton. At Siza, the tanning and dressing of leather are carried on on a large scale; in 1864 the imports of leather to Greece amounted in value to £43,490. The number of merchant vessels belonging to Greece in 1834 was 2,755.

	No.	Tonnage.
1838	3,269	84,000
1854	3,920	268,000
1864	4,528	280,342
1866	5,156	297,424

This gives 58 tons as the average tonnage of the Greek vessels. In 1864 the total number of men composing the crews was 24,949. Siza is the most important seaport and centre of the commerce and industry and of Greece. The number of arrivals and departures of Greek vessels engaged in foreign trade was 10,829, of 960,683 tons, the arrivals; and 9,352, of 1,000,215 tons, the departures. The arrivals of vessels engaged in the coasting trade was 56,354, of 2,186,553 tons, and 45,780 the departures, of 1,880,891 tons. The total tonnage of the movement of merchant shipping amounted to 6,028,342. Greece has made no insignificant figure at international exhibitions. At the Great Exhibition at London, in 1851, the number of Greek exhibitors was 36; at Paris, in 1855, the number was 131; at London, in 1862, the number was 295; and lastly, at the Paris Exhibition, in 1867, the Greek exhibitors were 305 in number. The state of the roads in Greece leaves much to be desired, and may be attributed partly to the insufficiency of the population, and partly to the mountainous nature of the country, which has put great difficulties in the way of the carrying out of such works. The number of post-offices in Greece, in 1820, was only 13; in 1850, 39; and in 1861 the number was 103. The number of letters sent in 1840 was 323,300, in 1860, 725,708, and in 1861, 1,300,000.

Exports of Silkworms' Eggs from Japan.—During the past year the quantity of silkworms' eggs exported from Japan, amounted to 2,195,651 cards. Of this number 800,000 have been sent to France, Spain, Turkey, Persia, and other countries, and the remainder to Italy.

Movement of Shipping at Venice.—During 1868, the number of arrivals from Italian ports were 521, of a total tonnage of 48,786; the number of vessels that sailed from the port of Venice for Italian ports were 687, of 52,704 tons. The number of arrivals from foreign ports were 2,578, of 308,721 tons, and the departures 2,392, of 298,581 tons; making a total of 3,099, of 357,507 tons arrived, and 3,079, of 351,285 tons sailed. In 1866, the total number of arrivals were 2,886, of 258,435 tons, and departures 2,813, of 253,883 tons. The difference in favour of 1868 is, therefore, 213, of 99,072 tons, arrivals, and 266, of 97,402 tons, departures.

Colonies.

Gold in Queensland.—It has long been believed that gold and iron were to be found in large quantities in the country traversed by the rivers that fall into the Gulf of Carpentaria. The Gilbert ranges were especially pointed out as the spot where igneous rocks, through those which are stratified, gave a reason for believing, in connection with other conditions, that deposits of gold would be found. That anticipation has been fully realised. The creeks and gullies on the Gilbert River have been proved to be auriferous, and are represented as having been found payable with a more than ordinary uniformity. A great rush in consequence took place, not only from the different districts of Queensland, but also from the neighbouring colonies, and we fear that much disappointment, and perhaps wide-spread injury, will, as usual, be occasioned to people who, without practical knowledge of gold-mining, risked everything in the hope of turning up one of the prizes in the lottery of alluvial gold-mining. There can be no doubt, however, but that in the extreme north of Queensland very valuable mineral deposits exist, but they require skill and money to develop them, none the less because the first few comers can pick nuggets out of the soil without labour or expense.

Schools in Victoria.—According to the report of 1868, it appears that there has been an increase for the year of 226 children in the school, and 5 in the reformatories. The result of the industrial training was, that at the end of the year 194 children were licensed out to employers, 115 of whom were doing well. 52 had not been reported upon.

Land Revenue of Victoria.—According to returns lately furnished by the Victorian Government Lands Department, it appears that in 1860, 29,049,338 acres of

territory were occupied for pastoral purposes, for which a rental of £119,902 8s. 1d. was paid. At the present time 27,034,785 acres are occupied in like manner, at a rental of £174,331 17s. During the past year, 3,990 persons have taken up 158,354 acres of land under the 42nd clause. In the agricultural areas 303,117 acres had been applied for, and 2,261,959 acres were open for leasing on the 31st December last. The sales by auction last year consisted of 191,980 acres of land, realising £275,776 18s. 270,475 acres of commonage are available for farming and gold-fields, and the total land revenue for the past year was £870,497 4s. 9d.

Immigration to Victoria.—To the inhabitants of those colonies there is something incomprehensible in the attitude of doubt and perplexity assumed by the government and people of the mother country, when confronted with the momentous question of emigration. We, at this end of the world, possessing a full knowledge of the circumstances of Great Britain and of her Australian colonies, familiar, by report, with the ever augmenting pressure of population upon the means of subsistence there; conversant by daily experience with the hindrances to material progress, which result from the want of population here, and strongly impressed by the undeniable fact that every industrious man withdrawn from the over-crowded labour market at home becomes a valuable consumer of British commodities abroad, are at a loss to understand the hesitating and temporising policy of English statesmen and the English public, in regard to a matter of vital importance to the whole empire. It cannot be denied that a redundant population, which entails an annual tax of £12,000,000 sterling upon industry and property, in the shape of poor-rates and voluntary relief, besides furnishing thousands of recruits to the vast army of the vicious and the criminal, is a frightful evil.

Preservation of Meat.—Desultory experiments on the preservation of meat are being made by a number of the inhabitants in the Wimmera district, and to a certain extent with success. One of the most sanguine of the meat preservers states that the secret of his success is to dip the joint for a few minutes into boiling water. This he considers sufficient to prevent the action of the air, and to act as effectively as some of the most simple and less complicated agents which are now used. A suggestion has been made that the stock and flock owners of Riverina should establish packing and meat-preserving establishments in that district, which is considered one of the great fattening countries of the world. Nothing decided has, however, yet been done in the matter. An attempt has been made to float a meat-preserving company at Ballarat, but the project did not meet with the success its proposers expected, and the scheme was temporarily abandoned. Several gentlemen have, however, now taken up the matter warmly, and will commence operations without further delay.

Further Discovery of Copper in Australia.—Two or three weeks ago, Mr. T. Fleet, of the far north, brought to Adelaide some rich specimens of carbonates and oxides from a new discovery of copper in the north, thirty miles west of the Blueman property. They were taken from the surface of the ground, where a splendid lode of immense width is reported to be traceable for several hundred yards. Mr. Fleet placed himself in communication with several Adelaide gentlemen, and the result is that a conditional offer of £3,000 or £4,000 has been made to him for his discovery. An assay of the samples has given a return of 54 per cent. If the discovery turns out as valuable as the reports at present to hand indicate it to be, it will give a decided impulse to the formation of the railway into the north.

Cotton in Queensland.—There is one curious feature in the present short crop, that whilst some planters have gathered from one bale to one bale and a-half per acre, others have come off with practically nothing at all. A great deal of this difference proceeds from the various descriptions of soil in which the cotton has been planted, and it is strongly suspected that the rich scrub lands and strong black soil are not so well adapted for the plant as lands of a poorer description.

Statistics of South Australia for the Year ending 31st March, 1869.—There are 23,441,200 acres comprised in the colony. The extent of land in the possession of freeholders amounted to 2,270,079 acres, being an increase of 92,138 acres for the year. The area enclosed increased 929,196 acres. 533,035 acres were sown with wheat, from which 5,173,970 bushels were reaped, or an average of 9¼ bushels per acre. Barley, 21,244 acres, yield 311,142 bushels; oats, 4,210 acres, yield 59,213 bushels. Hay there was a large increase in, the acreage, say from 97,432 acres in 1867-8 to 106,644 acres in 1868-9, producing 113,167 tons. Potatoes, a decrease from 2,701 acres and 6,538 tons to 2,684 acres and 6,335 tons.

Notes.

New Professorship at Anderson's University, Glasgow.—Mr. James Young, so well known in connection with the paraffin industry, has presented ten thousand guineas to Anderson's University, for the purpose of founding a chair of technical chemistry, and establishing bursaries, scholarships, &c. Mr. W. H. Perkin, F.R.S., who, it will be remembered, delivered a course of Cantor lectures before the members of the Society of Arts during the last session, has been appointed the first professor.

Consumption of Horseflesh at Berlin. — During the past year, the number of horses slaughtered for food at Berlin was 4,044.

Newspapers in Italy.—In 1868, the total number of newspapers published in Italy was 842, in 115 towns. Six were published in Frenda, viz., 2 at Aosta, and 4 at Florence; 1 in English at Naples, 2 in the Neapolitan dialect, 2 in Piedmontese, 2 in the Venetian dialect, and 1 in Genoese. The greatest number of newspapers are published at Florence, viz., 126; then Milan, with 104; Turin, 82; Naples, 76; Genoa, 47; Venice, 29; Bologna, 29; and Palmero, 27.

The Improvements of Paris and the City Debt.—The Corps Legislatif was, during the late session, occupied with the discussion of a bill, the object of which was the approval of a treaty made between the city and the Credit Foncier for the reimbursement of a sum of four hundred millions of francs due by the city of Paris, for the execution of works of public utility. It is not our province to enter into the political phase of the question, or to discuss the charges of irregularity brought against the authorities of the Seine, but the cost of the great works carried on there since 1862, is a matter of general interest. The following statement is translated in full, and without correction of evident errors, from the *compte rendue* of the speech of M. Genteur, the government commissioner charged with the conduct of the debate:—"The total expenditure of the city of Paris, for road and other works, independently of a subvention of ninety-six millions of francs received from the government, has been 1,876,170,080 francs. Since 1852, there has been paid a total of 1,399,991,195 francs, 850 millions of which were derived from the excess of municipal receipts over expenditure. There remain to be paid 465 millions, which sum is the object of the treaty with the Credit Foncier. In addition to the above-named sum, the city owes 490 millions on account of previous loans; the sum due then for the various series of new roads, streets, &c., and for loans, 953 millions; and in addition, 156 millions due by the Caisse des Travaux Publics; total, 1,100 million francs (£44,000,000)." In the speeches of this gentleman, and those of the ministers, we find the following additional information. The cost of the first series of new boulevards and streets, namely, the Rue de Rivoli and the Boulevard Sebastopol, was 270 millions, that of the second series 410 millions, and of the third 300 millions,

in all 980 millions of francs, or £39,200,000; and this account does not include the alterations still in hand. The sum of 707 millions has been expended on buildings and improvements of various kinds; thus 61 millions have been spent on religious structures; 55 millions on hospitals and asylums; 129 millions on schools, lycées, mairies, and municipal edifices of all kinds; 38 millions on markets; and, lastly, 195 millions on promenades, squares, and lighting apparatus. As regards current expenses, the octroi service cost 3,000,000 francs a year in 1847; it had increased to 8,300,000 francs in 1867, but the per-centage has diminished, the rate being, in 1847, 10 per cent. It must be remembered, however, that the boundaries of the city, where the octroi duties are levied, have been enormously extended. The expenditure for primary instruction was increased from 1,100,000 francs in 1847, to 5,450,000 francs in 1867. The maintenance of the pavements, sewers, and the lighting of the promenades, &c., had risen during the same period from 4,300,000 frs. to 23,600,000 frs. The cost of keeping up the parks and public gardens has also increased from 250,000 frs. to 2,600,000 frs. per annum.

Glue which will Unite Polished Steel.—The following is a Turkish receipt for a cement used to fasten diamonds and other precious stones to metallic surfaces, and which is said to be capable of strongly uniting surfaces of polished steel, even when exposed to moisture. It is as follows:—Dissolve five or six bits of gum mastic, each the size of a large pea, in as much spirits of wine as will suffice to render it liquid. In another vessel dissolve in brandy as much isinglass, previously softened in water, as will make a two-ounce phial of strong glue, adding two small bits of gum ammoniac, which must be rubbed until dissolved. Then mix the whole with heat. Keep in a phial closely stopped. When it is to be used, set the phial in boiling water.—*The Stationer.*

Waterproof Packing Paper is thus made by some manufacturers:—The paper must first be covered with a resinous liquid, then painted over with a solution of glue and soot, as, without this, the paper will later show blotches. After this is dried, the actual waterproof coat is applied. This is prepared with 2½ ozs. of powdered shellac, dissolved in two pints of water, which is gradually brought to boil, and stirred until the substance is perfectly dissolved and softened, when gradually ⅓ oz. of powdered borax is added, until an intimate union of the substances takes place. The liquid is then left to cool, and, while still hot, any mineral colour may be added, such as lampblack, yellow ochre, red ochre, iron blue, or burnt umber, whereupon it is left to get entirely cold. It is then ready for use. The operation can be so quickly performed with a brush that two women can prepare 3,000 feet in ten hours.—*The Stationer.*

Patents.

From Commissioners of Patents' Journal, September 10.

Grants of Provisional Protection.

Ale, &c., fining and clarifying—2519—J. Valters.
Billiard tables, &c.—2564—R. J. Westley.
Boxes, fancy circular—2338—G. C. Ramsey.
Buoys, &c.—2357—E. W. Hawes.
Carding machines—2533—C. D. Abel.
Carriage breaks—2575—A. McNeile.
Carriage wheels, &c.—2578—T. Coles.
Carriages, &c., sunshades for—2551—J. Ritchie.
Cast-iron, producing wrought-iron and steel from—2538—E. A. Cowper.
Cast-iron, &c., treating conglomerates of—2553—T. S. Blair and F. Ellershausen.
Chaff-cutting machines—2522—R. Maynard.
Charcoal filters—2463—J. Prato and F. Polacco.
Coffee, &c., hulling, &c.—2544—B. Hunt.
Combustible compounds—1911—W. R. Lake.
Cops for wefting and warping purposes—2523—C. Mackay and T. K. Wheeler, jun.
Cotton, &c., machinery for spinning and doubling—2517—T. Briggs.
Elastic seats—2574—A. P. Tronchon.
Fire-arms, &c., breech-loading—2513—J. Williams.
Furnaces—2570—H. E. Newton.
Furniture, &c., casters for—2423—I. E. Woolf.
Gas—2313—P. R. Hodge.
Gas, purifying, &c.—2395—S. J. Woodhouse.
Gloves, fastenings for—2562—R. Priestley.
Grain, &c., apparatus for loading or discharging—2556—J. Holdsworth.
Hops, appliances employed in the cultivation of—2527—T. Coley.
Iron and steel, &c.—2540—J. M. Stanley.
Jewellery boxes, &c.—2567—W. F. Williams.
Kilns for burning limestone, &c.—1456—H. Robinson.
Lace—2536—H. Yates.
Lard, &c., refining—2547—W. R. Lake.
Looms—2549—S. C. Lister.
Looms—2576—W. Glover.
Mangling and squeezing machines—2554—J. Butterworth and J. Ainsworth.
Mattresses, &c., springs for—2545—J. Teychenné.
Mine shafts, &c., safety cages for—2571—C. R. Stooke.
Motive-power, obtaining and applying—2529—H. Call.
Nails, &c., machinery for manufacturing—2569—W. E. Newton.
Paper pulp and paper—2552—C. Duff.
Paper pulp, treating wood for the production of—2566—T. Cattell.
Printing machines—2601—A. Ogg.
Railway chairs, &c.—2599—H. Bridgewater.
Railway signal posts, &c.—2595—E. D. Temple.
Railway sleepers—2543—W. E. Gedge.
Railway trains, communication in—2557—R. H. Herriott and C. and W. A. Plumbe.
Railway water cranes—2550—R. C. Rapier.
Reaping machines—2579—T. Wardlaw.
Rests for supporting the arms, &c.—2591—R. Pitcairn.
Rotary engines and pumps—2561—J. Loader.
Sash frames, &c.—2593—P. McGough.
Sewing machines—2433—T. Coad.
Sewing machines—2483—W. Jones.
Sewing machines—2524—T. Shakespear and G. Illston.
Sewing machines, metallic belts for driving—2568—W. Winter.
Ships' cabins—2532—W. Brown.
Steam boilers, &c., safety apparatus for—2559—C. S. W. Muir.
Steam condensers, &c.—2535—B. Hunt.
Stoves—2560—R. C. Robinson.
Stoves, &c.—2542—F. J. Drechsler.
Telegraphs and relays, needle and alphabetical—2603—G. Henley.
Tell-tale clocks—2511—J. Frengley.
Vehicles, measuring and indicating the distance travelled by—2541—O. Vivier.
Velocipedes, &c.—2558—J. Brown.
Washing machines—2577—W. E. Newton.
Watches, &c.—2563—L. Goldberg.
Wire-work—2572—F. W. Potter.
Woollen fabrics, &c., apparatus for pressing—2585—G. H. Nussey and W. B. Leachman.
Yeast, manufacturing—2530—G. Zoeh and A. Lehmann.

Invention with Complete Specification Filed.

Motors, constructing electro-magnetic machines as—2597—T. Slater.

Patents Sealed.

741. J. B. Bernier.
754. H. Ormson.
766. G. Bray.
784. J. Tenwick.
795. W. R. Lake.
805. W. and C. S. Catt.
1231. W. Robinson.
1846. J. Tangye.
2166. J. H. Johnson.

From Commissioners of Patents' Journal, September 14.

Patents Sealed.

798. W. McAdam and S. Schuman.
802. W. Robertson.
806. E. Roper and G. Shaw.
812. H. Claughton.
814. M. Rourke.
818. J. H. Bennett.
822. G. R. Mather.
834. J. Cox.
836. J. Thomas, W. Bacon, and H. Groves.
837. F. W. Fox.
838. A. Albini.
850. H. Whitehouse and W. Probert.
855. J. Kay.
864. W. G. Crossley.
965. T. A. Dillon.
1001. J. Cruttenden & T. Wells.
1018. F. W. H. Medhurst.
1032. J. Sterriker.
1034. G. T. Bousfield.
1061. W. E. Newton.
1088. A. V. Newton.
1102. D. B. Peebles.
1135. A. V. Newton.
1268. J. Crabtree.
1316. J. Frölich.
1343. J. Wilson.
1385. C. J. Galloway and J. H. Beckwith.
1600. J. Brittain.
1734. F. Lewis.
1746. A. C. Engert.
2043. F. Walton.
2114. S. E. Crispe and J. West.
2148. R. P. Williams.
2173. W. Leftwich.
2234. J. Hayward.
2248. W. Dredge and A. Stein.

Patents on which the Stamp Duty of £50 has been paid.

2374. B. Bayliss.
2375. C. C. Connor.
2388. G. T. Bousfield.
2430. A. V. Newton.

Patents on which the Stamp Duty of £100 has been Paid.

2509. T. Molineux.
2514. J. R. Johnson and J. S. Atkinson.
2481. W. Hirst.
2506. W. Richards.
2520. G. Bedson.

Journal of the Society of Arts.

FRIDAY, SEPTEMBER 24, 1869.

Proceedings of the Society.

REECE'S COLD-PRODUCING MACHINE.

The principle of Mr. Reece's apparatus is, to take advantage of the high latent heat of ammonia and of the other physical characters of that substance, with the object of abstracting heat from water or any other materials, so as to effect a considerable reduction of their temperature. The result is attained by allowing liquefied ammonia to vaporise in a close vessel, surrounded by the water or other material to be refrigerated, so that the heat requisite for the vaporisation of the liquefied ammonia may be taken from the material cooled. This operation is rendered continuous by applying the absorptive power of water for gaseous ammonia, so that the gas is dissolved as fast as it is produced, and the resulting solution of ammonia is pumped into a vessel, where it is brought in contact with steam at a high temperature, so that the ammonia is again separated from the water it was dissolved in and passed to a condenser, where it is liquefied, and then serves to replenish the refrigerator. One of the chief features of this apparatus consists in the use of liquefied ammonia, free from any admixture of water, with the object of rendering the ammonia more effective than it otherwise would be.

The Council appointed a Committee to examine and report on this machine, and obtained the services of the following gentlemen to serve thereon:—Professor W. A. Miller, F.R.S., C. W. Siemens, F.R.S., F. A. Abel, F.R.S., Charles Tomlinson, F.R.S., Colonel Francis Maude, C.B., and Dr. Benjamin Paul. The Committee met on the 4th of May, at No. 5, Primrose-street, to see the machine in operation, and they then deputed Dr. Paul to make some experiments, with the object of ascertaining the capability and efficacy of the apparatus.

The result of these experiments showed that the cooling effect produced by the consumption of 1 lb. of coal in the furnace of the generator was equivalent to the melting of $9\frac{3}{4}$ lbs. ice, independently of the consumption of fuel requisite for the pumping of brine, ammoniacal liquor, and condensation water.

The mean rate of refrigeration, during the two days' experiments, amounted to a cooling effect equivalent to the melting of 128 lbs. of ice per hour.

The mean of the work done in the liquefier was at the rate of about 20 lbs. of liquid ammonia produced per hour.

The initial temperature of the condensation-water was about 54° Fahr., on the average, during the experiment, and the temperature of the atmosphere in the operating-room was about 60° Fahr.

The detailed report of these experiments was laid before the committee by Dr. Paul, on the 4th June, and, upon consideration of the results, he was then instructed to make another experiment with the condensing water at an initial temperature of 80° Fahr.

On the 24th July, Dr. Paul reported to the committee that Mr. Reece had been unable to provide for the further experiment they required, and thereupon it was resolved to report as follows:—

"It is the opinion of the Committee that the machine, as at present constructed, cannot be recommended for adoption. Mr. Reece has declined to make arrangements for carrying out the further experiments proposed by the Committee. They are, however, of opinion that, with certain modifications, the apparatus might be usefully employed for refrigerating purposes."

The following extract from Dr. Paul's paper, "On Artificial Freezing and Refrigeration," read before the Society on the 18th December, 1868 (see *Journal*, page 71), explains more fully the construction of the machine:—

"In Reece's apparatus, the boiler, containing water or a weak solution of ammonia, is connected with a vessel called the analyser, consisting of a series of plates arranged one above the other within a tall columnar vessel. The steam passing from the boiler, under a pressure of eight atmospheres (= 110 lbs. on the square inch), into the bottom of this vessel, comes in contact with a stream of concentrated solution of ammonia, which is continuously pumped into the analyser at the top, and, in falling from plate to plate, the ammonia of this solution is converted into gas, while the steam is chiefly condensed and runs back to the boiler. The ammoniacal vapour then passes from the analyzer into a vessel called the rectifier, where the remaining steam is condensed and runs back to the analyser, while the ammonia, passing on to a condenser surrounded by cold water, is liquefied, and collected in a receiver, whence it flows into the refrigerator.

"Meanwhile a regulated current of spent liquor runs from the boiler through a long tube, called the heater, fitted with an internal set of tubes, through which the concentrated solution of ammonia is pumped into the analyser. By this means the solution of ammonia is heated, and the spent liquor from the boiler is cooled sufficiently to be used for supplying to the absorber, into which it is forced by the pressure in the boiler, through a pipe fitted with a cock to regulate the supply. In the absorber it becomes saturated with ammonia discharged from the refrigerator, and is then pumped out into the analyser.

"It is here necessary to mention a very important feature of the ice-making machine invented by Mr. Reece, since it constitutes a very great improvement on the ammonia machine employed by Carré. The improvement to which I refer consists in the dehydration of the ammonia, and in using, as the refrigerating agent, liquid ammonia, which is practically free from water, instead of a liquid containing 25 per cent. of water, and only 75 per cent. of ammonia, that being the refrigerating agent used in Carré's machine.

"The effect of this difference upon the working of the machines is very great. Thus, for instance, in Carré's machine, the distillate passing from the boiler is separated into 95 per cent. of solution, containing 25 parts of ammonia—which, after being cooled, is used for supplying to the absorber—and 5 per cent. of a solution, containing $\frac{3}{4}$ ammonia, and $\frac{1}{4}$ water, which passes to the condenser, furnishing a distillate containing 25 per cent. of water. Then, since the ammoniacal distillate produced in the condenser contains 25 per cent. of water, and as water is capable of dissolving and retaining in solution its own weight of ammonia, at the temperature of from 22° to —40°F., produced in the refrigerator, only two-thirds of the ammonia in the distillate will be available for refrigeration, while the remaining third of the ammonia, being retained by the water passing into the refrigerator in the 212 lbs. of distillate, will be of no service for refrigeration, and this solution of ammonia must, from time to time, be run off into the boiler. Therefore, since a machine of the power here assumed must vaporise at the rate of 106 lbs. of ammonia an hour, it would be requisite to produce in the condenser a distillate at the rate of 212 lbs. per hour for supplying the refrigerator, since of this quantity 53 lbs. will be water, and that water will retain 53 lbs. of ammonia, leaving only 106 lbs. for refrigeration. Then, since the cooled exhaust liquor introduced into the absorber already contains 25 per cent. ammonia, it will dissolve only $\frac{1}{20}$ more of its weight of ammonia, and it will be necessary, in order to produce the above-mentioned quantity of distillate per hour, to supply at the rate of 200 gallons of this liquor per hour to the absorber, and to pump nearly one ton of ammonia solution from the

absorber into the boiler against a pressure of 10 atmospheres, which will require an expenditure of power to the extent of $\frac{1}{2}$ horse-power per hour.

"In the apparatus devised by Mr. Reece, on the contrary, the distillate passing from the boiler and containing 30 per cent. of ammonia is separated by the operation of the analyser into 75 per cent. of a solution containing five parts of ammonia, which is returned again to the boiler, and into 25 per cent. of gaseous ammonia, which passes on the rectifier, where it is more fully dehydrated, and thence passes to the condenser, where it is liquefied and delivered to the refrigerator almost anhydrous. In this case, therefore, $\frac{5}{6}$ of the ammonia distilled from the boiler passes into the refrigerator, and the whole of that is effective for refrigeration, so that to maintain a vaporisation in the refrigerator, at the rate of 106lbs., per hour, only 127lbs. of ammonia has to be distilled from the boiler, while in Carré's apparatus only $\frac{1}{5}$ of the ammonia distilled from the boiler passes into the refrigerator, and of that quantity $\frac{1}{3}$ is ineffective for refrigeration. A still further advantage of Mr. Reece's arrangement consists in the use of water containing but very little ammonia, or about 5 per cent., for effecting the absorption of the gas generated in the refrigerator, and as that is capable of dissolving a further 20 per cent. of the gas, only $\frac{1}{5}$ as much as is requisite in Carré's apparatus is necessary, consequently there is only $\frac{1}{5}$ as much liquor to be pumped back into the boiler."

Proceedings of Institutions.

Union of Lancashire and Cheshire Institutes.—A meeting of pupil, assistant, and principal teachers, in connection with elementary day schools in the Manchester district, was held at the Manchester Mechanics' Institution, on Thursday evening, under the auspices of the above Union. The attendance was extremely large, indicating the keen interest felt in the subject of the meeting.—Mr. Alderman Rumney, who occupied the chair, said the meeting had been called to hear an explanation of the outline of the work proposed to be done in the scheme of forming central classes for the teachers in connection with the Union. The importance of the movement could not be exaggerated. The absence of scientific and art teaching in the schools had been felt by all taking an interest in popular education. Everyone interested in education had regretted also the low position of teachers. He did not think that anywhere, on the continent or in America, the position of a teacher was so low as in this country. But there was no country where education was of more importance than in England. This light regard for the teacher was an indication of the low condition of education generally on the part of the middle and upper classes. In part that had been owing to the fact that teaching had been a sort of employment which people who had failed in every other business seemed to be considered fit to undertake, as a natural resort *in extremis*. The fact that such persons had taught was lamentable, and had perhaps to do with the low estimation in which teaching was unfortunately held. No position could be more important than that of a teacher; and just as we could improve the teacher would he or she be raised in the estimation of all classes of the community. The remuneration would be improved in proportion. Although it had been generally most inadequate, possibly it had been quite as great as was in many cases deserved. The movement which those present were inaugurating would have this manifold tendency, that it would put teachers in a better position, make them more efficient for their work, and it would be found that they could not learn one thing well without learning something of almost every other thing. The faculties could not be exercised upon any study without acquiring a higher degree of training. No one interested in the progress of education could look upon such a meeting without feeling most deeply interested in it.—Mr. Thomas Lawton, visiting agent of the Union, and secretary of the class committee, said they had received returns from thirty-two schools in the union, which showed that fifty-nine male pupil teachers, twenty-eight female, thirteen assistant, and nine principal teachers, making up a total of 109, had applied for admission into the science and art classes about to be formed. The subjects to be taught were, geometrical drawing, animal physiology, chemistry, and mathematics. The chemistry class would be held at Owen's College, all the other classes being held at the Mechanics' Institution in David-street. Each pupil would be expected to attend the lessons during the whole course, the teachers' remuneration depending upon the number submitting themselves to the examinations, prior to which it was essential that each should have attended at least 25 of the lessons in the course. Prizes would be given to successful students. Each pupil obtaining a first-class certificate in the elementary examinations, and each obtaining a first-class in the advanced grades, would receive a Queen's prize. Local prizes to successful students in each subject were also contemplated.—Mr. Angell, teacher of the animal physiology class; Mr. Christopher Spriggs, teacher of the geometrical drawing class; Mr. Bentley, B.A. (Owen's College), mathematical teacher; Mr. Leresche, art teacher; and Dr. Thorpe, teacher of the chemistry class, each said a few words in explanation of their method of instruction in their respective subjects.—Dr. Pankhurst, hon. sec. of of the Union, expressed the great satisfaction the council felt in this gathering, as indicating the correctness of their hopes and anticipations in commencing so important a movement. One of their principal objects, contemplated for a very long time, was the diffusion of teaching; and they all must see that, in the gathering that night, they had set in motion a real, substantial movement in that direction. No subject would ever be extensively and successfully taught except under these conditions—first, that there exist a sound theory as to the subject to be taught; secondly, a thorough knowledge of the subject itself; and, thirdly, that there be provided in sufficient abundance adequate apparatus and appliances required in the study. If these essentials had existed in relation to the subjects to be taught in these classes, those subjects would have taken the same high position as some others. The teaching administered in this institution was both right in its subjects and right in its method, as was shown by the list just published of the competition for the Whitworth prizes, by which it appeared that a student from this institution was at the head of the list for all England.—Professor Barker, of Owen's College, congratulated the promoters of this important scheme upon the great promise of success which appeared by the number and enthusiasm of the presen tmeeting.—Dr. Watts was glad to see that those taking part in education were availing themselves of every possible advantage to improve the means by which they were to win their livelihood, and to improve the future race of pupils. It was gratifying to find that the movement was being inaugurated by more than a hundred students; and, if this effort succeeded, it would not be confined in its operations to Manchester, but centres would have to be formed in other large towns in the union. In conclusion, he moved a vote of thanks to Mr. Alderman Rumney for presiding, which was warmly accorded. Three of the classes were opened on Saturday morning, September 18th, when forty-two students presented themselves for geometrical drawing; seventy-two for animal physiology; and forty-five for chemistry.

EXAMINATION PAPERS, 1869.

(*Continued from page* 819.)

The following are the Examination Papers set in the various subjects at the Final Examination held in April last:—

ENGLISH LITERATURE.

THREE HOURS ALLOWED FOR THE TWO AUTHORS SELECTED BY THE CANDIDATE.

BACON.

(The Essays.)

I.

1. Give the substance of the essay Of the Vicissitude of Things.

2. Explain these passages, and state in what context they occur:—

(*a.*) *Goodnesse* I call the Habit, and *Goodnesse of Nature* the Inclination.

(*b.*) The right use of Bold persons is, that they never Command in Chief, but be Seconds, and under the Direction of others.

(*c.*) When Hempe is sponne,
England's done.

(*d.*) He could not fiddle, but yet he could make a small Towne, a great Citty.

(*e.*) The first Creature of God, in the workes of the Days, was the Light of the Sense; the last, was the Light of Reason; and his Sabbath worke, ever since, is the Illumination of his Spirit.

(*f.*) Men's thoughts are much according to their Inclination: Their Discourse and Speeches according to their Learning and Infused Opinions; But their Deeds are after as they have been Accustomed.

(*g.*) Some Bookes are to be Tasted, Others to be Swallowed, and Some Few to be Chewed and Digested.

3. In what sense, differing from modern usage, is each of these words used by Bacon:—

suspect	allay	round	rest
success	speculation	witty	converse
use	adamant	tiller	obnoxious.

4. Explain the following words:—

arietation	ure	sophy	habilitation
stond	whit	herselike	fallaxes
stirps	zelant	galliard	eugh.

5. Sketch the argument of either the essay Of Usury, or that Of Plantations.

II.

6. What does Bacon say respecting the publication of the Essays in his letter to his brother?

7. Compare Bacon's Essays, as regards their purpose and manner, with those of some other distinguished English writer.

8. Name the other principal works of Lord Bacon.

MORRIS.

(Specimens of Early English, p. 184 to p. 378.)

I.

1. Explain the following passages, state from what poems they are taken, and notice peculiar words and grammatical constructions:—

(*a.*) Brytayn hath ynow of al matyr that neodeth bugge and sulle, other ys neodfol to mannes use; thar lakketh nevere salt and yre.

(*b.*) And summe chosen chaffare;
To cheeven the bettre,
As hit semeth to ure siht
That suche men scholden.
And summe murthes to maken,
As munstrals cunne.

(*c.*) Among these children was a wydow sone,
A litel clergeoun, that seve zer was of age,
That day by day to scole was his wone;
And eek also, wherso he saugh thymage
Of Christes moder, had he in usage,
As him was taught, to knele adoun and saye
His *Ave Maria*, as he goth by the waye.

(*d.*) Mekille pride was thare in prese,
Both on pencelle and on plate,
When the bare rade withouten rese
Unto Cane the graythest gate.
Thare fand he folk bifor the zate
Thretty thowsand stif on stede.
Sir John of France come al to late;
The bare has gert thaire sides blede.

(*e.*) Jason, which sih his fader old,
Upon Medea made him bold,
Of art magique, which sche couthe,
And preith hire, that his fader zouthe
Sche wolde make azeinward newe.
And sche that was toward him trewe,
Behite him, that sche wolde it do,
When that sche time sawh therto.

(*f.*) Now ffals and ffauvel
Fareth forth to gedere
And Meede in the middel,
And al the meyné aftur.

2. What is Alliteration? Illustrate your answer by examples.

3. Which are the principal points in which the grammar of Chaucer differs from that of our own time?

4. Give some account of the Vision of Piers Ploughman.

5. Sketch the story either of Sir Gawayne and the Green Knight, or of William and the Werwolf.

6. What do you know of Sir John Maundeville?

7. Who were the principal poets contemporary, or nearly contemporary, with Chaucer? Name some of their principal works.

8. Give some account of John de Wycliffe.

MILTON.

(The Paradise Lost, i.—viii.)

I.

1. In what connection do the following passages occur? Explain the allusions and the peculiar and obsolete expressions.

(*a.*) —— there leviathan,
Hugest of living creatures, on the deep,
Stretched like a promontory, sleeps or swims,
And seems a moving land; and at his gills
Draws in, and at his trunk spouts out, a sea.

(*b.*) —— as when by night the glass
Of Galileo, less assured, observes
Imagined lands and regions in the moon:
Or pilot, from among the Cyclades,
Delos or Samos first appearing, kens
A cloudy spot.

(*c.*) —— all unawares
Fluttering his pennons vain, plumb down he drops
Ten thousand fathom deep.

(*d.*) —— abashed the devil stood,
And felt how awful goodness is, and saw
Virtue in her shape how lovely.

(*e.*) Yet not the more
Cease I to wander where the Muses haunt
Clear spring, or shady grove, or sunny hill,
Smit with the love of sacred song.

(*f.*) —— and, O! too like
In sad event, when to the unwiser son
Of Japhet brought by Hermes she ensnared
Mankind with her fair looks, to be avenged
On him who had stole Jove's authentic fire.

2. Explain these words and phrases:—

anarch	Cerberean mouths
ambrosial	Lethæan sound
the Serbonian bog	the Ausonian land
the giant brood of Phlegra	the Tuscan artist.

3. In what way are Sin and Death introduced into the narrative? Explain the allegory.

4. Briefly describe the council of Pandemonium.

II.

5. What critical objections have been urged against the Paradise Lost? How far do you agree with them?

6. To what class of poems does the Paradise Lost belong? Compare it with some other poem of the same class with which you may be acquainted.

7. What do you know of the history of the composition and of the first publication of the Paradise Lost?

8. Name some other of Milton's principal works in prose as well as verse.

Shakespeare.

(Julius Cæsar.—Henry VIII.—The Tempest.)

I.

1. State the connection in which each of the following passages occurs.—Explain the allusions and remarkable expressions.

(*a.*) Since thou dost give me pains,
Let me remember thee what thou hast promised,
Which is not yet performed me.

(*b.*) Vain pomp and glory of this world, I hate ye;
I feel my heart new opened: O, how wretched
Is that poor man that hangs on princes' favours!

(*c.*) They are both in either's powers; but this swift business
I must uneasy make, lest too light winning
Make the prize light.

(*d.*) But I am constant as the northern star,
Of whose true-fixed and resting quality
There is no fellow in the firmament.

(*e.*) Things done well,
And with a care, exempt themselves from fear;
Things done without example, in their issue
Are to be feared.

(*f.*) This is a slight unmeritable man,
Meet to be sent on errands: Is it fit,
The three-fold word divided, he should stand
One of the three to share it?

2. Explain these words and expressions:—

paragon	the phœnix throne
steaded	the red plague
hests	the miraculous harp
flote	with hearts of controversy.

3. Who were Artemidorus and Cinna the poet? What part does each of them take in the action of the play in which they are introduced?

II.

4. From what sources did Shakespeare take the facts worked into the plots of Julius Cæsar and Henry VIII? In what chief particulars has he deviated from his authorities?

5. Sketch the plot of the fourth act of Julius Cæsar.

6. Describe the character of Cromwell.

7. What persons are introduced into any of these three plays that do not represent human beings? Give some account of each.

8. What do you know of the early editions of Shakespeare's works?

LOGIC AND MENTAL SCIENCE.

THREE HOURS ALLOWED.

Mental Philosophy.

Hamilton.

1. Write an essay, giving the chief points which Hamilton brings forward in the contest between realism and idealism.

2. Enumerate the laws of association, and justify your classification of them.

3. What different mental processes are involved in what Hamilton calls the elaborative faculty?

4. Write a short history of the words realism, nominalism, and conceptualism.

5. What is the law of the conditioned?—how is it proved?—and what are its applications?

Logic of Induction.

Mill's Logic.

1. Explain the successive intellectual steps involved respectively in a process of inductive and deductive reasoning.

2. There are true and false inductions. Distinguish between them, and illustrate with examples.

3. Write a short essay on *causation*, embodying Mill's theory, and those he opposes.

4. In what different methods may we proceed in finding out the true causes of a phenomenon? How does Mill classify and explain these methods?

5. What is the proper use of hypotheses? Give examples of their use and abuse?

Moral Philosophy.

Stewart's Outlines.

1. What is Stewart's classification of the intellectual powers? Criticise it, and, if you can, amend it.

2. How do the *intellectual* and *active* powers differ from each other?—and why does Stewart treat of moral philosophy under the latter?

3. How does Stewart justify his opinion that the moral faculty is original and innate?

4. Write a short history of the different theories which have been propounded on the nature of the moral faculty.

5. What are the chief objections against utilitarianism? Are these objections satisfactorily answered by *Mill?* Give reasons for your answer.

Formal Logic.

1. Write a short essay explanatory of the nature of abstraction and generalisation, and their bearing upon logic.

2. Explain what is meant logically by division and definition. Point out the laws of both, and the errors to be avoided.

3. Give a detailed description of what is meant by a term, a proposition, and a syllogism, with the *varieties* of each.

4. Enumerate the general and special rules of the syllogism, and justify those of the 1st figure.

5. Give a logical description of the dilemma as a mode of argument.

6. Make a syllogism, drawn according to each of the following symbols:—Darii, Camestres, Disamis, and Bokardo.

What is the logical explanation of the fallacy involved in the following argument?

> The Apostle Paul expressly recommended the use of *wine* in his inspired writings. Therefore every one who acknowledges the apostolic authority will feel it to be his duty to take it.

(*To be continued.*)

WHITWORTH SCHOLARSHIPS.—THE PRACTICAL EXAMINATION.

The examinations on the results of which the first Whitworth Scholarships of £100 a-year have just been awarded, deserve more than ordinary notice, as they are the first which have combined theoretical knowledge with the practical use of tools and skill in handicrafts.

It will be remembered that when Mr. Whitworth offered to found a certain number of scholarships, by handing over £100,000 to trustees for that purpose, he desired that these scholarships should be awarded, in open competition, to young men, subjects of the United Kingdom, who showed the greatest amount of intelli-

gence and proficiency in the theory and practice of mechanics and its cognate sciences.

According to the regulations which were afterwards drawn up by Mr. Whitworth, it was settled that the competition should be decided by two examinations, one of which should test in a high degree the theoretical knowledge of the candidates, and the other their practical knowledge in mechanical handicrafts and the use of mechanical tools.

The endowment being vested in the Lord President of the Council, the carrying out of the founder's scheme rested with the Science and Art Department, Mr. Whitworth himself taking a large share in the arrangements required. It was decided that the two examinations referred to should be :—

1st. The theoretical examination, held annually in May, by the Science and Art Department, in the following subjects :—

a. Elementary mathematics.
b. Higher mathematics.
c. Theoretical mechanics.
d. Applied mechanics.
e. Practical, plane, and solid geometry.
f. Machine construction and drawing.
g. Accoustics, light, and heat.
h. Magnetism and electricity.
i. Inorganic chemistry.
j. Metallurgy.
k. Freehand drawing.

2nd. A special examination, also to be held by the Science and Art Department, by which the skill of the candidates in the following tools was to be tested :—

a. The axe.
b. The saw and plane.
c. The hammer and chisel.
d. The file.
e. The forge.

And, further, their proficiency in the following undermentioned handicrafts was to form part of the competition, viz. :—

a. Smith's work.
b. Turning.
c. Filing and fitting.
d. Pattern-making and moulding.

It was moreover laid down that none should be eligible to obtain a scholarship, under any circumstances, unless he should have passed satisfactorily in *a*, *c*, *e*, and *k* of the theoretical subjects, and in at least one of the before-mentioned classes of tools.

In order to assist in commencing his scheme for scholarships, which could only come into operation by degrees, Mr. Whitworth created sixty exhibitions or premiums, of the value of £25 each, tenable until April last. These were placed at the absolute disposal of the governing bodies of the various educational institutions and towns. Eight were given to Owen's College, Manchester, and two to the Grammar School, Manchester, the seat of Mr. Whitworth's workshops ; three each to the Universities of Oxford, Cambridge, and London ; three to the Society of Arts ; two to the College of Preceptors, and one each to about thirty other universities, colleges, or public schools ; and in addition one was given to each of the following towns, viz :—Birmingham, Bristol, Swansea and Cardiff, Halifax, Leeds, Northampton, and Sheffield, for presentation to the most deserving artisans. Each locality nominated the student it considered most eligible, the only conditions being that he should not exceed 25 years of age, and that all who were thus aided to qualify themselves, were to undertake to compete for the scholarships in May, 1869.

At the examination in May, 106 candidates accordingly presented themselves as competitors for these Whitworth scholarships, including about fifty-five who held the exhibitions above referred to. Of these just over half, or fifty-four, failed to qualify in the essential subjects, and were consequently disqualified from further competition. Some of the successful ones showed great proficiency, the highest obtaining 122 marks, a standard which it is hardly likely could at any time be much excelled.

The details of the practical examination had next to be arranged, and, owing to the novelty and somewhat difficult nature of the scheme, it was not till the 15th September that the work was completed, and the awards made known, which were published in the last number of the *Journal*.

The gentlemen appointed to the task of acting as examiners were Col. Rich, R.E. ; Mr. Marshall, secretary to the Mechanical Engineers ; and Mr. Manby, hon. secretary to the Civil Engineers. As the latter gentleman was prevented from acting, his place was supplied by Mr. Hoyle, secretary to Mr. Whitworth.

In order to economise the cost of the candidates' travelling as much as possible, it was found expedient to hold two examinations, one in London, and the other at Mr. Whitworth's works, in Manchester. By this arrangement, those who resided in the neighbourhood of London, and who did not wish to be examined in handicrafts, were not required to go to Manchester ; and those who completely failed in the more elementary examinations were likewise saved the journey to that town, where alone there was convenient accommodation accessible for testing the various handicrafts.

For the purpose of holding the examination in the use of tools for the London candidates, Messrs. George Smith, Taylor, and Co., the government contractors, lent their famous workshops at Pimlico, and these competitors, numbering twenty-one, commenced their work at nine a.m. on the 30th August. Each candidate might take up one or more of the sets of tools, and two hours were allowed for each set : to those few who attempted all five sets eight hours were given to complete their work. The candidates from the neighbourhood of Manchester presented themselves on the 7th September, at the works of Messrs. Whitworth and Co. ; they numbered 25, so that altogether 46 were in this part of the competition.

The examination at both places was the same, and consisted as follows :—

The Axe.—Each candidate was required to square up an octagonal block of wood, like the sample block given to him, using the axe only, and to keep the square as large as possible. He was also to make an axe-haft like the pattern given to him, using the axe and spokeshave, and to finish the haft to the same size as the pattern.

The Saw and the Plane.—Each candidate was to saw out of a piece of plank given to him two square strips, and plane them up square, and also to make two parallel strips 2 feet long by 2 inches wide, and $\frac{3}{8}$ inch thick.

The Hammer and Chisel.—Each candidate was to chip a piece of cast-iron over the top surface, leaving the surface as even as possible from the chisel.

The File.—Each candidate was to file square any two adjacent sides of the cast-iron tube. A square was provided for trying the work. The competitor was directed to give his file always nine-inch stroke. He was further required to file up a hexagon nut given to him on its six sides. Two guages were provided, one giving the size of the nut across the sides, and the other the correct angle for the corners.

The Forge.—Each candidate was required to weld together two pieces of square iron, using only his hand hammer, and to make two halves of a pair of tongs, like a pattern supplied, from three pieces of round iron, also provided him.

As before mentioned, two hours were allowed for each set of tools, though it was stated that, if the work were completed before that time, the time actually spent in the operation would be recorded, and taken into consideration in awarding credit.

The proportion of the members who selected the different classes of tools will be seen from the following table :—

	London.	Manchester.	Total.
The axe	9	10	19
The saw and plane	18	21	39
The hammer and chisel	19	20	39
The file	19	22	41
The forge	13	10	23
Total individuals examined	21	25	46

Such, then, was the examination in the use of tools, and it was open, to all who wished to gain additional marks in the competition, to be examined in one or more handicrafts. Those who put down their names for this examination had to present themselves at the workshops of Messrs. Whitworth and Co., on Thursday and Friday, the 8th and 9th September, and the nature of the tests applied to ascertain their proficiency and skill were as follows:—

Turning.—All taking up this handicraft were required to bore out a bevil-wheel to $1\frac{1}{2}$ in. in the hole, using two drills and a finishing-bit, which were supplied. Also to turn up a piece of round iron supplied to them, to serve as a mandril, to force on the wheel with the mandril press, and turn it up on the back and face and tops of the teeth, and to scrape it up clean and smooth like the pattern.

Fitting.—All taking up this handicraft were required to key a boss upon the short shaft, cutting a key-way $\frac{7}{16}$ in. square, and letting the key half into the shaft, and half into the boss, to file up the key and fit it well in, and to let the end of the shaft project one inch through the boss to support the head of the key.

Pattern-making.—All taking up this handicraft were required to make a pattern of a short piece of a girder, from a sketch and material given to them. The pattern was to be ready for the foundry, including the core-box for the two bolt holes in the flange of the girder.

Smith's-work.—No paper was set in this, as it was not required.

Four hours were allowed for each of these practical examination papers, and every candidate was allowed to attempt one or more, as he thought proper. Pattern-makers were required to bring the necessary tools with them, but other candidates had to work with the tools supplied to them, and were not allowed any others.

As regards the quality of the work performed at these examinations, and the amount of skill displayed, it is not possible to say anything at present, as no report has been published by the examiners of the Science and Art Department on the subject. It is, however, certain, from the lists of results issued to the candidates, that the practical examination very much altered the relative position which the candidates had attained in the theoretical. For instance, Mr. W. H. Greenwood, who stands first in the combined examination, was but eleventh in the theoretical portion, also Mr. Elgood has jumped from thirteenth to the fourth place, and Mr. J. N. Brittle from the thirty-eighth to the sixth, whereas those who stood fifth, sixth, eighth, and ninth in the theoretical, have failed to secure a scholarship at all.

In Mr. Whitworth's original scheme, he stated that he wished the number of marks obtainable in the theoretical subjects and those obtainable by the most skilled workman should be about equal; and also that he intended, by requiring a practical acquaintance with a few simple tools to be a *sine quâ non*, to render the competition accessible on fairly equal terms to the student who combines some practice with his theory, and to the artisan who combines some theoretical knowledge with perfection of workmanship. Taking the experience of this year, there can be no doubt that any student wishing to compete on a future occasion would do well to pay particular attention to this practical branch of the work, which, it has been shown, will tell so decidedly in the competition; and also any artisan, having the same object, should study carefully the essential theoretical subjects which have thrown out so many. To encourage the attainment of high theoretical knowledge, combined with a practical and skilful acquaintance with the means employed in mechanics, was the chief object which Mr. Whitworth had in view when he established and so munificently endowed these scholarships, and, as a first trial, the result seems to be eminently successful, and cannot fail in a few years, when it becomes more widely known, and when the competition becomes more keen, to have a most important bearing on the mechanical industry and well-being of the country. It will, undoubtedly, in the words of the letter to Mr. Disraeli, in which Mr. Whitworth presented his endowment, "be the means for bringing science and industry into closer relation with each other than they are at present in this country."

AMSTERDAM EXHIBITION.

Sir—I beg to forward, for publication in your *Journal*, for general information, the list of recompenses awarded to British exhibitors at the Amsterdam Exhibition. From this list it will be seen that, out of about 210 exhibitors, 150 have received rewards, including 15 diplomas of honour, 10 gold medals, 36 silver medals, 28 bronze medals, and 12 honourable mentions. Besides these, exhibitors not coming properly within the scope of the exhibition (owing to their goods being of a different or expensive character, and therefore not strictly suited to the working classes), received 17 diplomas of excellence and 3 extraordinary mentions. There would have been some other awards, but the jury decided not to recompense raw materials, and some few exhibitors were admitted after the jury examination had been concluded. Although many exhibitors were recompensed in several classes, they could only receive one reward, namely, the highest accorded to them in any class. Trusting the attention I have given to the interests of British exhibitors will be duly appreciated,

I am, &c.,

P. L. Simmonds, British Commissioner.

Exhibition Palace, Amsterdam, 22nd September, 1869.

List of Recompenses awarded to British Exhibitors at the Amsterdam International Exhibition of Domestic Economy, &c.

Class I.—Houses and Fittings, &c.

D. Anderson and Sons, Belfast—Roofing felt—Honourable mention.

Engert and Rolfe, London—Asphalted roofing felt—Bronze medal.

T. H. Phillips, London—Gas cooking stove—Bronze medal.

Partridge and Co., Birmingham—Gas brackets—Bronze medal.

Jas. Harding, London—Roofing felt—Silver medal.

Doulton and Co., London—Drain pipes—Mention extraordinaire.

Gallichan and Co., London—Drain pipes—Mention extraordinaire.

W. S. Adams and Co., London—Cooking stove—Mention extraordinaire.

Walker and Strangman, London—Washing boiler—Honourable mention.

C. J. Philp, Birmingham—Chandeliers—Silver medal.

Moule's Patent Earth Closet Co., London—Earth closets—Bronze medal.

J. E. Watson, Newcastle—Plans of workmen's dwellings—Bronze medal.

J. Cliff and Son, Wortley, near Leeds—Drain pipes—Diplome d'excellence.

Duley and Co., Northampton—Kitchener—Mention extraordinaire.

G. Glover and Co., London—Gas meters—Diplome d'excellence.

W. Blews and Sons, Birmingham—Gas fittings—Diplome d'excellence.

John Brogden and Sons, Bridgend, Glamorgan—Iron—Gold medal.

Maw and Co., Broseley—Mosaic tiles—Diplome d'excellence.
Society for Improving the Condition of the Labouring Classes, London—Drawings of cottages—Diplome d'honneur.
Central Cottage Improvement Society, London—Drawings of cottages—Diplome d'honneur.

Class II.—Furniture, &c.

John Adams, Sheffield—Polishing powder—Honourable mention.
Chorley and Debenham, London—Floor-cloths—Bronze medal.
James Hartley and Co., Sunderland—Glass-ware—Bronze medal.
G. B. Kent and Co., London—Brushes—Bronze medal.
Osborne, Bauer, and Chesseman, London—Soaps—Honourable mention.
Piesse and Lubin, London—Soaps—Honourable mention.
J. A. Pols, London—Refined oils—Honourable mention.
Wilson, Turner, and Co.—Nickel silver goods—Honourable mention.
H. B. Condy, London—Fluid for purifying water—Mention extraordinaire.
Wm. Cooke, Leeds—Maritime printed papers—Silver medal.
J. C. Davis, London—Knife-cleaners, &c.—Silver medal.
Isaac Rickett and Sons, Hull—Rice starch—Silver medal.
Edward James and Sons, Plymouth—Rice starch—Silver medal.
London Starch Company, London—Rice starch—Silver medal.
Parsons, Fletcher, and Co., London—Rice starch—Silver medal.
A. Lyon, London—Domestic articles—Bronze medal.
E. Martin and Sauteur, Brothers, London—clocks—Silver medal.
Edward Moore and Co., South Shields—Cheap glass—Silver medal.
N. Price and Co., London—Perfumery—Diplome d'excellence.
Seth, Thomas, Clock Company, Liverpool—Cheap clocks—Silver medal.
Thomas Spencer, London—Improved filters—Diplome d'excellence.
W. Taylor and Co., Leith—Soap and candles—Bronze medal.
Tritton and Hoare, Stockton-upon-Trent—Cheap earthenware—Silver medal.
Crichley and Co., Birmingham—Umbrella stands—Mention extraordinaire.
Price's Patent Candle Company, London—Candles—Diplome d'honneur.
F. C. Calvert and Company, Manchester—Carbolic acid—Diplome d'excellence.
J. C. and J. Field, London—London candles—Mention extraordinaire.
George Kent, London—Articles for household use—Gold medal.
Mander, Brothers, Wolverhampton—Resins and varnishes—Mention extraordinaire.
Peyton and Peyton, Birmingham—Iron and brass bedsteads—Diplome d'excellence.
Silicated Carbon Filter Company, London—Filters—Mention extraordinaire.
Simpsons, Payne, and Co., London—Candles—Bronze medal.
Henry Stephens, London—Ink—Mention extraordinaire.
Young's Paraffin Company, Glasgow—Candles—Diplome d'honneur.
Powell and Bishop, Hanley—China and stoneware—Diplome d'excellence.
Eugene Rimmel, London—Perfumery—Diplome d'excellence.
Shaw and Fisher, Sheffield—Electro table services—Mention extraordinaire.

Class III.—Clothing.

Thos. Ainsworth, Whitehaven—Linen, thread, &c.—Silver medal.
Anderson, Abbott, and Anderson, London—India-rubber and oil-skin clothing—Silver medal.
J. Buckley and Sons, Leeds—Hats and caps—Bronze medal.
Sir Elkanah Armitage and Sons, Manchester—Canvass, ducks, and cotton goods—Diplome d'honneur.
Arundah and Co., Glasgow—Hats and caps—Honourable mention.
W. Bliss and Son, Chipping Norton—Woollen fabrics—Gold medal.
Brough, Nicholson, and Co., Leek—Silk thread—Diplome d'excellence.
Cow, Hill, and Co., London—India-rubber articles—Silver medal.
Day, Watkinson, and Co., Huddersfield—Bedford cords, &c.—Silver medal.
Ermen and Engels, Manchester—Sewing cotton—Gold medal.
R. and T. Grimstone and Co., Tadcaster—Shoe-threads—Honourable mention.
Hitchcock, Williams, and Co., London—Waterproof mantles—Diplome d'excellence.
Howden and Wade, near Leeds—Pilot-cloth—Honourable mention.
Robt. Jeffrey and Sons, Glasgow—Linen and cotton goods—Silver medal.
W. and C. Kesselmeyer, Manchester—Cotton velvet, &c.—Silver medal.
Waldemar, Lund, and Co., London—Ivory and gold studs, &c.—Mention extraordinaire.
D. McArthur and Co., Glasgow—Linen sets—Bronze medal.
Charles McDonald and Co., Glasgow—Shawls—Bronze medal.
McIntyre, Hogg, and Co., Glasgow—Shirts and woollens—Silver medal.
W. McLaren, Sons, and Co., Glasgow—Cambrics and tweeds—Honourable mention.
S. W. Norman, London—Boots and shoes—Mention extraordinaire.
Paisley Co-operating Manufacturing Society—Shawls—Bronze medal.
E. Possett, and Co., Derby—Elastic webs—Diplome d'excellence.
W. Salmond and Sons, Arbroath—Sail-cloth—Diplome d'excellence.
Robert Thatcher, Oldham—Cotton yarn and twine, &c. Diplome d'honneur.
Thomson and Dodd, Huddersfield—Trouserings—Silver medal.
B. Vickerman and Sons, Huddersfield—Woollen goods—Bronze medal.
Edwin Wilks, Cheltenham—Portmanteaus—Mention extraordinaire.
North British Rubber Company, Edinburgh—India-rubber goods—Silver medal.
Wadkin and King, Manchester—Cotton twines—Bronze medal.
Henderson and Co., Durham—Carpets—Mention extraordinaire.
Morton and Sons, Kidderminster—Carpets—Diplome d'excellence.
J. Wilkinson, Son, and Co., Leeds—Carpets—Mention extraordinaire.
H. Monteith and Co., Glasgow—Corahs and Bandanas—Bronze medal.

Class IV.—Food.

Tomlin, Rendell, and Co. (Glencove Co.), London—Maizena—Silver medal
S. Allsopp and Son, Burton-on-Trent—Pale ale—Diplome d'honneur
John Aitcheson and Co., Edinburgh—Ale—Silver medal.

Patrick Auld, London—South Australian wines—Mention extraordinaire.
Banbury Brewery Co., Banbury—Brown stout—Bronze medal.
Batty and Co., London—Pickles—Diplome d'excellence.
G. Borwick and Sons, London—Baking-powder—Silver medal.
W. J. Coleman and Co., London—Liebig's extract of meat—Gold medal.
John Green, London—Sheet gelatine—Bronze medal.
J. Gilbert, South Australia—Wines—Mention extraordinaire.
Henley & Son, London—Cider—Mention extraordinaire.
Huntley and Palmer, Reading—Biscuits—Mention extraordinaire.
John Mackay, Edinburgh—Quintessences—Mention extraordinaire.
John McCall and Co., London—Preserved provisions—Bronze medal.
J. T. Morton, London—Preserved provisions—Mention extraordinaire.
Peak, Frean, and Co., London—Biscuits—Mention extraordinaire.
P. Rappott and Co., London—Gin and liqueurs—Diplome d'excellence.
Thomas Amey—Petersfield—Desiccated and condensed milk—Bronze medal.

Class V.—Tools and Implements.

Johnson, Matthey, and Co., London — Chemical apparatus, &c.—Diplome d'excellence.
Joseph and Robert Dodge, Sheffield—Tools and cutlery —Diplome d'honneur.
Kirby, Beard, and Co., London—Fish-hooks and needles —Diplome d'honneur
Patent Plumbago Crucible Company, London—Crucibles —Diplome d'excellence.
Ashby and Jeffery, Stamford—Agricultural implements —Silver medal.
Wm. Hounsell and Bridport — Fishing-nets — Silver medal.
John Hyman, London — Crucibles — Mention extraordinaire.
Woods, Cocksedge, and Warren, Stowmarket—Agricultural implements—Silver medal.
D. F. Taylor and Co., Birmingham—Pins and needles—Silver medal.
W. Woodfield and Son, Redditch—Needles—Silver medal.
Hayes and Crossley, London—Needles—Silver medal.
W. Warne and Co., London—India-rubber goods—Silver medal.
Sellers and Co., London—Sewing machines—Silver medal.
North American Sewing Machine Company, London—Sewing machines—Silver medal.
Allen and Cragg, Lowestoft—Fishing nets—Bronze medal.
J. B. Brown and Co., London—Wire netting—Mention extraordinaire.
Clarke and Dunham, London—Articles for mills—Mention extraordinaire.
W. Robinson, Bridgewater—Cask-cleaning machine—Mention extraordinaire.
John J. Rollins, London—Tools and implements—Silver medal.
J. Sparkes Hall, London—Shoemaker's bench—Honourable mention.
W. Lamb, New York—Sewing machine—Gold medal.
Wheeler and Wilson, London—Sewing machine—Silver medal.

Class VI.—Means for Moral Improvement, &c.

J. Brinsmead and Sons, London—Cheap pianofortes—Mention extraordinaire.
W. and R. Chambers, London—Educational books—Diplome d'honneur.
B. S. Cohen, London—Pencils—Bronze medal.
Ellis A. Davidson, London—Books and models—Bronze medal.
G. and W. Dean, London—Children's books—Mention extraordinaire.
James Perry and Co., London—Steel pens—Mention extraordinaire.
Joseph Solomon, London—Optical instruments—Silver medal.

Class VII.—Societies, &c., for Promoting the Well-being of the Working Classes.

Henry Briggs, Son, and Co., Whitwood—Gold medal.
Postmaster-General, London—Diplome d'honneur.
Central Co-operative Society, Rochdale—Diplome d'honneur.
Society of Equitable Pioneers, Rochdale — Diplome d'honneur.
Thomas Twining, Twickenham, London — Diplome d'honneur.
Working Men's Club and Institute, London—Gold medal.
Working Men's College, London—Gold medal.
Working Women's College, London—Gold medal.
Rochdale Co-operative Corn Mills Society — Bronze medal.
J. Brucciani, London—Bronze medal.
Gustav Meinhardt, Birmingham—Bronze medal.

PARIS IMPROVEMENTS, FROM 1852 TO 1868.

(Continued from page 825.)

Hospitals.—Considerable sums have been spent by the town, by the administration of the Assistance Publique, and from the funds of the hospitals, in the following undertakings:—

1. The completion of the Lariboisière Hospital, commenced under the Government of July.

2. The construction of the Hospital for Sick Children (St. Eugénie); a hospital at Berck-sur-Mer; the Maison de Rétraite, at Chardon-Lagache, and the foundation of the general hospital stores.

3. The re-construction of the Hôtel Dieu, now in course of execution.

4. The purchase of land for the new hospital at Menilmontant.

5. The removal and re-construction of the Maison Municipal de Santé, in the Faubourg St. Dénis, and St. Pierre, at Auteuil; the hospital of Villas, at Issy, and another for incurables at Ivry.

6. The hospitals of St. Antoine and La Charité have been enlarged by the building of new wings, and a building for lying-in women has been added to the Hospital de la Piété. Baths have been added to the hospital of St. Louis, and the hospital of Bicètre and of La Salpetrière considerably enlarged. A flour-mill and stores have been added to the Boulangerie Centrale.

7. A considerable number of old buildings have been restored.

8. The furniture, linen, and clothing at the various hospitals have been renewed and increased.

9. Twenty-eight new *maisons de secours* have been established, chiefly in the suburbs.

The number of beds in the various hospitals, which in 1852 was 6,743, is now 7,820, an increase of 1,077, without taking into account the 500 supplementary beds which are ready to be put up in case of emergency. In 1867, the number of sick persons who received medical attendance in these hospitals was 63,398.

The number of gratuitous consultations was 648,610, of which 329,521 were given in the hospitals, and 355,089 in the *maisons de secours*. The number of the beds in the asylums has also been largely increased, and are now 11,260. A special service has also been organised for attending sick persons at their own houses, and in 1867 1,137 persons received attention, namely, 427 men and 710 women.

The number of poor persons who received charity from the Bureaux de Bienfaisance was 105,119.

Churches.—The works relating to religious buildings comprise:—

1. The completion of the churches of St. Clothilde and St. Vincent-de-Paul, which were begun under the Government of July; the churches of St. Jean Baptiste, St. Bernard, Notre Dame-de-Chignancourt, and Notre Dame-de-la-Gare, commenced before their annexation by the communes of Belleville, La Chapelle, Montmartre, and Ivry.

2. The construction of the churches of La Trinité, St. Augustin (now opened), St. Ambroise, St. Joseph, Notre Dame-de-la-Croix at Menilmontant, Notre Dame-des-Champs, St. Pierre de Montrouge, and St. François de Xavier now nearly completed.

3. The construction of the Temple Reformé du St. Esprit in the Rue de la Roquepin, the Temple de la Resurrection at Grenelle; these are now both opened. The Jewish synagogues in the Rue de la Victoire and the Rue des Tournelles now in course of construction.

4. The purchase of the churches of St. Eugené, St. Martin des Champs, St. Eloi, St. Marcel, and St. Martin des Batignolles.

5. The purchase of the presbyteries of St. Sulpice, St. Thomas d'Aquin, St. François de Xavier, St. Pierre-du-Gros Caillon, and the construction of the presbyteries of La Trinité, St. Germain Auxerrois, St. Leu, St. Vincent-de-Paul, St. Nicholas du Chardonnel, St. Bernard, and the Consistory of the Oratoire.

6. The enlarging, restoration, and decoration of a large number of the old churches, some of which have incurred considerable expenses upon the town, such as the churches of St. Etienne-du-Mont, St. Leu, St. Germain Auxerrois, and St. Lauren.

Municipal Buildings.—The principal works that have been executed are the restoration and improvements which have been carried out at the Hôtel de Ville, the purchase and completion of the new museum in the Hôtel Carnavalet, the restoration of the Tour St. Jacques. The building of the Hôtels de Marie for the 1st, 3rd, 4th, 7th, and 11th arrondissements are now completed, and for the 13th, 15th, 16th, and 20th arrondissements are in course of construction. The purchase and building of an hotel for the Etat Major of the National guard, the construction of hotels for the Etat Major of the Guard de Paris and for the Sapeurs-Pompiers barracks in the Rue de la Banque, Place Lobau, and in the city for the Garde de Paris, in the Rue Pigalle, at Passy, Villette, Menilmontant, Rue de Charenton, and at Grenelle, for the Sapeurs-Pompiers, have been built, as also twenty-four buildings for lodging the employés of the octroi.

The construction of the new theatres in place of the old Theatres Lyrique, Cirque Impérial, Gaité, Vaudeville, and Panorama, which have been pulled down, and their sites appropriated to make room for municipal improvements; the construction of the Maison Eugéne-Napoleon; the purchase of land for enlarging the Sorbonne; the enlarging and complete restoration of the Lycées Bonaparte and St. Louis; the reconstruction of the upper part of the Lycée Napoleon, and various improvements that have been carried out at the Lycée Charlemagne; the reconstruction of the municipal College Rollin and the Collége Chaptal; the enlarging of the Ecole Turgot, and the construction of a third professional school in the Rue Château-Landon. The Ecole Inferior des Filles has been opened on a large scale. The Institute des Frères de la Doctrine Chretienne, in the Rue Oudinot, has been completely rebuilt, as also a number of houses in the Rue Faubourg St. Martin and in the Rue St. Bernard; and, finally, a large number of scholastic establishments have been built, rebuilt, enlarged, restored and furnished, in various parts of the city.

The principal works now being carried out by the municipality are:—The completion of the Opera; rebuilding the Hôtel Dieu; continuation of the Rue Reàumur; opening of the Boulevard de Rennes; completion of the Waterworks de la Vanne; new park at Mont Souris; continuation of the Boulevard St. Germain; completion of the Avenue Napoléon.

ANNUAL STATEMENT OF THE POSITION OF FRANCE IN 1868.

The official report on the condition of the empire contains the following information, relative to agriculture, industry, and commerce:—

Mineral Manures.—Several scientific professors are engaged in experimenting with the salts of potash and chemical manures. An able agriculturist and an engineer have been commissioned to search for beds of fossil, phosphate of lime, and other substances having a fertilising influence on the soil; these resulted, during the past year, in the discovery of deposits in Calvados, Orne, and Sarthe. The soil of France contains mineral deposits of a fertilising character, over a zone extending from the Pas de Calais to the Bay of Antibes, to the extent of about six hundred miles. A chart showing all the deposits, with a complete collection of the various fossil phosphates, has been deposited at the Ecoles des Mines.

Subsistence.—At the end of the year 1867, there was a considerable deficit in the stock of grain in France, and it was necessary to have recourse to importation. The case was quite different at the end of last year; an abundant crop has supplied resources considerably more than sufficient for all the wants of the country.

Agricultural Education.—In consequence of the recommendations of the Agricultural Commission, a special one was nominated to inquire into the subject of superior scientific agricultural education, and a series of propositions to that end is now under the consideration of a superior commission of inquiry. The School of Grignon, which was to have been given up, has been re-opened, and its means enlarged, and the schools of the Grand-Jouan and the Saulsaie have been augmented by grants from the state. In addition to the agricultural schools, and below them, come the farm-schools, which are in private hands, the state only paying the teachers and the board of the pupils. In the year 1850, these farm-schools numbered seventy, but since that time they have gradually fallen to fifty-one. New farm-schools have been established near Napoleon-villa, in Morbihan, for the pupils of the Lycée of that town; in the Meurthe, near Nancy; at Saint-Eloi, Haute-Marne; at Chassagne, Cantal, where the manufacture of cheese at the cost of the state—begun at Saint Angeau, but to be suppressed next month—will in future be carried on. A fifth farm school, devoted to the cultivation of the vine, has just been formed at St. Martin de Sestat, in the Gironde; and a sixth is now in course of establishment for the department of the Doubs.

Cattle Disease.—A disease, of a less dangerous character than that which lately ravaged Europe, has appeared amongst the cattle in the departments of Central and Puy-de-Dôme. It is called the mountain disease, and is supposed to arise from atmospheric vicissitudes and certain forage plants. The subject is now under examination by a commission composed of veterinary surgeons and proprietors, under the presidency of M. Bouley, Inspector-General of Veterinary Schools. The geological conditions, climate, soil, vegetation, and water are all being most minutely examined, and the report is expected to be presented shortly.

Cotton.—The trade in cotton was very active at the beginning of 1868, at Havre, Mulhouse, in Calvados, the Vosges, and the Somme. The increase in the price of cotton, which had reached 40 to 50 per cent., has pressed upon the sale of the fabrics. The net import of cotton wool for consumption, during the first ten months of the year, amounted to 82,240 tons, against 68,011 in 1867, and 96,475 in 1866.

Wool.—In spite of the large quantities of wool pur-

chased in London, the price increased in Calvados and the Marne. In the Cévennes the rates were rather higher than in 1867, but quotations began to fall in October. The manufacture of woollens was generally active, weavers were at one time scarce in the Elbœuf district, buyers were numerous, and the consequence was an increase in the rates of wages.

Flax and Hemp.—The crops this year were mediocre; but that of hemp was plentiful in the departments of the Sarthe and the Somme and the spinning and weaving establishments there have been actively at work during the winter.

Silk.—In spite of the high price of the raw material, the situation of the trade was satisfactory in the Rhone, during the early part of the year. Important orders were received from Paris and England, and wages were able to be raised. The unsatisfactory results of the silkworm breeding in France, however, rendered the position of the manufacturer a very difficult one.

Imports and Exports.—Commerce exhibited an increase in both directions during the past year, but principally in the imports, the augmentation being as follows:—

In imports	330,795,000 frs.
In exports	21,898,000

Navigation. — Navigation presents the following results: — Out-going ships, 3,400,000 tons, of which 1,936,000 were under the French flag in 1868, against 3,450,000 tons, of which 1,538,000 were under the French flag, in 1867, being a diminution of 50,000 tons outward, but with an augmentation of 57,000 tons in the case of French vessels. The foreign mercantile navies, therefore, support a loss of 107,000 tons. No account is given of in-going vessels.

The exportations from France to England show a diminution of about three millions of francs. The imports are not given. Manufactured products are reported to be generally progressing. Silks and woollens have augmented to the extent of twenty millions of francs; pottery, glass, and articles of fashion to the extent of two millions. Prepared skins, ornaments, and clothing have fallen off five millions.

The importations from Belgium into France shows a diminution of thirty-five and a-half millions of francs, as compared with 1867, while the exports have, on the contrary, increased twenty millions.

The importations from the German Confederation into France gained more than twenty-one millions in 1868, while the French importations into the Zollverein only augmented to the extent of five and a-half millions of francs.

The trade with Italy fell off to the extent of seventeen millions; the exportations of France into Italy being fifteen millions and a half less than in 1869.

The exports from France into Switzerland increased, in 1868, by thirty-two millions of francs.

The restrictions in the customs of the United States caused a decrease in the French exportations to that country.

Stock.—The amount in hand on the 1st January was 132,325,000 francs. The entries, during the first ten months of 1868, amounted to 362,809,000 francs, and the deliveries to 360,352,000 francs, being a stock of 134,782,000 francs. During the same period there were delivered 16,066 warrants, representing a value of 201,299,000 francs.

Employment of Children in Factories.—For several years the government has seen the necessity of revising the laws on this subject, and, above all, of insuring its execution. The mining engineers have been entrusted with the duties of inspectors, each in his own district.

GERMAN SCIENTIFIC AND MEDICAL ASSOCIATION.

(Gesellschaft deutscher Naturforscher und Aerzte).

The forty-third annual meeting of this association was opened at Innsbruck, on Saturday, 18th inst. The first general meeting was held in the theatre, at 10·30 a.m. Professor Dr. O. Rembold, one of the local secretaries, opened the proceedings. The statutes of the association, embodying the object of its formation, were read, and these stated that "the main object of the association is to afford means of making the scientific men of Germany mutually acquainted with one another."

The Governor of the Tyrol, his Excellency Baron Von Lasser, then made a speech, welcoming the association in the name of the Emperor of Austria, and he was followed by the Mayor of Innsbruck, who gave a similar welcome in the name of the town.

Professor Dr. Helmsholtz, Privy Councillor, of Heidelberg, was then called upon to deliver his address. The subject he had chosen was "The History of the Development of Science in Later Times." Beginning with the discovery of the laws of gravitation, he traced out the progress of scientific discovery till the most recent date. The address was received with much applause. Professor Helmholtz was followed by Dr. J. R. Mayer, of Heilbronn, whose discourse was scarcely audible to a large number of the audience.

After these addresses, the members of the association distributed themselves to their various sections. With true German love of detail, no less than eighteen sections have been made. They are follows:—

1. Mathematics and astronomy.
2. Physics and mechanics.
3. Chemistry and pharmacy.
4. Mineralogy, geology, and palæontology.
5. Botany and vegetable physiology.
6. Zoology.
7. Anatomy and physiology.
8. Internal medicine.
9. Medicinal reform.
10. Surgery and ophthalmology.
11. Diseases of women and obstetrics.
12. Mental diseases (psychiatrie).
13. Teaching of natural science.
14. Public hygiene and forensic medicine.
15. Diseases of children.
16. Anthropology and ethnology.
17. Military hygiene.
18. Medical statistics.

All the sections are accommodated in the various class-rooms of the university, and as there is so great a sub-division of subjects, no very large rooms are required.

Each section proceeded to elect its president, and the order of the papers for Monday, the 20th instant, was arranged. This finished the real work for the day. At one o'clock there was a general dinner, and in the afternoon a promenade to Berg Isel, a hill south of the town, which commands a lovely view of the surrounding neighbourhood. In the evening a concert was given in the theatre, by the members of the Innsbruck Musical Association.

To-day (Sunday) is devoted to an excursion over the Brenner, which is really a trip worth making. The scenery is fine, and the engineering difficulties of crossing this Alpine pass have been most successfully overcome. To judge by the look of the town to-day, a very large number of the members of the Association have availed themselves of this opportunity of visiting the Brenner; and, as the weather is fine, they will certainly be pleased with the excursion.

On Monday there are sectional meetings; on Tuesday, sectional meetings and a second general meeting. The afternoon is to be devoted to a promenade to the Lanser Köpfe, two hills on the east of the town. On Wednesday the geologists make an excursion to the salt works of Hall, and there is to be a concert in the evening in the assembly-rooms. On Thursday and Friday the sections continue their sittings, and the final general meeting will be held on the latter of these days. This will conclude the work of the association for 1869.

In the journal of the Association, published on Saturday

morning, there were about 750 names, but as the names of the lady associates are not printed, the list does not show the total number of members and associates. In all it will probably about reach a thousand.

Among the names we may notice those of Vogt, Kekulé, Mohr, Varrentrapp, Helmholtz, Zirkel, Dove, von Hauer. There are three four English names on the list, the best known being that of Mr. Geikie, the director of the Geological Survey of Scotland.

The *habitué* of the British Association meetings cannot fail to be struck by one great want, viz., that of a reception-room, where he could meet his friends, write and receive letters, and read the newspapers. At Innsbruck there is nothing of the kind; the only approach to it is the large assembly-room, which is converted into a huge restaurant, and, if not blinded by the smoke, you may perchance find a friend there at supper in the evening. It was amusing, too, to notice how the difference of a few hundreds of miles alters social arrangements. On Saturday morning, the principal personages at the general meeting appeared, at 10 a.m., in full evening dress, with white kid gloves, whilst at the concert in the evening there were not half-a-dozen persons in evening-dress. The Germans certainly bear away the palm from us with regard to early rising. The sections sit from 8 a.m. to 10 a.m., and have, therefore, finished their work before we begin ours in England. What is to be done for the rest of the day is a problem to be solved. The lodgings committee has done its work well, and there are no complaints about quarters or excessive charges.

Commerce.

Exports of Sulphur from Sicily.—The exports of sulphur from Sicily during the first seven months of 1868 were 142,583,914 quintals, as compared with 141,933,398 quintals during a corresponding period of the previous year. This shows an increase of 650,516 quintals in favour of the seven first months of 1868.

Flour Mills in Italy.—The following statistics of the flour mills in Italy are taken from returns made to the Minister of Finance relative to the grinding tax just introduced in Italy. The total number of mills throughout the kingdom is 69,421, of which 38,000 are exclusively employed for grinding for the proprietors. Of the total number, only 20,886 are continually at work. The number of pairs of mill-stones is 94,807, of which 55,986 are driven by water, 716 by steam or by wind, and 38,105 by cattle. The quantity ground amounts yearly to:—

	Quintals.
Corn	20,619,646
Maize and rye	15,831,902
Oats	109,387
Other cereals, dried vegetables, and chestnuts	1,736,818
Total	38,297,752

The tax will amount to 58,070,867 francs per annum.

Colonies.

A New Process of Sheep Washing.—According to the *Melbourne Argus* a new process of sheep washing has been introduced, which thoroughly cleanses the wool, yet preserves its fibre unimpaired and without reducing it too much in weight. The sheep are to pass in rotation through the soak in two large round iron tanks, the water containing nothing but soap and soda. The sheep while passing through are kept sheltered from cold, and are not exposed to fatigue, and after being in a sufficient time they pass on to the jets, which consist of (each) a simple sheet of water as fine as a knife edge, and supplied under a pressure of twelve feet, and about the same length as a sheep's body. This divides the fibre of the wool, without in the least degree injuring the staple, and thoroughly removes all impurities. The wash-tank throughout is constructed entirely of iron, made in sections for the convenience of carriage, and is easily put together at the station. The water is supplied by a powerful centrifugal pump, worked by a steam-engine. The heater for supplying hot water possesses many advantages. It requires no brickwork or masonry, and the fireplace is adapted to take in logs of wood six feet long. Provision is made for cleaning dirt from the soaking tanks without any loss of soap and soda, and for maintaining the water at a uniform temperature. The wash is of ample capacity to wash 4,000 sheep daily.

Sugar of New South Wales.—It seems, by returns from the northern rivers of the colony, that the sugar-producing interest is advancing, it being estimated that little short of 3,000 acres have been placed under cane culture. Machinery, imported and colonial-made, is being put up in various localities, and altogether the progress of this industry is becoming marked and important. It may not be inapposite to remark, in connection with this subject, that favourable advices have been received from the Mauritius, of a new process by Dr. Ivry for the manufacture of sugar, in which the monosulphite of lime gives a more grainy, a drier, and purer sugar than formerly obtained, a larger quantity, of better quality, being obtained from the syrup. Antecedent, however, to the receipt of this intelligence, the *Maryborough Chronicle* (a Queensland paper) had informed us that Mr. Tooth, of the Yengarie plantation in that neighbourhood, having given his attention to the discovery of the separation of the sugar from the cane juice without spoiling the former, has, after much research and many experiments, succeeded. By his system all the sugar of the cane is extracted in pure white fine crystals; no molasses are made, and no refining process will be necessary. Mr. Tooth, it is believed, has, besides patenting his process in England, also obtained patents in America, France, and Holland. The result of this year's operations in sugar making at Yengarie are being looked for with considerable interest.

Telegraphs.—There are now only one or two short sections requisite to complete the circuit between Sydney and London; and it is estimated that that portion in which Australia is chiefly concerned, namely from the Gulf of Carpentaria to the Island of Java, a distance of 1,900 miles, could be laid for £500,000. Application has been made to the government of Dutch India for a concession to land a cable on the east coast of Java, to connect Australia, under a subsidy or guarantee. It is proposed to ask from the governments of the Australian colonies a guarantee of seven per cent. on a moiety of the cost of construction, and the amount which they would be asked to contribute is set down at £17,500. The proportion payable by New South Wales would simply be £4,375, in the event of the traffic not paying a dividend of seven per cent. over and above the working expenses.

Notes.

Honours to Industry.—Mr. Whitworth has been offered by Mr. Gladstone a Baronetcy, which he has accepted. The same honour has, it is believed, been conferred on Mr. Fairbairn; and the newspapers have announced that the founder of Saltaire is to be in future Sir Titus Salt, Baronet, so that Arts and Manufactures are properly recognised by the present administration.

Railways in Hungary.—A line of railway is about to be constructed in Hungary, from Grosswardine to Klausenburg and Kronstadt, with various branches, forming altogether a length of 609 kils. It will form the most direct communication between Vienna, Buda, Pesth, Galatz, the Black Sea, and the East. This line

will cross a most fertile country, with rich veins of iron, and coal, and rock salt, and most extensive fruits. The line is divided into six sections:—The first from Grosswardine to Klausenburg, which is to be opened for traffic by the end of November, 1869. The second from Karlsburg to Toris, Gerend and Maros-Vasazhely. The third from Toris to Kapus and Schaessburg, to be opened by the 1st December, 1869. The fourth, Kapus to Hermannstadt, by the 1st November, 1871. The fifth, Klausenburg, to Boos Gerend. The sixth from Schaessburg to Kronstadt, to be completed by the 1st October, 1872. The estimated cost of these lines is 320,000frs. per kil. (£20,600 per English mile).

Liebig's Baking Powder.—The publication in the *Journal*, of the 10th instant, of the observations of Dr. Debus, in his address to the Chemical Section of the British Association, has led to many inquiries being made as to whether the mixture alluded to can be purchased ready prepared for use. It appears that the article is regularly sold in the shops under the title of the "Horsford-Liebig Baking Powder." The prefix, of "Horsford" is used in conjunction with that of Liebig, Horsford claiming to be the original inventor of that which Liebig has improved. It is understood that the article is prepared in Germany, under the supervision of Liebig himself.

American Telegraphs.—In the United States there are 4,126 telegraph offices, or one for every 7,549 of the population, and nearly every town and village has its office. Over 50,000 miles of line, and 100,000 miles of wire, with 265 submarine cables are in operation.

Railways in Italy.—The total receipts of the Alta Italia Railway Company, during the past year, amounted to 54,633,350·10 frs., as compared with those of 1867, which amounted to 52,807,903·52 frs., showing an increase of 1,825,446·58.

South Austrian Railways.—The total length of the network of railways in South Austria in 1868 was 1,887 kilometres. The receipts amounted to 69,851,432·88 frs., and show an increase of 12,293,997·87 frs. on those of the previous year, which amounted to 57,557,435·01 frs. The receipts per kilometre, in 1868, amounted to 37,017·19 frs., whilst those of the previous year, on 1,756 kilometres of line, was only 32,777·58 frs., an increase of 4,239·61 per kilometre, or 12·9 per cent. more. The receipts were composed of:—

	Francs.
Passengers	15,479,079·43
Luggage and goods	54,372,353·45
Total receipts	69,851,432·88

This gives the average receipts per kilometre of 8,203·01 frs. for passengers, and 28,814·17 frs. for luggage and goods. The average receipts per week were 297,674·60 frs. for passengers, and 1,045,622·18 for luggage and goods, The maximum weekly receipts was 494,000 frs. for passengers, and 1,560,000 frs. for goods; and the minimum was 148,000 frs. for passengers, and 770,000 frs. for goods.

Patents.

From Commissioners of Patents' Journal, September 17.

Grants of Provisional Protection.

Alcohols, apparatus for rectifying—2624—W. E. Gedge.
Carbonate of soda—2616—C. F. Claus.
Carriage doors and windows, raising or closing the glasses or shutters of—2592—J. Day.
Copper, separating from ores—2608—P. Spence.
Diaphragm indicators, especially adapted for water and other meters -2604—J. G. Lynde.
Doors, &c.—2620—E. T. Hughes.
Fabrics, weaving—2584—W. S. Laycock.
Fire-engines, &c.—2582—J. Shand.
Glass for decorative or ornamental purposes—2606—H. Defries.
Hydrocarbon oils, treating—2588—R. Scott and W. McIvor.
Knives and forks, &c.—2596—S. H. Greaves.
Marine signals, &c., transmitting power for operating—2600—R. Spear.
Mules for spinning—2630—S. Rawsthorne and J. Metcalf.
Phosphoric acid, &c., extracting from the tap cinder of puddling furnaces, &c.—2610—J. Hargreaves.
Railway carriages, assisting or retarding the progress of—2594—F. Prestage.
Railway chairs—2590—S. Willis.
Railways, signalling on—2602—W. H. Burnett.
Reaping and mowing machines—2622—W. E. Newton.
Screw and ratchet wrenches—2580—T. Wilson.
Screw propellers—2628—W. B. Thompson.
Sewing machines—2386—C. Lockman.
Silk, &c., machinery for combing—2586—T. Greenwood & J. Bapty.
Steam boilers—2598—A. M. Clark.
Telegraphic communications, apparatus for composing, transmitting, and receiving—2634—G. Little.
Tobacco—2612—J. Porteous and H. Gibson.
Velocipedes—2614—F. H. W. Heuer.
Velocipedes—2626—W. R. Lake.
Waves, apparatus for utilising the force of the—2632—F. Ellershausen.

From Commissioners of Patents' Journal, September 21.

Patents Sealed.

821. T. Martin.
832. A. B. Walker.
840. J. Jack.
848. F. D. Nuttall.
868. J. Combe and J. Barbour.
879. C. Longfield.
886. J. Horsley.
890. R. W. Page.
900. F. Baker.
903. E. Peyton.
917. W. R. Lake.
935. E. H. Huch.
939. W. R. Lake.
970. J. H. Lloyd.
973. B. J. B. Mills.
975. B., H., and J. N. Craven.
981. T. Lippiatt.
989. C. D. Norton.
1079. J. A. Miller.
1215. W. R. Lake.
1256. H. E. Newton.
1287. A. V. Newton.
1646. W. R. Lake.
1820. W. E. Newton.
2052. A. V. Newton.
2091. Q. Dunlop, T. J. Martin, and W. Orr.
2138. C. D. Abel.
2217. H. Knight.
2242. G. T. Bousfield.
2311. W. R. Lake.
880. J. Macintosh.
881. L. A. Israel.
893. F. J. Manceaux.
895. J. Nevill.
907. J. R. Baillie.
909. T. Champion.
916. W. Meakin.
926. G. Hodgson, H. Bottomley, and E. Cockroft.
931. F. Parker.
936. W. Riddell & T. Bletcher.
977. J. A. Hopkinson and J. Hopkinson, jun.
1279. W. R. Lake.
1329. J. Broadfoot.
1487. C. E. Spooner and G. A. Huddart.
1622. J. Cranston.
1800. G. W. Oliver.
1889. F. Forder and J. Traves.
1973. R. Heyworth.
2183. T. Thomas.
2211. A. C. Kirk.

Patents on which the Stamp Duty of £50 has been paid.

2356. J. H. Betteley.
2367. J. Boyd, J. McPherson, T. K. Kerr & J. Taylor.
2378. J. Twibill.
2417. H. Carter and G. H. Edwards.
2382. J. Dunn.
2413. C. W. Siemens.
2436. I. Dimock.
2386. J. H. Johnson.
2416. A. B. Walker.
2432. T. A. Rochussen.
2503. E. B. Bigelow.
2523. R. Hornsby and J. E. Phillips.
2383. E. Wall.
2398. H. W. Ley.
2554. G. E. Searle.
2403. H. S. Cropper.
2415. A. B. Bérard.

Registered Designs.

5043—August 2—Instrument to be used for ascertaining the temperature of ricks or stacks, and for other like purposes—T. C. Eyton, Wellington, Salop.
5044—August 9—The traveller's companion, viz., a walking-stick or an umbrella—Messrs. Brooks and Parker, Birmingham.
5045—August 11—The Royal purse lock—Peacock, Mansfield, and Brittan, Salisbury-square, Fleet-street, E.C.
5046—August 11—A hand drilling brace—Casterbrook and Allcard, Sheffield.
5047—August 16—A muzzle for horses—J. P. McGeorge, Newark-upon-Trent.
5048—August 18—Nelson's improved dead eye—J. Nelson, Sunderland.
5049—August 27—Madge's registered shoe—W. Madge, Kingsbridge, South Devon.
5050—August 28—Pencil point protector—Hinks, Wells, and Co., Birmingham.
5051—September 2—Self-acting window catch and fastener—W. T. Ramshill, Deptford.
5052—September 6—Indicator in connection with railway passengers' alarm bell—H. A. Huskisson, Birmingham.
5053—September 16—Stirrup-bar for saddle tree—H. T. Groves, Melbourne.
5054—September 17—Boot fastening—C. Birch, Moseley-street, Birmingham.

Journal of the Society of Arts.

FRIDAY, OCTOBER 1, 1869.

Proceedings of the Society.

Musical Pitch.

The following additional information has been obtained, through the assistance of the Foreign Office, in reply to the queries issued by the Society some time since. The previous replies will be found at page 699 of the *Journal*:—

Queries.

1. Is there any standard musical pitch officially prescribed, and in use; and, if so, what is it, and by what number of vibrations for "C" is it represented? (It would be very desirable that a tuning-fork, or other instrument showing the pitch, should be procured and sent. The expense of this the Society will pay.

2. By what authority is it adopted, and how enforced?

3. Is it compulsory on any, and what class of musicians, and whether or not in military bands, conservatoires, operas, Royal chapels, &c.? Name these, if any.

Foreign Office, September 13th, 1869.

Sir,—With reference to your letter of the 27th July, I am directed by the Earl of Clarendon to transmit to you, for the information of the Society of Arts, copies of letters giving information respecting musical pitch in Italy, which have been sent home by Her Majesty's Chargé d'Affaires at Florence.

A tuning-fork which accompanied the report from Bologna is retained at Florence until the departure of the next messenger, and will be sent to you as soon as received.

I am, Sir,
Your most obedient, humble servant,
(Signed) E. Hammond.

P. Le N. Foster, Esq., M.A., Adelphi.

Florence.

(Translation).

Sir,—With reference to Sir A. Paget's note of August 11th, I renewed my application to the Minister of Public Instruction, with a view to engage him to supply me, as soon as possible, with a reply to the inquiries of the Society of Arts in England relative to musical pitch in Italy.

My honourable colleague now replies, that having desired steps to be taken accordingly in Florence, Naples, Milan, Turin, Bologna, and Venice, he has received from the authorities of Bologna, Florence, Venice, and Milan the answers sent herewith, together with a report regarding the pitch in use at Bologna drawn up by the Professor of Physics in the Royal University there.

As regards the city of Turin, information has been sought from the Musical Lyceum, the orchestra of the Royal Theatre, and the band of the National Guard, the only societies connected with music that exist there, and they have unanimously replied that they have neither adopted, nor is there prescribed officially, any fixed pitch (*diapason modello*,), and that, therefore, they are unable to reply to the inquiries contained in the circular forwarded to me.

The state of things on this point is the same at Naples, where no pitch is prescribed, to regulate the vocal and instrumental orchestras of the theatres and musical establishments and societies.

The only point to note with regard to the Royal Musical College of the city and province of Naples is, that the tuning-fork or diapason which regulates the pitch of the above-named orchestras, generally speaking, is that always used at Vienna, and considered most effective, as being the sharpest, and therefore most brilliant *(più acuto e giundi più vivido)*, which is proved by the perfect execution there, long since, of all sorts and kinds of musical compositions.

Such is the information that the King's government has been able to collect on the inquiries presented to it. I trust that they will serve to meet, at any rate in some measure, the wishes of the Society of Arts in England, and in this hope I avail myself, &c.,

(Signed) A. Blanc.

September 4th, 1869.

1 and 2. There is none.

3. The musical pitch adopted in Florence is, generally, that of Vienna. The musical pitch adopted in the Royal Institute of Music is somewhat lower. In the orchestra of the Pagliano Theatre they did adopt in the last musical season, but exceptionally, the French *diapason normal*. In short, this matter, among us, is left entirely to the *bon plaisir* of every orchestra director.

(Signed) L. F. Casamorata,
President of the Royal Institute of Music of Florence.

June, 1869.

Bologna.

(Translation).

Dear Sir,—I send you herewith the pitch for which you have asked. The number of vibrations has been found to be 887·77, which may be taken as 888, being only a quarter of a vibration in excess. This pitch is therefore higher than the French normal pitch by 18 vibrations, and it is rather lower than that of S. Carlo, of Naples, and much lower than that of La Scala, at Milan, as used by these theatres in 1857, when M. Lissajous examined them. To ascertain the number of vibrations, two methods have been adopted, namely, the graphic method and the accoustic method of the sirene of Cagnard de la Tour. By the first method, both my illustrious colleague, the engineer Sacchetti, and I have obtained the same results; but by the second method it was necessary that there should be an ear well practised in appreciating the sounds, so as to determine when the sirene and the note to be tried were accurately in unison. The intelligent co-operation of the very skilful professor of this Musical Lyceum, Signor Carlo Verardi, to whom I now wish to record my best thanks, has been of the greatest help to me. It is needless to add, that it has been necessary to make many experiments in both methods, in order to attain precision in the results. Much time has been required to make these experiments, and to adjust the necessary instruments. This must be my apology for the delay in replying to you.

With the greatest esteem allow me to subscribe myself,
(Signed) Lorenza della Casa,
Professor of Physics of the Bologna University.

1. No musical pitch, officially prescribed, exists at Bologna; that adopted by the orchestra of the theatre and of the Musical Lyceum, is represented by 887·77 vibrations for *La*.

2 and 3. There is no authority regulating the pitch, and consequently it is not compulsory.

Milan.

1. At Milan there is a pitch officially adopted in the Royal Conservatoire of Music, in the theatres of La Scala and Canobbianna, in the schools of music and theatres

connected with them, and in the National Guard. This pitch is the Paris pitch, namely for *La*, 870 vibrations.

2. The authorities which regulate this pitch are, the Academical Council for the Royal Conservatoire and the Committees of the Town Council for the theatres, the schools connected with them, and their musical bands.

3. The pitch of 870 vibrations for the note *La* is compulsory on the above-named musical bodies, but without government interference.

Venice.

1. No fixed musical pitch is prescribed in Venice; such being the case, the second part of the question requires no answer. There is, however, in the Lyceum of Marco Polo, in St. Catterina, a tuning-fork of the Paris pitch. Our orchestras adopt the musical pitch of Vienna, because the greater part of their wind instruments are made in that city.

2. As no officially-prescribed musical pitch exists, no authority regulates it; and as our orchestras have no fixed pitch, it varies according to the fancy of the director; it ought, however, to be stated that these artists endeavour to keep the pitch as low as possible.

3. The non-existence of a fixed musical pitch answers this question. However, it may be observed that the organ of the metropolitan chapel of St. Marco was formally tuned on the basis of the old *La*, very low. A few years ago it was directed to be raised, because the bowed instruments lost their fullness of tone, and the wind instruments manufactured in Vienna were not in tune with it; now, this organ is tuned a quarter of a tone lower, but still it is higher than the normal French pitch. The other organs are tuned according to the fancy of the builders. Modern builders generally adopt the Vienna pitch in preference to that of Paris. There is no authority which regulates the pitch in bands of the army and the National Guards.

(Signed) Giovanni Lazzari
(Formerly President of the Fernie Theatre).
Antonio Buzzelli.
Francesco Tessarini.
Césare Trombini.

Venice, 16th June, 1869.

Proceedings of Institutions.

EXAMINATION PAPERS, 1869.

(*Continued from page* 832.)

The following are the Examination Papers set in the various subjects at the Final Examination held in April last:—

LATIN AND ROMAN HISTORY.

THREE HOURS ALLOWED.

Section I.

Translate:—

'Vincis,' ait 'Perseu. remove fera monstra, tuaeque
Saxificos vultus, quaecumque ea, tolle Medusae:
Tolle, precor. Non nos odium regnive cupido
Compulit ad bellum. pro coniuge movimus arma.
Causa fuit meritis melior tua, tempore nostra.
Non cessisse piget. Nihil, o fortissime, praeter
Hanc animam concede mihi. tua cetera sunto.'
Talia dicenti neque eum, quem voce rogabat,
Respicere audenti 'Quod' ait 'timidissime Phineu,
Et possum tribuisse, et magnum est munus inerti,
Pone metum, tribuam. nullo violabere ferro.
Quin etiam mansura dabo monimenta per aevum:
Inque domo soceri semper spectabere nostri,
Ut mea se sponsi soletur imagine coniunx.'
Dixit. et in partum Phoeynida transtulit illam,
Ad quam se trepido Phineus obverterat ore.
Tum quoque conanti sua vertere lumina cervix
Deriguit, saxoque oculorum induruit humor.
Sed tamen os timidum, vultusque in marmore supplex,
Summissaeque manus, faciesque obnoxia mansit.

1. Parse fully, giving both accidence and syntax, the words vultus, meritis, dicenti, respicere, quod, conanti.

2. Give the present and perfect tenses indicative and the supines of the verbs remove, tolle, cessisse, induruit, mansit.

Section II.

Translate:—

Quas dea per terras et quas erraverit undas,
Dicere longa mora est. Quaerenti defuit orbis.
Sicaniam repetit. Dumque omnia lustrat eundo,
Venit et ad Cyanen. Ea ni mutata fuisset,
Omnia narrasset. sed et os et lingua volenti
Dicere non aderant, nec quo loqueretur, habebat.
Signa tamen manifesta dedit, notamque parenti,
Illo forte loco delapsam in gurgite sacro,
Persephones zonam summis ostendit in undis.
Quam simul agnovit, tamquam tunc denique raptam
Scisset, inornatos laniavit diva capillos,
Et repetita suis percussit pectora palmis,
Nescit adhuc, ubi sit. terras tamen increpat omnes
Ingratasque vocat nec frugum munere dignas:
Trinacriam ante alias, in qua vestigia damni
Repperit. Ergo illic saeva vertentia glebas
Fregit aratra manu, parilique irata colonos
Ruricolasque boves leto dedit, arvaque iussit
Fallere depositum, vitiataque semina fecit.

1. Account for the mood of the verbs erraverit, narrasset, loqueretur, scisset, sit, fallere.

2. What is the precise difference between is, hic, ille, iste?

3. Account for the case of quaerenti, volenti, munere, manu, leto.

Section III.

Translate:—

At enim te in disciplinam meam tradideras—nam ita dixisti—; domum meam ventitaras. ne tu, si id fecisses, melius famae, melius pudicitiae tuae consuluisses. sed neque fecisti nec, si cuperes, tibi id per C. Curionem facere licuisset. auguratus petitionem mihi te concessisse dixisti. o incredibilem audaciam! o impudentiam praedicandam! quo enim tempore me augurem a toto conlegio expetitum Cn. Pompeius et Q. Hortensius nominaverunt—nec enim licebat a pluribus nominari—tu nec solvendo eras nec te ullo modo nisi eversa re publica fore incolumem putabas. poteras autem eo tempore auguratum petere, cum in Italia C. Curio non esset? aut tum, cum es factus, unam tribum sine Curione ferre potuisses? cuius etiam familiares de vi condemnati sunt, quod tui nimis studiosi fuissent.

1. Parse fully, giving both accidence and syntax, the words domum, fama, audaciam, solvendo, tui.

2. Account for the mood of consuluisses, fore, esset, potuisses, fuissent. What difference would be made in the meaning if the last word had been fuerant?

Section IV.

Translate:—

Heredidates mihi negasti venire. utinam hoc tuum verum crimen esset? plures amici mei et necessarii viverent. sed qui istuc tibi venit in mentem? ego enim amplius H.S. ducenties acceptum hereditatibus rettuli. quamquam in hoc genere fateor feliciorem esse te: me nemo nisi amicus fecit heredem, ut cum illo commodo, si quod erat, animi quidam dolor iungeretur; te is, quem tu vidisti numquam, L. Rubrius Casinas fecit heredem. et quidem vide quam te amarit is, qui albus aterne fuerit ignoras: fratris filium praeteriit: Q. Fufii, honestissimi equitis Romani suique amicissimi, quem palam heredem semper factitarat, ne nomen quidem perscripsit: te, quem numquam viderat aut certe numquam salutaverat, fecit heredem. velim mihi dicas, nisi molestum est, L. Turselius qua facie fuerit, qua statura, quo municipio, qua tribu.

'nihil scio' inquies 'nisi quae praedia habuerit.' *is* igitur fratrem exheredans te faciebat heredem. in multas praeterea pecunias alienissimorum hominum vi eiectis veris heredibus, tamquam heres esset, invasit. quamquam hoc maxime admiratus sum, mentionem te hereditatum ausum esse facere, cum ipse hereditatem patris non adisses.

1. Explain H.S. ducenties. How did the Romans commonly express sums of money?

2. Account for the mood of viverent, jungeretur, fueris, dicas, adisses.

3. Account for the case of tibi, sui, facie, heredibus, hereditatum.

Section V.

1. What was a Roman colonia?

2. Give an account of the league made by Spurius Cassius with the Latins and the Hernici.

3. Write a short life of Camillus.

4. What was the military tribunate? How long did the institution last?

5. Mention the occasions on which Rome was in trouble because a large proportion of the citizens were in debt, and what was done on each occasion.

6. What were the Licinian laws? and what was their purpose?

Section VI.

1. What caused the second Punic War? To what causes do you attribute the success of Rome in that war?

2. Mention any very distinguished censors, and what made them distinguished.

3. Describe the suppression of Catiline's conspiracy, and its consequences.

4. Give an account of the Gracchi.

5. Describe the Roman government of the provinces.

6. Give an account of Mithridates.

FRENCH.

THREE HOURS ALLOWED.

Part I.

Candidates for a third-class certificate are to translate the following extract into English, and to answer the grammatical questions thereto annexed, in the order in which they are placed. This first part is all that is required of them.

Il y a une grande puissance de conviction et de dévouement à l'idée, dans cette lutte d'un seul contre une multitude. Braver à la fois, sans autre parti que sa raison individuelle, le respect humain, cette lâcheté de l'esprit déguisée en respect de l'erreur; affronter les haines de la terre et les anathèmes de l'Eglise, ce fut l'héroïsme de Voltaire. Il exposa son nom; il le dévoua, et pendant sa vie et après sa mort. Il se résigna à de longs exils en échange de la liberté de combattre. Il se séquestra volontairement des hommes pour que leur pression ne gênât pas en lui sa pensée. A quatre-vingts ans, infirme et se sentant mourir, il fit plusieurs fois ses préparatifs, à la hâte, pour aller combattre encore et expirer loin du toit de sa vieillesse. La verve intarissable de son esprit ne se glaça pas un seul moment. Il porta la gaieté jusqu'au génie, et sous cette plaisanterie de toute sa vie on sent une puissance sérieuse de persévérance et de conviction. Ce fut le caractère de ce grand homme. La verve lumineuse de sa pensée a trop caché la profondeur du dessein. Sous la plaisanterie et sous le rire, on n'a pas assez reconnu la constance. Il souffrait en riant et voulait souffrir, dans l'absence de sa patrie, dans ses amitiés perdues, dans son nom flétri, dans sa mémoire maudite. Il accepta tout en vue du triomphe de l'indépendance de la raison humaine. Le dévouement ne change point de valeur en changeant de cause; ce fut là sa vertu devant la postérité. Il ne fut pas la vérité, mais il fut son précurseur, et marcha devant elle. Une chose lui manqua: ce fut l'amour de Dieu. Il le voyait par l'esprit, il haïssait les formes que les âges passés lui avaient associées et adoraient à sa place. Il déchirait avec colère les nuages qui dans sa conviction empêchaient l'idée divine de rayonner sur les hommes, mais son culte était plutôt de la haine contre l'erreur que de la foi dans la divinité. Le sentiment religieux, ce résumé sublime de la pensée humaine, cette raison qui s'allume par l'enthousiasme pour monter à Dieu comme une flamme et pour se réunir à lui dans l'unité de la création avec le créateur, du rayon avec le foyer, Voltaire ne le nourrissait pas dans son âme. De là les résultats de sa philosophie. Elle ne créa ni morale, ni culte, ni charité; elle ne fit que décomposer et détruire. Négation froide, corrosive et railleuse, elle agissait à la façon du poison, elle glaçait, elle tuait; elle ne vivifiait pas. Aussi ne produisit-elle pas, même contre ces erreurs, qui n'étaient que l'alliage humain d'une pensée divine, tout l'effet qu'elle devait produire. Elle fit des sceptiques au lieu de faire des croyants. La réaction chrétienne fut prompte et générale. Il en devait être ainsi. L'impiété vide l'âme de ses erreurs sacrées, mais elle ne remplit pas le cœur de l'homme. Jamais l'impiété seule ne ruinera un culte. Il faut une foi pour remplacer une foi. Il n'est pas donné à l'irréligion de détruire une religion sur la terre. Il n'y a qu'une religion plus lumineuse qui puisse véritablement triompher d'une religion altérée en la remplaçant. La terre ne peut pas rester sans autel.

Lamartine.—*Les Girondins.*

1. Parse the first two sentences of the above extract, down to "de Voltaire".

2. Give the five primitive tenses of the verbs:—*Mourir, fit, aller, combattre, sent, reconnu, souffrait, riant, voulait, voyait, nourrissait, détruire, produisit, devait, puisse.*

3. Write the masculine form of the adjectives *corrosive, railleuse, lumineuse,* and write the feminine of *frais, gros, vieux, sec, favori.*

4. The *h* is mute in "l'héroïsme." Is it the same in "héros," "héroïne," "héroïque"?

5. "A de longs exils." Explain the use of "de" here, and give all the meanings of that word.

6. "A quatre-vingts ans." When is "vingt" thus spelt with an *s*?

7. "Glaça," "changeant." Explain the rules which refer to the peculiar spelling of these two words.

8. "Il haïssait." Give the forms of the verb "haïr," in which the *i* does not require the "tréma," as in the present case.

9. Explain the spelling of both past participles in "les formes que les âges passés lui avaient associées."

10. "Aussi ne produisit-elle pas." What are the other words, adverbs or conjunctions, with which the verb is thus placed before its nominative case, although the sentence is not interrogative? Give examples.

11. How do you explain the subjunctive "puisse" in the last sentence but one?

12. Distinguish between *volontairement* (5th sentence) and *volontiers;* and also between *il voulait souffrir* (12th sentence) and *il voulait bien souffrir.*

13. The word "parti" that occurs in the second sentence has several meanings, totally different; can you give them with examples?

14. Conjugate the preterite and the present subjunctive of the verbs:—*Créer, détruire, rire, vouloir, souffrir, haïr, devoir.*

Part II.

Candidates for a second-class certificate are to answer questions 9 and 11 in Part I., together with those in Part II., and to translate the English extract and idiomatic expressions which follow.

Grammatical and Idiomatic Questions.

1. Decline the French personal pronouns of both genders, giving the disjunctive or analytical, and the conjunctive or synthetical forms in each case.

2. When do the dative pronouns *lui, leur,* and the accusative *le, la, les,* follow the verb instead of preceding it, according to the general rule? Give examples.

3. Show with examples how personal pronouns are

construed in the disjunctive form for the sake of contradistinction.

4. Show also by examples the construction of pronouns with reciprocal verbs. Translate "they will hurt each other," and "they will write to each other," 1st, in speaking of two persons, 2nd, in speaking of more than two.

5. Name the substantive that corresponds to each of these adjectives, which occur in the French extract:—*Lumineuse, sublime, humaine, froide, corrosive, railleuse, sceptique, chrétienne, prompte*, and also to each of the past participles—*Déguisée, perdues, flétri, maudite.*

6. Give all the meanings of the verb *manquer*, with examples.

7. Contrast the pronunciation of the following French words with that of the words exactly corresponding to them, and all but identically the same in English:—*Subtil, calme, sculpteur, sceptique, schisme, hérésie, observer, posséder, baptême, baptiser, psaume, psalmiste, phthisie.* Add any others you may think of, presenting a like contrast in the two languages.

8. Explain by the affinity of sounds how the *v* of *cheval* and the *j* of *jeter* are respectively affected and modified, when the *e* mute being dropped each of these words is pronounced like a monosyllable.

9. Conspicuous among the many English misspellings of words or locutions borrowed from the French, may be noticed *coûte qui coûte*, and the *morale* (of troops, &c.). Correct and explain.

Translation.

The pretty fable by which the Duchess of Orleans illustrated the character of her son, the Regent, might, with little change, be applied to Byron. All the fairies, save one, had been bidden to his cradle. All the gossips had been profuse with their gifts. One had bestowed nobility, another genius, a third beauty. The malignant elf who had been uninvited came last, and unable to reverse what her sisters had done for their favourite, had mixed up a curse with every blessing. In the rank of Lord Byron, in his understanding, in his character, in his very person, there was a strange union of opposite extremes. He was born to all that men covet and admire. But in every one of those eminent advantages which he possessed over others was mingled something of misery and debasement. He was sprung from a house, ancient indeed and noble, but degraded and impoverished by a series of crimes and follies which had attained a scandalous publicity. The kinsman whom he succeeded had died poor, and but for merciful judges would have died upon the gallows. The young peer had great intellectual powers; yet there was an unsound part in his mind. He had naturally a generous and feeling heart, but his temper was wayward and irritable. He had a head which statuaries loved to copy, and a foot the deformity of which the beggars in the streets mimicked. Distinguished at once by the strength and by the weakness of his intellect; affectionate, yet perverse; a poor lord and a handsome cripple, he required, if ever man required, the firmest and most judicious training.

Macaulay.—*Essays.*

Idioms.

Il est fait à cela. Il est fait pour cela.
Je me le suis assuré. Je m'en suis assuré.
Rendez-vous. Rendez-vous y.
Il n'y reviendra pas. Il n'en reviendra pas.
Vous en revenez toujours là.
Il en est revenu d'une belle.
Que vous en reviendra-t-il? A combien cela vous reviendra-t-il?
Il en faut peu. Il s'en faut peu.
Il s'y trouve bien. Il s'en trouve bien.
Elle prend l'air. Elle prend des airs.

Part III.

Candidates for a first-class certificate are expected to translate the above idioms and English extracts, and to answer in French the last seven questions in Part II., as also the following:—

Literature.

1. Describe the character of Villon's writings, and comment on Boileau's lines—

Villon sut le premier, dans ces siècles grossiers,
Débrouiller l'art confus de nos vieux romanciers.

2. State what you know of the *Heptaméron.*

History.

Sketch briefly the part taken by France in the Crusades.

(*To be continued.*)

PARIS CONSERVATOIRE DES ARTS ET METIERS.

The following account of the Conservatoire des Arts et Métiers, and the Central College in Paris, taken from the *Builder*, is worthy of attention at the present time:—

"The Imperial Conservatory of Arts and Trades, or, as it is styled in French, the "Conservatoire des Arts et Métiers," is the oldest establishment for affording technical instruction in France. It owes its origin to a mechanical genius, Vaucanson, who, during his life-time, was apparently frittering away his talents in contriving complicated pieces of automata, which nevertheless formed the delight of those who had an opportunity of seeing these triumphs of mechanical skill.

"Vaucanson constructed, among other things, an automaton flute-player, which executed several airs in a charming way; and a duck which waddled in the water, arranged its plumage, picked up its food, and apparently digested it; together with other ingenious imitations of the natural habits of the bird.

"These, however, were but the playthings of a great man, and Vaucanson, while he lived, did much that was of service to his country, and at his death he bequeathed his valuable collection of looms and other machines to the government, for the free use of artisans, native and foreign. The government accepted the gift, and placed the collection in a building which was open to all. The collection was enlarged, and, just as the great French revolution burst over France, the institution had become an important aid to the mechanic. During the early, tempestuous days of the revolution, the Conservatory was at first neglected, and then shut up. But the period of its vicissitudes was short, and in a very little time the institution resumed its teaching. In 1796, a drawing-school was established. This was an era in the records of technical instruction in France, for until this time no establishment for the teaching of drawing applied to industry, and based upon descriptive geometry, was to be found in the country. From this school, as the government report assures us, proceeded a number of pupils who, in various ways, became useful to their country, as well as several eminent manufacturers.

"In 1810, the Continental blockade, devised by Napoleon to strike a death-blow at English manufacturing industry, was in full operation, and the importation of English cotton goods was almost entirely prevented. This condition of affairs gave rise to the establishment of a spinning-school at the Conservatory. Looms were set up, and a sufficient number of workmen were trained to give an impulse to the weaving trade of France. This school did not long continue in operation; the weavers found employment in private manufactories, after which the establishment was closed, as being of a character foreign to the general nature of the Conservatory.

"With the exception of this temporary educational workshop and the elementary drawing-school, the only object of the Conservatory, down to this date, was the formation of a collection of machines, looms, and apparatus employed in the industrial arts. Its scope was much widened in consequence of a decree of 1819. Prior to

this, the Conservatory merely offered to industry a mute museum, from which the manufacturer or artisan might doubtless derive useful instruction; but this instruction was unaccompanied by the teaching of the principles which should form its foundation.

"In December of the latter year, an important step was taken. There was established a public and gratuitous course of instruction on the application of the sciences to the industrial arts. Here, indeed, was an immense stride, the consequences of which are everywhere to be witnessed in France at the present day. A decree of 1829 added fresh popularity to the Conservatory, by the inauguration of a course of physics as applied to the arts. In 1836, three more additions were made. These were—a course of cultivation, a course of mechanics and buildings applied to agriculture, and a course of agricultural chemistry. There were now seven courses in full operation. But these were still insufficient for the increasing development of industry, as well as for the general demand for more scientific instruction. In prompt obedience to this demand, an enlightened French ministry decreed five new public and gratuitous courses. They were—a course of mechanics applied to industry, a course of descriptive geometry, a course of law as applied to industry, a course of chemistry applied to the arts, and a course of agriculture, to which the previously existing course of cultivation was added as a second course. Thus the number of courses was raised to ten. In 1848, a course of ceramics was opened by M. Ebelman, director of the Sèvres government porcelain manufactory; but at his death the lectures were discontinued. Many improvements were also suggested at this period, but were delayed in consequence of the political condition of France during 1848 and subsequently. The foundation of new courses recommenced in the year 1852, with the establishment, at the instance of the Paris Chamber of Commerce, of a course of spinning and weaving, and a course of dyeing, printing, and dressing of tissues. In the same year, a course of zoology applied to agriculture and industry was opened. A course of civil architecture was founded in 1854. At this period, the number of gratuitous public courses in the applied sciences had reached the number of fourteen. But the augmented advantages of the Conservatory were not restricted to oral teaching; the collection of models and machines was enlarged, classified, and in every way improved. Since 1849, a catalogue had been in existence; but now every object exhibited was accompanied by a card explanatory of its use. Projected in 1849, and at the present time in full operation, is a gallery for experiments, and for machines in motion. This department has an important office to perform. It is used for trying, either at the demand of the different ministries, or of private manufacturers, any new machines or apparatus presented for examination. These experiments have been received with great satisfaction, and reports of them have been published by the Conservatory. The experiments are made gratuitously. The Conservatory also undertakes the verification of the standard weights and measures required by those foreign governments which have adopted the French metrical system.

"The collections of models are estimated to be worth 1,300,000 francs, or £52,000 of our money. The library contains 18,000 works on the sciences and industrial arts. In the gallery of drawings there are upwards of 7,000 designs of the newest and most useful machines, to scale, and with dimensions given. There is likewise a collection of expired patents. As early as the Exhibition of 1851, the industrial artists of France were, according to their own confession, alarmed at the strenuous efforts England was beginning to make to dispute with them the empire of taste. From this feeling arose the demand made by the industrial interest for increased facilities in art-teaching. The director of the conservatory addressed a memorial upon the subject to the Emperor. There are two characteristic paragraphs in this memorial, dated 1854, which we will translate. They show that our indifference to what is going on upon the Continent respecting the teaching of science and art is not shared by the foreigner, who, as a matter of fact, has been closely watching all our efforts at improvement in technical instruction. The first paragraph says:—"The Universal Exhibition of London has proved to England the superiority of France in the arts dependent on form, taste, and colour. Instead of disputing the fact, the English have set to work at once, with their immense resources and habitual energy, to found museums and drawing-schools all over the country. The Queen and private individuals have stripped their galleries to enrich the museums of practical art with the finest specimens of Sèvres porcelain, bronzes, sculptures, &c."

"The second paragraph is still more characteristically French:—"It would seem as if the English were bent on operating on the human species in the way they have upon races of animals, so as to transform a nation of traders and artisans into a nation of men of taste. How far the Anglo-Saxon race is susceptible of this transformation is a philosophical question beyond my province; but one thing is certain—namely, that a few years hence England will have made immense progress in the arts of design."

"To return to the Conservatory. According to the yearly reports addressed to the Minister of Agriculture, Commerce, and Public Works, the number of persons attending the public courses of the Conservatory is constantly increasing. In six months it has reached 180,000 persons. The great amphitheatre of the institution will accomodate 700 persons; the smaller one 300 persons; and both are found too small.

"When the courses were first started, Sunday was the day which the public appeared to prefer. Gradually, however, the week-day evenings came into favour.

"The teaching so freely given at the Conservatory is exclusively devoted to science applied to industry. The audience is for the most part composed of foremen, workmen who have already received some instruction, and apprentices. There are also a few foreign professors, and many persons who take an interest in the progress of technology. As we have seen, these public courses are gratuitous, and are open to both natives and foreigners. The teaching of this institution is so constantly kept on a level with all the improvements continually being made in France, England, and elsewhere, that the courses are attended by a great number of young foreigners, whose intention it is to become professors.

"The special influences which this institution brings to bear upon the progress of science applied to industry, may be thus summarised:—The collection of models, machines, and products; lectures on science relating to industry, and upon industrial arts; a gallery of drawings which the public are permitted to copy; and an elementary school. The sum at present voted for its maintenance is 285,500 francs a year.

"The Conservatory of Arts and Trades is situate in the Rue St. Martin, and the visitor to Paris may go over it on any Sunday or Thursday free; on other days he would have to pay a franc.

"The Central Imperial School of Arts and Manufactures is a highly esteemed and most important educational establishment, and has been already described at some length in our pages. By its means many pupils who cannot avail themselves of the opportunities offered by the great Polytechnic School, are enabled to obtain a most complete and practical education.

"For the purpose of comparison, we will give a short sketch of the Polytechnic School. It was founded in the year three of the Convention (1794), for the instruction of young men in mathematics and drawing, for the artillery and engineer corps. None but candidates who can pass a very severe examination in mathematics are admitted. Its effort has always been to educate, above all things, good engineers; and some of the most cele-

brated military and civil engineers have been bred within its walls. Still, the time required by this school (seven years), including the preparatory and complementary studies, is much too long for candidates who are anxious to commence their practical and money-earning career as soon as possible. The difficult preliminary examination also includes a great number of candidates. Again, more than half the pupils of the Polytechnic School choose the military service, whilst the greater portion of the other half abandon the civil services to follow scientific pursuits. This is why the admirable Polytechnic School has never been able to satisfy the ever-increasing demands of industry.

"The Central School, therefore, fills up a manifest deficiency in the French system of technical instruction. It was founded in 1829, by the celebrated chemist Dumas, assisted by three other gentlemen, without any aid from the government; but, after some years of success, it first of all passed into the hands of a proprietor, and was then transferred to the State. In the Central School have been educated a considerable number of able engineers, who have taken high rank as constructors of railways, &c. Many directors, managers, and other functionaries of important industrial establishments, civil engineers, mechanical engineers, architects, &c., have emanated from this school.

"The Central School is very popular, even with persons of narrow means, though what in France is held to be a high charge (800 francs, £32 a year) is demanded from pupils. The government and several of the departments have founded scholarships, in favour of the sons of parents in very humble circumstances, and in some cases money for board and lodging has been added. The sons of rich parents pay for their education, as they naturally ought; whilst the doors of the school are also open for the sons of artisans who have given proof of the talents necessary to profit by the instruction.

"At the Central School the pupils are compelled, whatever may be the career they intend to follow, to attend all the courses, and to pass very strict and frequent examinations. During the first year, the instruction is purely theoretical. In the second and third years, theory and practice are blended. The teaching is not confined to unaided oral instruction, for laboratory experiments, and mineralogical and geological excursions are made use of, to complete what the lectures of the professors have commenced. As we have stated, there are frequent compulsory examinations during the courses and at their close, in addition to which there are searching examinations at the termination of each year's studies. The effect of this system is to keep the pupils always up to their work. Discipline is also strictly maintained.

"The Central School is quite international and cosmopolitan in its character; pupils of all nations are admitted on the same footing as natives of France. Not a country in Europe is without a representative, and, at one time or another, pupils have come here from every part of the civilised globe."

Lest it should be thought from the expression "that there is likewise a collection of expired patents," that patents are represented in the Conservatoire, it may be mentioned that such models of patents are not shown publicly, but are kept in a small garret covered with dust, and rarely, if ever, consulted. It is no better than a collection of old mouse-traps, hand lanthorns, old shoes, sabots, corkscrews, and the like, of no practical value.

PARKS, GARDENS, AND PROMENADES OF PARIS.

The changes that have taken place in Paris during the last few years form altogether the most extraordinary amount of work that any municipal government ever caused to be executed in the same space of time in an old city; broad boulevards have replaced narrow and tortuous streets, and pierced masses of dwellings rotting with age and reeking with poisonous emanations. The refuse of the city has been collected by means of a grand system of sewers, and the Seine freed, or nearly so, from all pollution; at the same time, the decoration of the city has been unceasingly pursued; old parks have been beautified and new ones formed, public gardens have been laid out in every quarter of the city, in broad places around public monuments, and in one case in connection with a church—an innovation that has called forth much criticism—and all the great thoroughfares of the city have been planted with trees which, if they do not yet afford much shade, relieve the somewhat monotonous effect of the long lines of white stone houses most agreeably.

The work of the landscape gardener and florist has been no sinecure; in many cases everything was wanting, not only trees and flowers but soil and water, and considering the difficulties of the case the effect that has been achieved is certainly marvellous. How all this has been done, the methods adopted, the costs incurred, and the successes achieved, are now being made known to the world by M. A. Alphand, of the Imperial Corps of Engineers of Roads and Bridges, and Director of the Public Ways and Promenades of the City of Paris, in a publication which in the magnificence of its typography and illustrations has few rivals.* The work will, when completed, form one volume of text and one of illustrations, and it is issued in parts, more than half of which have already appeared. M. A. Alphand naturally commences with his eldest, which is at the same time his most beautiful child, the Bois de Boulogne; after this come Vincennes, the new parks and gardens, the Champs Elysées, the park and garden of the late Universal Exhibition, now completely obliterated, twenty squares, the boulevards, places, fountains, and cemeteries, with a special chapter on the garden of the city of Paris, the floral manufactory where all the decorations of the flower-beds are reared, and where, in the chilly months, the less hardy kinds find a comfortable home.

The work includes everything connected with the subject, the formation of roads, sewers, and conduits, the supply of water, and methods of irrigation, the transplanting of trees, production and distribution of flowers, lodges, restaurants, railings, gates, candelabra, lamps, and useful and decorative objects of all kinds; and in each case the cost of the work, and of the keeping of the various parts in condition, are given, so as to render the book especially valuable to all those who are entrusted with the surveillance or execution of public parks, gardens, and promenades, as well as to landed proprietors.

The Bois de Boulogne is the last remaining portion of the great forest of Rouvray, where Dagobert is said frequently to have hunted; in the twelfth century it lost its old name, and was called the Bois de St. Cloud. The present name originated in the following manner:—Some pilgrims in 1319 erected, in a small hamlet, then called Menu-les-St. Cloud, a church, in imitation of that of Boulogne-sur-Mer. The hamlet was then called Boulogne, and the wood took the same title. The Abbey of Longchamps, the chateaux of Madrid, La Muette, Ranelagh, and Bagatelle, all appertaining to the Bois, are pregnant with historical recollections, dating from the time of Francis I. to that of Louis XVI., but our business is with its recent history.

At the fall of the first Empire nearly the whole of the old timber in the Bois was destroyed, and during the reign of Louis Philippe a great deal of labour was bestowed upon its plantations and roads, but in 1841 it suffered serious diminution by the construction of the fortifications, which cut off Ranelagh and considerable tracts of land on the Passy and Auteuil sides.

In 1852 the Bois de Boulogne was transferred from

* "Les Promenades de Paris, Bois de Boulogne, and de Vincennes, Parks, Squares, Boulevards," par A. Alphand, &c., illustrated by chromolithography and engravings on steel and wood, from designs by E. Hochereau, Inspector of the Promenades of Paris, &c. Large folio. Paris, J. Rothschild; London, R. Hardwicke.

the State to the care of the city of Paris, which was bound to execute within four years embellishments to the extent of £80,000, and in the following year the two lakes were formed, and the new roads and plantations commenced. The success which attended these operations determined the complete transformation of the Bois, and for this purpose a large tract of land on the banks of the Seine, three miles in length and of considerable width, was included in the Bois, the cost of the purchase of this land being partly covered by the letting of certain detached portions for building, and by the establishment of the hyppodrome or racecourse on the plains of Longchamps. The Bois was then enclosed by means of a ha-ha ditch and iron railings, with seventeen pairs of gates.

Before the Bois could be completely planted and laid out in grass there was much to be done, for a considerable portion of the lands near the river were liable to be flooded at every high tide by an old arm of the Seine, which had to be filled up. These and other works occupied five years.

The whole extent of the Bois is upwards of two thousand acres, of which about one half is in plantations, a quarter under grass, and the remainder occupied by water and roads.

The lakes and rivulets contain nearly two hundred thousand tons of water; and the maximum quantity dispensed by the various cascades is 3,500 tons per hour. To supply such a mass of water as this was a serious matter, especially as it was necessary to obtain a certain amount of pressure for the purposes of irrigation. The supply that could be obtained from the Seine was not only insufficient, but costly, as it had to be raised by steam power, and moreover the Seine water was then the only potable water in Paris. Recourse was therefore had to the canal of the Ourcq, the level of which is more than twenty feet higher than that of the lakes in the Bois; this source gave 18,000 tons in the twenty-four hours. An artesian well was sunk at Passy, and this now supplies from 9,000 to 10,000 tons in the same period; but the water is strongly impregnated with sulphuretted hydrogen, and can, therefore, scarcely be used for the alimentation of the lakes, which are well stocked with fish.

The total cost of the transformation of the Bois is given by M. Alphand as follows:—

Works, equal to.....	£298,953
Purchase of surrounding lands, &c.	275,126
Total	£574,079
Against which stands the proceeds of the sale of building plots and other receipts	£351,174
Leaving a balance of	£222,905

Another and very important fact is stated, namely, that whereas formerly the garden land around the Bois was only worth from 1s. 3d. to 5s. per square metre, it now fetches from 16s. to £4 per metre, while 487 mansions or villas have grown up around the Bois, whose construction is estimated to have cost, on an average, at least £8,000 each. The revenue derived in consequence in the form of direct and indirect taxation must certainly be considerable. The width of the roads in the Bois is one of its remarkable features; the principal of these are more than sixty feet broad, three quarters of which are given to the carriage-way; the secondary roads are fifty feet and thirty-three feet, and the smaller twenty-five feet wide. The margins of the footpaths are maintained by means of a mixture of the scrapings of the carriage-way to which they appertain with chopped hay or straw, and the system is said to answer well. Edgings of Portland cement moulded on the spot have lately been tried, but they cost more than two shillings the metre. The drainage of the Bois was a serious matter; the level is generally flat, and sewers throughout would have cost about £160,000. The system of wells was therefore adopted, and these are placed at intervals of about 200 yards apart; these wells are capable of containing from ten to twenty tons of water, and are circular or rectangular in form according to circumstances. The methods of making the roads, the means employed, and the cost are given in full detail with great minuteness; the greatest economy was practised, so that the total cost only averaged about fourpence the square yard. Of the million square metres of roads and pathways in the Bois, more than half are macadamised, the rest are gravelled or merely beaten, the soil being, in general, very strong.

The conduits for water, the arrangement of the hydrants, and the modes of irrigation have been studied with great care, and the methods now in operation are remarkable for their efficiency and economy. Each carriage road has beneath it a conduit in which the pressure varies from fifty to a hundred feet, and minor branches conduct the water to every part of the park. The pipes used originally were of cast-iron, but all the new ones are made of sheet-iron and bitumen.

After experiments of several kinds the system of watering by means of carts has been entirely abandoned for that of jointed hose, with copper branches for the delivery of the water. The two engravings, figs. 1 and 2 (p. 848), show the apparatus in use, with the details, on an enlarged scale.

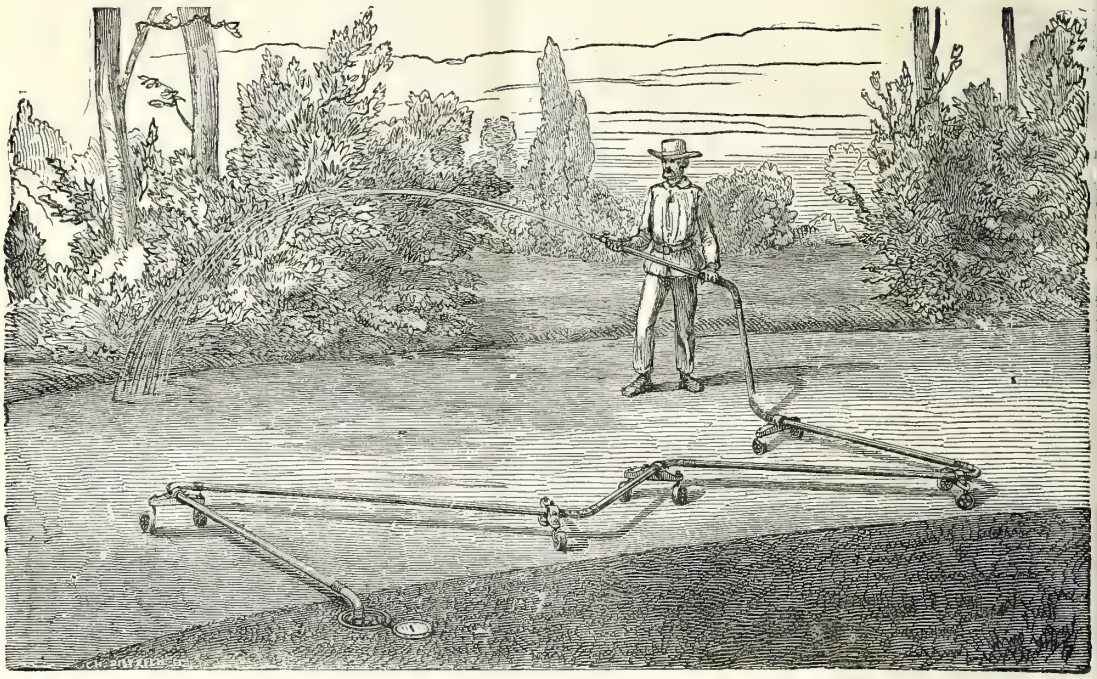
The apparatus is generally about forty feet long, and one inch in diameter; it consists of several tubes composed of plate iron, lined with lead and bitumen, and connected together by means of leather junction pieces and bronze screw joints, each tube having a small carriage with two rollers, as seen in the engraving. This apparatus costs seventy francs, or 4s. 4d. per mètre, and lasts about four years. It is found in practice that a man cannot manage a longer apparatus, and, as it will throw the water in a circle of twenty-five mètres radius, the hydrants are placed at intervals of from 30 to 40 mètres apart. The diminution of the jet of water when the tube is lengthened is also very great. The copper branch is rather less than half an inch in interior diameter at the orifice, that being found to be the most effective in practice; and it is provided with a stop-cock, so that the water can be shut off instantaneously on the passing of vehicles.

By this method the watering of the Bois costs £2,200 per annum, while by the old system of carts it came to £8,400. The quantity of water distributed is about three quarts per square yard.

M. Cousté, director of the tobacco works of Paris, proposed a chemical method of laying the dust on the roads and pathways, which has been tried with some effect; it consists of sprinkling them with chloride of magnesium or sodium, or other deliquescent salt well calcined, the quantity of salt used being half a pound per square yard, and the cost a tenth of a penny. On broad, much-frequented roads, which require scraping every week, the cost of this system is found to be double that of water, but in other places, where the salt is left undisturbed, it has proved very economical. It also possesses the important recommendation of keeping footpaths clear both of mud and dust.

The watering of the grass, of which there are 252 acres in the Bois, is performed in a more simple manner than that of the roads; in small plots the branch of the hose is supported by an iron stand, which is moved from time to time, but large expanses are watered by means of jointed hose, like those already described, the place of the branch being occupied, however, by a screw plug, and each joint of the pipe being pierced with two holes in its side, at an angle of 45°; the rougher these holes are the better, the ragged orifice causing the water to be thrown over the grass in the form of fine spray. When requisite, two or more of these apparatus are joined together. With 300 yards of tube, shifted three times, one man can easily water 1,500 square yards per hour. The grass is only watered during four months in the

Fig. 1.



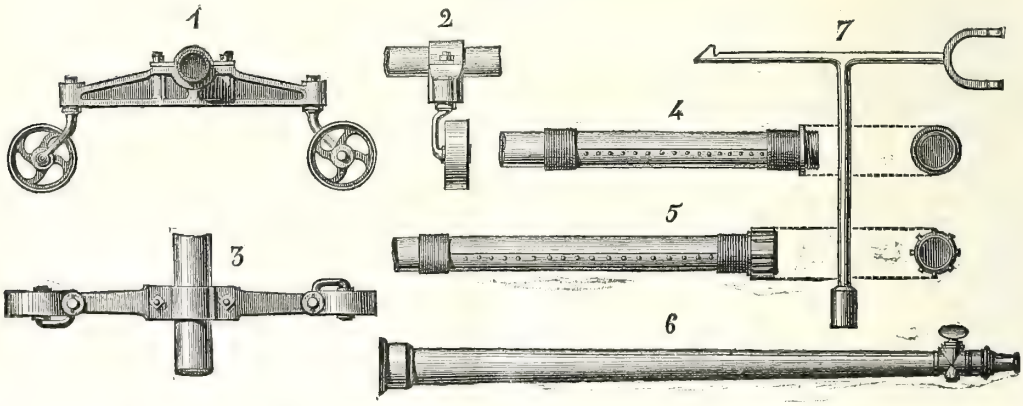
year, and the cost is not more than five guineas per acre. The length of the conduits and water-pipes in the Bois is 66,200 metres, and there are 385 stop-cocks, and 1,600 hydrants: the total cost of all these was £60,800, or at the rate of nearly seventeen shillings per yard.

The surface of the two lakes, both artificial, is equal to 220,000 square metres; the great lake had to be completely lined with rubble stone and concrete, and the work cost £9,228.

There are several pretty cascades in the Bois, and a grotto is formed beneath the great cascade of Longchamp. This cascade was formed on the site of an old quarry, advantage being taken of the irregularities of the ground; it has a main fall more than thirty feet wide, and nearly as high, and two minor falls, expending together 3,000 tons of water per hour. The cost of making this cascade was £6,400, the rocks used being brought from the picturesque forest of Fontainebleau.

The total cost of the lakes, rivulets, and cascades in the Bois was £38,780.

Fig. 2.



The history of the plantation of the Bois is told with complete details, including the transplanting of trees of all ages, with the cost of the operations, and the success achieved. The removal of trees is performed with the aid of carriages, fitted with windlasses, for lifting the tree when it has been isolated from the surrounding soil. These carriages are of three kinds, two being of wood and the largest of iron; they cost respectively £28, £44, and £340, and are all represented by engravings. The cost of transplanting a tree varies from one to five pounds. The success of the operation varies not only with the quality of the soil, but also with the nature of the tree itself; in some cases the losses have amounted to more than two-thirds of the whole, while in others the success has been complete. Great attention has been given to these operations, and much useful information is afforded concerning the kinds of trees best adapted for transplanting, of which the horse-chestnut seems the most remarkable, and also respecting the method of conducting the removal, and the precautions necessary afterwards.

The number of trees and shrubs planted in the Bois since the commencement of its transformation is 420,000, and the total cost of the plantations more than twenty-five thousand pounds.

Amongst the wood-engravings intercalated in the text are a number of specimens of exotic trees that have been acclimatised, and used in the plantations of Paris.

The large plates are executed on steel, stone, or wood, according to the nature of the subjects, which include views of picturesque spots, plans of the Bois and other parks and gardens, views and sections of lodges and other structures, and details of iron-work, &c. In addition to these there is a series of large chromo-lithographic prints of foliage and other exotic plants, such as *Solanum warscewiczii*, *Colocasia bataviensis*, and *Wigandia vigierii*, beautifully drawn and executed. The printing of the work, by M. J. Claye, of Paris, is admirable.

Commerce.

An American View of the Cotton Question.—The *New York Tribune* says:—"A geographical fact of the greatest importance lies at the foundation of all just views on the question of the cotton supply. England believes that deeper ploughing, selecter seed, more diligent culture, nicer picking and marketing, will enable her to offset our South with her India. As to quantities, this may be; as to quality, never; and this is the reason: Cotton, as to the size of the plant and the number of pods it holds, depends upon richness of soil and solar heat. These England finds in sufficient perfection in the Ganges and on the table lands of Deccan. But as to the colour and oiliness of the seed, the fineness and length of its silken filaments, cotton varies in quality according to the mildness and evenness of the autumnal climate. Different regions in our sunny cotton belt differ in this respect, but the contrast is a mild one, and we have a great advantage over the whole of the East India peninsula. After July, our southern climate is, for the most part, rainless till late in the fall. This is caused by the high lands, which commence from one to two hundred miles from the sea-side, where the best cotton grows. Clouds loaded with moisture from the Gulf and the ocean off Florida are wafted northward, but do not discharge their contents till they reach the cool wooded slopes of the Cumberland and Alleghany mountains. This circumstance gives America her unequalled advantages as a producer of long cottons. In India, there is a small district where the conditions are somewhat similar, and rain-clouds in the picking season are attracted northwards across the lower portions of the Ganges Valley, to expend their waters upon the frigid slopes of the range that parts India from Thibet. Dacca is the central city of this region, and Dacca lawns have a romantic fame like that of Damascus blades. A study of the geographical conditions in India, as etched on any good map, will show how limited is the area to which England must be confined in her endeavour to grow such cottons as her finest looms demand. Vigilant and grasping as ever, she has been moving of late to secure that hereditary pet of all her policies, a monopoly. She proposes to do it by active and potent stimulants applied to cotton culture in the Ganges Valley, and the transporting facilities of that country. In Lancashire, the great seat of the cotton industry of the kingdom, there is at present no more cotton than will keep the mills going five days out of six, and there is a continual struggle among the manufacturers to obtain the cotton necessary to prevent a stoppage of the mills. Sad effects are showing themselves in the rapidly growing number of operatives thrown out of employment, and in the increase of pauperism. At a meeting, just held in London, of representatives of the cotton industry of the north of England, and of members of Parliament whose constituencies are interested in that industry, the conviction was generally expressed by the speakers that Lancashire will have to look elsewhere than to this country, seeing that the Americans are using their cotton more and more largely themselves, and will consequently be able to spare less and less of it every year. Resolutions were passed, earnestly recommending the government to establish boards of agriculture in each presidency of India, with a view to the introduction of improved methods of cultivation, the proper selection of seeds, and the use of fertilisers; and also expressing the hope that the government will see the necessity of expending not less than fifty millions of dollars a year in extending the railway system of India, and meeting the requirements necessary for the agricultural development of the country. The movement is a pressure from the ghastly array of British pauperism upon meteorological facts that will be removed when the Alleghanies are emptied into the Gulf Stream. That same pressure of British pauperism it is that regularly pushed soft-headed legislators among us into low tariffs, and all the flounderings of the anti-protectionists. We are glad to see London flinging her doubloons against the eternal slopes of the Himalayas. That is their way of talking free-trade and practising protection. Still, it is proper to thank Lancashire for the lesson her vigilance affords, and we should better the instruction. A million hungry faces are turned to her imploringly, and begging of her mighty combiners, whether merchants or ministers, to explore the last tropical valley that roasts under a torrid sky before they give up the hope of keeping every spindle whirling. We have more coal than she, more waterfalls, more food, more acres suited to the growth of first-class cotton than she can find, though she search creation round, or fly from pole to pole. If the dark exigencies of her giant problems spur England to a restless national thrift, cannot we see that a wise forecast calls upon us to set up a breakwater against her pauper-made goods, that millions of bales of our upland cotton may sing the song of home industry on millions of American spindles?"

Colonies.

Gold.—It was officially reported on the 1st July that a very rich gold-field had been discovered at Trunkey Creek, which lies in the west, about 38 miles from Bathurst and 16 from Careoar. The field is described as consisting of auriferous quartz reefs, in which the precious metal is very abundant. These reefs have been marked off for six miles, and fresh discoveries in the vicinity are reported daily. The district is mountainous for many miles round, and, besides bearing gold, has silver, copper, iron, marble, and limestone. It is also a pure agricultural country. All the gold-bearing reefs run north and south, and dip slightly to the west. A report is current to the effect that there are already 300 people on the ground, and the whole neighbourhood is in a ferment.

Employment.—The *Melbourne Age* states that the presence of distressed colonists abroad is a matter which affects this as well as others of the Australian group. From the governments of Madras and Bengal communications have been received, stating that many Australian colonists who had gone to the East Indies as grooms in charge of horses, have there fallen into great distress, there being no new avenue for their employment, and their first occupation being gone. As this is likely to lead to false impressions, of Victoria at all events, it is desirable to explain that the sufferers owe their misfortunes to their choice of a pursuit and neglect of securing an engagement. There is no ground for their leaving the colony on the score of lack of employment. Instead of sending forth any of our population as a surplus, we are ready to give a hearty Australian welcome to as many honest, thrifty, industrious immigrants as are willing to aid in the utilisation of a fair and fertile territory, rich in

almost every resource that could stimulate enterprise. It is no exaggeration to say that when the new Land Bill becomes law, there will be facilities for agricultural settlement on our soil which, taken for all, are preferable to those presented in any other portion of her Majesty's dominions. New manufactures are springing up all over the country, furnishing employment for skilled labour; and although the days of impromptu fortune-making on the diggings are gone, the discoveries continually being made serve to show that our goldfields will retain their reputation for years. The wealth of Australian precious stones has never been adequately tested, although sapphires, rubies, diamonds, and other valuable gems have been found over and over again. Very recently, some fine stones have been found in the Ballarat district, and in Araluen, New South Wales, discoveries of diamonds have been made, and are being made, which apparently promise to secure for that locality a real reputation. The Australian Diamond Mine Company is certainly the rage among recent speculators.

Notes.

Railways and Canals in Spain.—At the beginning of 1867, there were 5,110 kils. of railway opened in Spain, which, during the previous year, carried 10,962,866 passengers. The net receipts of these lines, in 1866, amounted to 143,814,402 reals (£1,498,066). 1,887 kils. of railway, in addition to the above-mentioned 5,110 kils., are to be opened by the end of 1867, making a total of 6,977 kils. The total cost of this network will, when complete, amount to 607,848,512 escudi (£65,850,255), towards which the government give subventions to the amount of 183,228,315 escudi (£19,849,735). The roads are 16,065 kils. in length, of which 5,976 kils. have been made since 1858. There are now about 2,918 kils. of roads in construction, 6,640 projected, and 2,325 being surveyed. There are 1,277 kils. of navigable rivers, of which 481 kils. are navigable throughout the year, and 796 for only certain seasons. The inland river navigation is carried on by 26 steam-vessels, of 1,534 united horse-power, 1,157 row-boats, and 330 tow-boats. There are also 212 kils. of navigable canals, with 332 canal boats. The number of telegraph stations in Spain is 164, and, in 1866, there were sent 606,596 inland and 59,866 international dispatches for private individuals, and 118,635 inland and 4,121 international dispatches on public service.

Canals in Prussia.—A canal is projected, destined to connect the cities of Berlin and Dresden, so as to compete with the railways in the conveyance of heavy goods and merchandise, which could not, from their low price and bulk, afford a high rate of freight. There is at the present time a very round-about water route between these two places, and the barges plying on it are chiefly laden with coals and sandstones from Saxony, as also, to a large extent, with fruit from Bohemia; the journey occupies on the average three weeks. The proposed canal would shorten the journey to only four days. It will leave the Elbe a little below Dresden, and will enter the Spree just above Berlin, being a distance of about a hundred miles. The projectors depend for the success of their scheme mainly on the hope that, in their case, the government will allow steam to be used; the law in Prussia forbidding the use of screw or paddle wheels on all canals, on account of the destruction to the banks by the wash of the water.

The Austrian Lloyds' Steam Navigation Company.—The fleet of the Austrian Lloyds' Steam Navigation Company, at the end of 1868, consisted of 69 steam-vessels, of an aggregate tonnage of 62,220, and of 15,800 horse-power, and at the present time the total number of vessels has been increased to 73, with a tonnage of 70,000. The profits of the past year amounted to 2,103,600 florins.

Patents.

From Commissioners of Patents' Journal, September 24.

Grants of Provisional Protection.

Agricultural drills, &c.—2662—W. N. Nicholson and G. Black.
Boots and shoes—2465—E. T. Hughes.
Butter, &c., clarifying and refining—2565—W. Young.
Carriage doors—2548—J. Fion and W. Charlet.
Carts, &c.—2656—W. T. Lillicrap.
Ceramic or plastic materials, apparatus for moulding articles in—2670—J. G. Tongue.
Coffee, &c., machinery for hulling and polishing—2011—A. Angell.
Drilling machinery—2555—J. Spencer and J. Consterdine.
Electric signals, instruments for transmitting and recording—2525—O. and F. H. Varley.
Fires, apparatus for extinguishing—2664—W. R. Lake.
Hurdles for folds for lambs and sheep—2436—J. B. Rushbrook.
Jacquard machines—2668—J. E. Moorhead and W. Dudgeon.
Keyhole guides—2636—R. E. Hodges.
Life-buoys—2369—J. T. Greenfield.
Liquids, &c., measuring and registering the flow of—2648—J. A. Muller.
Locks and latches—2672—M. Andrew.
Millstones, machine for dressing—2646—A. M. Clark.
Motive-power, apparatus for transmitting—2660—P. Hall.
Mules for spinning—2640—S. Oddy and R. Nuttall.
Portraits, &c., box for enclosing—1638—H. A. Bonneville.
Printing surfaces, apparatus for producing—2658—D. Colville.
Railway rails—2650—W. Palliser.
Railways—2674—S. Fox.
Screw propellers—2644—C. H. Murray.
Steam, &c., indicating and registering the pressure of—2587—B. Isangk.
Tobacco pipes, &c., filling—2583—S. Schiff.
Velocipedes, &c.—2489—W. Longbottom and A. Willan.
Velocipedes, &c., bearings of loose axles for—2652—F. Forder and J. Traves.
Washers for fastening metal nuts—2515—F. Oakley.
Watch protectors—2642—K. Kraus.
Windmills—2502—H. Henchman.
Wire, machinery for drawing fine—2666—S. Simpson.
Wounds, &c., means for protecting—2654—A. H. Gilmore.

Invention with Complete Specification Filed.

Spinning frames, spindles and fliers of—2745—W. R. Lak .

From Commissioners of Patents' Journal, September 28.

Patents Sealed.

937. F. B. Taylor.
954. A. Barclay.
956. T. E. Williams.
959. T. G. Webb.
967. A. F. Baird.
971. H. Davey.
976. J. Livesey.
978. R. Jones.
979. W. E. Gedge.
982. J. C. Lee.
983. C. Lange.
985. G. Holcroft & W. N. Dack.
987. E. O'Connell.
991. J. Caplin.
995. W. Bayne and O. E. Mac Gregor.
996. G. H. Smith.
1000. F. Schäfer.
1002. W. Y. Craig & S. P. Bidder.
1003. D. Osborn.
1006. M. Wolfsky.
1012. U. Scott.
1071. D. and G. Hallas.
1072. J. A. Chaufourier.
1121. E. Beanes.
1122. A. d'Azambuja.
1131. B. J. B. Mills.
1138. J. H. Johnson.
1140. J. Leechman.
1150. B. W. Farey.
1166. F. J. Bramwell.
1188. T. Amies.
1326. E. Crowe.
1455. T. Bullivant.
1539. W. R. Lake.
1708. C. Francis.
1857. W. E. Newton.
1890. E. H. C. Monckton.
1914. R. Moreland, jun., and D. Thomson.
1928. J. Brooke and J. Hirst.
1946. A. Clark.
1956. J. Howard.
2065. T. James.
2075. J. Walker and P. A. Godefroy.
2136. J. J. Cousins.
2287. H. A. Bonneville.
2288. H. A. Bonneville.
2368. W. R. Lake.

Patents on which the Stamp Duty of £50 has been paid.

2410. G. and E. Ashworth.
2420. J. W. Morgan.
2419. G. O. Gooday.
2425. W. Clark.
2448. T. Whitaker and J. Constantine.
2502. J. H. Dallmeyer.
2454. J. and A. Gamgee.
2468. W. E. Newton.
2470. G. E. Van Derburgh.
2483. H. A. Bonneville.
2545. R. Mortimer.
2561. W. E. Newton.
2465. A. Steven.
2522. J. Whitworth.
2479. J. C. Sellars.
2480. H. A. Bonneville.
2491. W. Clark.
2593. G. T. Bousfield.
2680. H. Kessler.

Patents on which the Stamp Duty of £100 has been Paid.

2633. H. Hutchinson.
2653. J. L. Hughes.
2613. T. Kennedy.

Journal of the Society of Arts.

FRIDAY, OCTOBER 8, 1869.

Announcements by the Council.

Improved Cabs.

The Council of the Society of Arts offer the following medals for improved hackney carriages specially suited to the metropolis :—

The Society's Gold Medal for the best and most convenient open hackney carriage for two persons.

The Society's Silver Medal for the second-best ditto.

The Society's Gold Medal for the best and most convenient closed hackney carriage for two persons.

The Society's Silver Medal for the second-best ditto.

The Society's Gold Medal for the best and most convenient hackney carriage for four persons, either open or closed, or both.

The Society's Silver Medal for the second-best ditto.

Lightness of construction, combined with adequate strength and durability, will be especially considered in making the awards.

The awards will be made after actual trials of the carriages extending over a certain period.

Communications describing the carriages must be sent to the Secretary of the Society of Arts before the 1st January, 1870, the carriages to be sent to a place hereafter to be appointed.

The Council also offer the Society's Silver Medal for the best instrument, to be affixed to a cab or other hackney carriage, for indicating the fare as between the passenger and the driver, whether by registering the distance travelled or otherwise, and which instrument shall also indicate, for the convenience of the cab-owner and of the driver, the total distance travelled during the day and the total amount earned. The instruments competing, with full descriptions of their construction, to be sent to the Society's House before the 1st January, 1870.

Competitors may, at their option, sign their communications, or may forward with them sealed letters containing the name and address of the writer.

The Council reserve to themselves the right of withholding all or any of the medals, in case none of the carriages or instruments possess, in their opinion, sufficient merit.

In the trials of the several carriages, the small amount of vibration and noise will be duly considered by the judges.

Designs for Channel Steamers.

The very defective state of the accommodation afforded by the Channel steamers, plying between this country and the Continent, having been brought under the notice of the Council, they have determined to offer the Gold Medal of the Society, and the large Silver Medal of the Society, for the best and the second-best block model of a steamer, which shall afford the most convenient shelter and accommodation to passengers on the deck of the vessel crossing the Channel between France and England. The steamer is not to exceed in tonnage and draught the best vessels now in use between Folkestone and Boulogne, and the model must be on a scale of a quarter of an inch to a foot. The models, marked in cypher, are to be sent in to the Society of Arts' House, John-street, Adelphi, on or before the 1st November, 1869, with a sealed envelope, giving the name and address of the designer.

The Council reserve the right of withholding either or both medals, in case, in their opinion, the models sent in do not possess sufficient merit.

The following particulars of the South-Eastern Channel steamers, *Victoria, Albert Edward,* and *Alexandra,* are given for the convenience of competitors, but it is not intended to confine the designs to them, except as to tonnage and draught :—

Length between perpendiculars, 200 ft.
Breadth of beam, 24 ft.
Depth underside of deck amidships, 12 ft. 6 in.
Draught of water, 7 ft.
Bow, clipper.
Stern, elliptic.
Rig, polacca with two masts, lug foresail, gaff mainsail, staysail, and flying jib.
Engines, oscillating.
Paddle wheels, 17 ft. 6 in. diameter.
Tonnage, 568 tons.
Speed, 17 miles an hour.

Subscriptions.

The Michaelmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of Institutions.

EXAMINATION PAPERS, 1869.

(*Continued from page* 844.)

The following are the Examination Papers set in the various subjects at the Final Examination held in April last :—

GERMAN.

THREE HOURS ALLOWED.

Candidates for a First Class Certificate must translate one prose and one poetical extract of Section I., answer the last three questions of Section II., and write out the remaining portion of the paper. Candidates for a Second Class Certificate must translate either extract *a* or *b* of Section I., and answer all the questions of Section II. Candidates for a Third Class Certificate have to do the same work, with the exception of the last four questions of Section II.

Section I.

a. Frau, welchen Sturm gefährlicher Gedanken
Weckst du mir in der stillen Brust! Mein Innerstes
Kehrst du ans Licht des Tages mir entgegen,
Und, was ich mir zu denken still verbot
Du sprichst's mit leichter Zunge kecklich aus.
Hast du auch wohl bedacht, was du mir räthst?
Die wilde Zwietracht und den Klang der Waffen
Rufst du in dieses friedgewohnte Thal
Wir wagten es, ein schwaches Volk der Hirten,
In Kampf zu gehen mit dem Herrn der Welt?
Der gute Schein nur ist's, worauf sie warten,
Um loszulassen auf dies arme Land
Die wilden Horden ihrer Kriegesmacht,
Darin zu schalten mit des Siegers Rechten,
Und unterm Schein gerechter Züchtigung
Die alten Freiheitsbriefe zu vertilgen.

Schiller.

b. Doch der Vater fuhr auf und sprach die zornigen Worte:
Wenig Freud' erleb ich an dir! ich sagt' es doch immer,
Als du zu Pferden nur und Lust nur bezeigtest zum Acker:
Was ein Knecht schon verrichtet des wohlbegüterten Mannes,
Thust du; indessen musz der Vater des Sohnes entbehren,
Der ihm zur Ehre doch auch vor anderen Bürgern sich zeigte.
Und so täuschte mich früh mit leerer Hoffnung die Mutter,
Wenn in der Schule das Lesen und Schreiben und Lernen dir niemals
Wie den andern gelang und du immer der unterste saszest.
Freilich! das kommt daher wenn Ehrgefühl nicht im Busen
Eines Jünglinges lebt, und wenn er nicht höher hinauf will.
Hätte mein Vater gesorgt für mich so wie ich für dich that,
Mich zur Schule gesendet und mir die Lehrer gehalten,
Ja, ich wäre was anders als Wirth zum goldenen Löwen.

Gœthe.

c. Und wirklich war das Elend in Deutschland zu einem so ausschweifenden Grade gestiegen, dasz das Gebet um Frieden von tausendmaltausend Zungen ertönte, und auch der nachtheiligste noch immer für eine Wohlthat des Himmels galt. Wüsten lagen da, wo sonst tausend frohe und fleiszige Menschen wimmelten, wo die Natur ihren herrlichsten Segen ergossen und Wohlleben und Ueberflusz geherrscht hatte. Die Felder, von der fleiszigen Hand des Pflügers verlassen, lagen ungebaut und verwildert, und, wo eine junge Saat aufschosz, oder eine lachende Ernte winkte, da zerstörte ein einziger Durchmarsch den Fleisz eines ganzen Jahres, die letzte Hoffnung des verschmachtenden Volkes. Verbrannte Schlösser, verwüstete Felder, eingeäscherte Dörfer lagen meilenweit herum in grauenvoller Zerstörung, während dasz ihre verarmten Bewohner hingingen die Zahl jener Mordbrennerheere zu vermehren und was sie selbst erlitten hatten ihren verschonten Mitbürgern schrecklich zu erstatten.—*Schiller.*

d. Hildebrand (nachher Gregor VII.) war der Sohn eines Zimmermanns zu Savona, einer toskanischen Stadt. Er trat in den geistlichen Stand, und da er sehr vorzügliche Geistesgaben zeigte, so wurde er vom Papst Leo IX. unter Heinrich's III. Regierung aus dem Kloster zu Clugny mit nach Rom genommen und dort zum Subdiakonus der römischen Kirche und nachher zum Kanzler gemacht; und von nun an lenkte er die Schritte der Päpste und war die Seele des römischen Hofes. Sein Ziel war die Erhöhung des Papstes über alle Fürsten und Könige der Erde, wie er denn schon als Kanzler sofort anfing das Zählen nach Regierungsjahren der Kaiser in den päpstlichen Bullen wegzulassen. Und er hat sein Ziel mit solcher Klugheit, Beharrlichkeit und Kraft sein ganzes Leben hindurch verfolgt, dasz man ihn zu den auszerordentlichen Menschen der Weltgeschichte zählen musz.—*Kohlrausch.*

Section II.—Grammar and Idioms.

1. Decline in the singular and plural—der brave Mann; die goldne Uhr; das deutsche Lied; ein schöner Tag; der Fremde; ein neues Haus.

2. Give the declension in both numbers of—ich, er, sie; derjenige; welcher, welche, welches, and dein, deine, dein.

3. Conjugate in the present and imperfect indicative, and state the past participle of—warten, reiten, werben; verstehen, anfangen, and ausfahren.

4. Translate into German:—It is a quarter past five; this table is three feet long; I have seen him three times; two-thirds of five-sevenths; my brother was in the house when I went into the garden; it does not rain, but it snows.

5. Give the rules with reference to the declension of proper names in German, illustrating them by examples.

6. Write down the past participle of—*unterhalten*, to amuse, and *unterhalten*, to hold under; *hintergehen*, to deceive, and *hintergehen*, to go behind; also of *frühstücken; rechtfertigen*, and *vollführen*.

7. Es steht zu hoffen.—Er steht in der Blüthe seiner Jahre.—Die Sachen stehen gut.—Wie steht es mit Ihrer Gesundheit?—Wer hat dieses Werk verlegt?—Er sah sehr verlegen aus.—Er verlegt sich auf das Studium der deutschen Sprache.—Womit vertreiben Sie sich die Zeit?—Er treibt das Englische sehr fleiszig.—Wer nicht vertrieben sein will, musz vertreiben.

Section III.

[The writing, either in German or English characters, must be thoroughly legible and distinct.]

The Europeans were hardly less amazed at the scene now before them. Every herb, and shrub, and tree was different from those which flourished in Europe. The soil seemed to be rich, but bore few marks of cultivation. The climate, even to the Spaniards, felt warm, though extremely delightful. The inhabitants appeared in the simple innocence of nature. . . . Their complexion was of a dusky copper colour, their features singular rather than disagreeable, their aspect gentle and timid; though not tall, they were well-shaped and active. They were shy at first through fear, but soon became familiar with the Spaniards, and with transports of joy received from them bells, glass beads, &c., in return for which they gave such provisions as they had, and some cotton yarn; the only commodity of value that they could produce. Towards evening Columbus returned to his ship, accompanied by many of the islanders in their boats, which they called canoes.—*Robertson.*

Questions in German History and Literature.

a. Give a brief outline of the struggle between Heinrich IV. and the Saxons.

b. Through which means did Gregory VII. endeavour to reform the abuses of the Church, and to secure its ascendency?

c. What was the Concordat of Worms?

d. Describe briefly the life and writings of Hans Sachs.

e. Which kind of poetry principally flourished during the times of the Reformation?

f. What is the principal work of Johann Fischart? With what tendency was it written?

Thema zu einem deutschen Aufsatz:
Ueber Sparsamkeit und Geiz.

ITALIAN.

(THREE HOURS ALLOWED.)

I.

Candidates for a first-class certificate are required to translate into English the following passages (poetry and prose), and to answer any grammatical questions added to them:—

Demarista. È chiaro a ognun, che al par di te spogliarmi
L'amor non so del sangue mio; che madre
Pur sempre io son . . . . . Fratel così tu fossi!
Timoleone. Oh! qual madre se' tu? Spartane donne,
T' insegnin esse in libera cittade
Ciò ch' esser den le madri. Il tuo, che chiami
Materno amore, effeminato senso
Di cieca donna egli è, che l' onor vero
Ti fa pospor del figlio alla ostinata,
Vile superbia sua. Le madri in Sparta
Mira, dei figli per la patria morti
Allegrarsi; contarne esse le piaghe;
E lavarle, baciandole, di liete,
Non di dolenti lagrime; e fastosa
Andarne più, qual di più figli è priva:
Donne son quelle, e cittadine, e madri.
Tu, del tuo figlio alla inflessibil voglia,
Che pur conosci rea, ti arrendi; ed osi
Dirmi e sperar ch' io mi v' arrenda? Al mio
Più inflessibil voler, ch' esser sai figlio
Di virtù, di', perchè non cedi? Il nome
Per lui fai solo risuonar di madre;
Per me tu il taci?

(Alfieri, *Timeoleone, tragedia.*)

GRAMMATICAL NOTES.

Den: Write the whole present tense of the indicative of this verb with its various forms, for the first and third persons, singular and plural.

Pospor: Give the preterite and future tenses of this verb.

Mira: What part of speech is this, and in what sense does it stand here?

Fastosa andarne: What is the correct meaning of this expression?

Voglia and Voler: Can you show any distinction between these words?

Taci: Give the whole present and preterite tenses of the indicative of this verb?

II.

Niuna cosa vola più che la occasione; niuna più pericolosa che il giudicare delle altrui professioni; niuna più dannosa che il sospetto immoderato. Desideravano la concordia tutti i principali cittadini, assuefatti, dietro agli esempj dei maggiori loro, a difendere spesso la libertà dal ferro con l'oro; perciò facevano instanza che gli ambasciatori eletti subitamente andassero, ai quali oltre alle altre cose si commetteva, che di Prato si facessero porgere vettovaglie all' esercito spagnuolo, acciocchè il vicerè quietamente aspettasse se la concordia trattata aveva effetto. Ma il Gonfaloniere, o persuadendosi, contro alla sua naturale timidità, che gl' inimici disperati della vittoria dovessero da se stessi partirsi; o temendo dei Medici in qualunque modo ritornassero in Firenze, o conducendolo il fato a essere cagione della rovina propria, o delle calamità della patria, allungando artificiosamente la espedizione degli ambasciatori operò talmente, che non andarono il dì, nel quale, secondo la deliberazione fatta, dovevano andare . . . . . .

(Guicciardini, *Storia d' Italia.*)

III.

Translate freely into Italian:—

Dear Joseph,—The only recompense I can make you for your kind attention to my affairs, during my illness, is to tell you, that by the mercy of God I am restored to perfect health, both of mind and body. This, I believe, will give you pleasure, and I would gladly do anything from which you could receive it.

I left St. Alban's on the 17th, and arrived that day at Cambridge, spent some time there with my brother, and came hither on the 22nd. I have a lodging that puts me continually in mind of our summer excursions; we have had many worse, and except the size of it (which, however, is fit for a single man,) few better. I am not quite alone, having brought a servant with me from St. Alban's, who is the very mirror of fidelity and affection for his master. And whereas the Turkish spy says, he kept no servant because he would not have an enemy in his house, I hired mine, because I would have a friend. Men do not usually bestow these encomiums on their lackeys, nor do they usually deserve them, but I have had experience of mine, both in sickness and in health, and have never seen his fellow. . . . .

I beg you will remember me to all my friends, which is a task will cost you no great pains to execute; particularly remember me to those of your own house, and believe me your very affectionate.

(Cowper's *Letters.*)

IV.

FAMILIAR AND IDIOMATIC PHRASES, &c.

(To be rendered, not literally, but by their English equivalents.)

Andar bel bello.
Detto fatto.
Egli vuol menarci per le lunghe.
Come ve la passate?
Portatevi da uomo.
Non so risolvermi così su due piedi.
Ha voce di dotto.
Ponete mente a quanto vi dico.
Fate pur capitale di me.
Menare una vita di stenti.
Egli se ne promette mari e monti.
Tanto accade a chi non ha giudizio.

Candidates for second or third-class certificates should (1) translate into English the following extracts, and (2) answer the grammatical questions given below:—

I.

Licinio. Ma che sarà di Roma,
Se perde il padre suo?
Regolo. Roma rammenti
Che il suo padre è mortal; che al fin vacilla
Anch' ei sotto l'acciar; che sente al fine
Anch' ei le vene inaridir, che ormai
Non può versar per lei
Nè sangue, nè sudor; che non gli resta
Che finir da Romano. Ah m' apre il cielo
Una splendida via; de' giorni miei
Posso l'annoso stame
Troncar con lode, e mi volete infame!
No, possibil non è: de' miei Romani
Conosco il cor. Da Regolo diverso
Pensar non può chi respirò nascendo
L' aure del Campidoglio. Ognun di voi
So che nel cuor m' applaude;
So che m' invidia; e che fra' moti ancora
Di quel, che l'ingannò, tenero eccesso,
Fa voti al ciel di poter far l' istesso.
Ah! non più debolezza. A terra, a terra
Quell' armi inopportune: al mio trionfo
Più non tardate il corso,
O amici, o figli, o cittadini. Amico
Favor da voi dimando;
Esorto cittadin; padre comando.

(Metastasio, *Attilio Regolo.*)

II.

Ne' tumulti popolari c' è sempre un certo numero d' uomini che, o per un riscaldamento di passione, o per una persuasione fanatica, o per un disegno scellerato, o per un maledetto gusto di soqquadro, fanno di tutto per ispinger le cose al peggio; propongono e promuovono i più spietati consigli, soffian nel fuoco ogni volta che principia a illanguidirsi: non è mai troppo per costoro;

non vorrebbero che il tumulto avesse nè fine nè misura. Ma per contrappeso c' è sempre anche un certo numero d' altri uomini che, con pari ardore e con insistenza pari, s' adoprano per produr l' effetto contrario; taluni mossi da amicizia o da parzialità per le persone minacciate; altri senz' altro impulso che d' un pio e spontaneo orrore del sangue e de' fatti atroci. Il cielo li benedica. In ciascuna di queste due parti opposte, anche quando non ci siano concerti antecedenti, l'uniformità de' voleri crea un concerto istantaneo nell' operazioni. Chi forma poi la massa, e quasi il materiale del tumulto, è un miscuglio accidentale d' uomini, che, più o meno per gradazioni indefinite, tengono dell' uno e dell' altro estremo: . . . . . Viva e muoia, son le parole che mandan fuori più volentieri; e chi è riuscito a persuaderli che un tale non meriti d' essere squartato, non ha bisogno di spender più parole per convincerli che sia degno d' essere portato in trionfo: . . . . . Siccome però questa massa, avendo la maggior forza, la può dare a chi vuole, così ognuna delle due parti attive usa ogni arte per tirarla dalla sua, per impadronirsene: sono quasi due anime nemiche, che combattono per entrare in quel corpaccio, e farlo muovere.

(Manzoni, *I promessi Sposi.*)

III

GRAMMATICAL QUESTIONS.

1. Show and exemplify the various rules for knowing the gender of Italian nouns, and give the exceptions to those rules.

2. Give the plural of the following nouns and adjectives:—*Moglie docile ed operosa; Uomo pari; Tribù antica; Labbro tumido; Fior salvatico; Giusta libertà; Felice inganno; Amica fedele; Lungo miglio; Monarca possente; Tempio magnifico.*

N.B.—Show if any of the above have more than one form of the plural number.

3. Give the conjunctive personal pronouns for *to him, to her, of it, of them, to himself, it to him,* and *them* in both genders.

4. Write the whole present tense of the indicative of *dire, sapere, prendere;* the preterite of *chiudere, spegnere, uscire;* the future of *dolere, cadere;* the present of the subjunctive of *udire, fare, capire;* and the participle past of *vincere, scendere, correre, togliere, offrire, porgere.*

(*To be continued.*)

USE OF GREENWICH HOSPITAL.—INDUSTRIAL TRAINING.

The *Times*, of 4th October, prints the following letter; and, if the suggestions were carried into effect, an opportunity would be afforded to try intellectual and industrial training on an extensive scale, and to solve, perhaps, the most important educational problem of the day:—

Sir,—In the *Times* of the 2nd October, you conclude an article on Greenwich Hospital by asking, "Is there no good and national purpose connected with the Navy to which the Admiralty can now apply it?"

The answer I would make to this is, "Apply it to the education of the children of seamen of all grades in both the Navy and Commercial Marine." Admit the child of the poor lieutenant, or even post-captain, at cost price, say £20 a-year, for teaching, maintenance, and clothes. Admit also the child of the common seaman, at half this cost, or less.

Admit two, three, or four thousand children, with even infant schools, according to the extent of the accommodation.

With such numbers, the best education that can be given may be given.

You may have religion taught, not by a worn-out schoolmaster, but by a chaplain.

You may teach the English language, with reading, writing, arithmetic, drawing, drilling, and vocal and instrumental music.

You may teach French and other languages, and the elements of science.

By a proper distribution of time, and intermixture of intellectual and industrial occupations, you may accomplish both headwork and handwork better than only intellect is trained at most public schools.

And if you want evidence that this suggestion is not an idle one, you may find proofs in the district schools of Hanwell, Anerley, Sutton, &c.

Let the Admiralty set up this model school for seamen's children, and a model for the country in the masterpiece of Wren, and it will do unmixed good.

I am, Sir, your obedient servant,

Felix Summerly.

MINERAL STATISTICS OF ITALY.

In former times, mining industry was in a far more flourishing state than it is at present, as may be seen by the numerous traces of mines and abandoned workings scattered throughout the peninsula. The cause of this decline must, in some measure, be attributed to the discovery of rich mineral deposits in other countries, and the improvements which have been made in working them, and which have not been introduced into Italy. The following table will give an idea of the present state of this industry in Italy, and shows the produce of the mines and metal works in 1867:—

	Mines.		Works.	
	Quantities.	Value.	Quantities.	Value.
	kils.	frs.	kils.	frs.
Iron	148,471,900	2,033,460	54,791,100	24,655,125
Copper	16,075,700	1,593,627	1,032,600	2,764,574
Lead and silver	16,027,600	2,972,678	9,898,000	4,180,826
			7,000	1,537,935
Gold ore	103,800	9,100	...	...
Gold native	94	226,555	125	236,331
Mercury	7,600,000	57,000	23,000	91,840
Zinc	282,800	10,000	80,000	36,000
Antimony	100,000	50,000	50,000	60,000
Nickel	69,600	1,043	37,600	132,000
Iron pyrites	4,750,000	26,000	...	...
Manganese	1,898,000	60,558	...	...
Coal and other fossil fuel	108,424,000	1,004,000	20,000,000	800,000
Sulphur	181,299,900	20,059,795	8,225,000	1,295,171
Totals	...	28,103,816	...	35,789,802

The most important mines in that country are those of iron. The quantity of ore extracted in 1867, was 148,471,900 kils., of the value of 2,033,460 frs., from forty-five mines, which employ 2,212 workmen during about 250 days in the year. The amount paid in wages amounts annually to 643,988 francs. About two-thirds of this production is from the mines in the island of Elba.

The imports of iron amount annually to 12,300 metric quintals, of the value of 59,250 frs.; and the exports to 101,850 quintals, of the value of 444,000 frs. The number of iron works where the ore is converted into iron is at present 299. Their production was as follows:—

	Quintals.	Value. francs.
First foundry iron	221,620	2,687,374
Second do.	83,298	2,991,763
Bar iron	166,612	6,322,890
Wrought iron-work	35,965	2,089,958
Steel	40,416	798,610
Machine, &c.	..	9,764,530
Total	547,911	24,655,125

The exports of iron and iron-work hardly reach in value 1,000,000 frs. per annum, whilst the imports amount to 42,321,000 frs., of which rails figure for upwards of eight millions, and seventeen millions of francs in bar-iron.

The quantity of copper ore raised from the thirty-four principal mines amounts annually to 160,757 quintals,

of the value of 1,593,627 frs. These mines employ about 2,412 workmen during from 250 to 300 days in the year, and their wages amount annually to 944,476 frs. The ore is smelted at twenty-five works, which produce 10,326 quintals of copper in cakes, of the value of 2,764,574 frs. The exports of copper amount annually to 4,911 quintals of raw copper, of the value of 1,326,000 frs., and 151 quintals of worked copper, of the value of 93,000 frs. The imports exceed six millions of francs.

The thirteen principal lead mines produce 160,276 quintals of lead ore, of the value of 2,972,678 frs., and employ 4,105 workmen, whose wages amount to 2,615,797 frs. per annum. In 1866, the exports of galena amounted to 20,000 quintals, of the value of about five millions of francs. The produce of the five principal smelting works amounts to :—

	Quintals.	Value. francs.
Pig lead	41,980	2,143,326
Lead worked	57,000	2,037,500
Silver	70	1,537,935
Litharge	112	5,800
Total		5,744,561

The number of workmen at these works was 775, and their earnings amounted to 346,000 francs. The following were the exports and imports of lead and silver, with their relative value :—

Imports.

	Quantity.	Value.
Lead	33,168 quintals	1,851,800 francs
Silver	7,399 kils.	1,776,000 ,,

Exports.

	Quantity.	Value.
Lead	14,718 quintals	796,300 francs
Silver	110,089 kils.	3,845,650 ,,

Gold is chiefly obtained from the auriferous pyrites of the Alps, and from the auriferous quartz of the Ligurian Alps. There are some gold mines in Piedmont, particularly the veins of auriferous pyrites of Macugnagna, at the foot of Monte Rosa, and although they do not contain ten or eleven grains of gold in a hundredweight, they have long defrayed the expense of working them. On the southern slope of the Pennine Alps, from the Simplon and Monte Rosa to the valley of Aosta, several auriferous districts and rivers occur. Such are the rivers Doza Baltea, Ticino, Po ; and the Orco, in its passage from Ponte to the Po, has afforded much gold by washing. The hills, also, in the neighbourhood of Chidano contains gold spangles in considerable quantity; 94 kils. of gold, and 1,038 quintals of auriferous quartz, to the value of 235,655 frs., were obtained from 14 mines, the number of workmen employed in them being 642, and their wages amounting to 278,968 frs. There are 14 establishments for treating gold by amalgamation ; these produce annually about 125 kils. of gold, for the value of 236,000 frs., and employ 80 workmen.

The imports of jewellery to Italy amounted to 3,325,000 francs in value, whilst the exports amounted to only 967,300 francs.

The only mines of quicksilver which are worked at present there, although several others exist, are those of Sicle, near Castellazara, in Tuscany, and at Agordo, in the Venetian provinces. The quantity of ore extracted from these mines in 1867 was 76,000 quintals, of the value of 57,000 frs. ; and the smelting works produced 230 quintals of quicksilver, of the value of 91,840 frs. The number of workmen employed in the mines was 288, and in the smelting works, 22.

At Argentiera there is a zinc mine and smelting works ; the quantity of ore raised was 2,828 quintals, from which 800 quintals of zinc were obtained, of the value of 46,000 francs.

About 100 tons of ore are raised annually from the antimony mine at Montanto, in Tuscany, and from this quantity about 50 tons of regulus of antimony are obtained, of the value of about 60,000 frs.

The quantity of nickel ore raised amounts annually to about 696 quintals, of the value of 1,043 frs., which yield 376 quintals of nickel, of the value of 132,000 frs. The cost of labour amounts to 5,060 frs. for the mines, and 17,217 frs. for extracting the metal.

There are three mines of iron pyrites in the province of Turin, which yield about 47,500 quintals of pyrites, of the value of 26,000 frs. The cost of labour amounts annually to 18,564 frs.

The four mines of manganese in the Val d'Aosta and at Spezzia produce yearly 18,980 quintals, of the value of 60,558 frs. The wages of the workmen amount to 42,204 frs.

The quantity of coal and lignite raised in 1864 was as follows :—

	No. of Mines.	Production.	Value.	Labour.	
				No. of Workmen.	Wages.
		quintals.	frs.		frs.
Anthracite	1	400	950	720	250,000
Lignite	20	415,533	472,000		

The following is the production, consumption, and importation of mineral fuel in Italy :—

	Coal.	Lignite and Anthracite.	Peat.
	tons.	tons.	tons.
Production	5,638	41,593	66,831
Imports	474,239	..	..
Consumption	479,877	41,593	66,831

The exports of sulphur* from 1862 to 1866 were as follows :—

	Unrefined Sulphur.		Refined Sulphur.	
	Quantity.	Amount.	Quantity.	Amount.
	quintals.	frs.	quintals.	frs.
1862	1,433,236	30,098,000	22,257	728,000
1863	1,470,350	30,877,000	57,275	1,890,000
1864	1,398,413	29,366,000	35,524	1,172,000
1865	1,382,324	29,366,000	70,841	2,337,000
1866	1,791,100	37,610,000	4,343	147,000
Average	1,495,084	32,326,000	38,050	1,255,000

In 1867 the total exports of sulphur amounted to 1,925,262 quintals.

The production of petroleum in Italy amounts annually to about 1,896 quintals. The imports in 1866 amounted to 123,620 quintals, of the value of 14,830,000 frs. An important establishment for the refining of petroleum has recently been opened at Recanati ; and another at Turin has been at work for some time past, for refining American petroleum.

MOVEMENT FOR INTERNATIONAL ECONOMY OF MILITARY EXPENDITURE.

A special meeting of members of the International Statistical Congress at the Hague was held recently, in a hall attached to the second chamber of the States-General, to hear an address by Mr. Edwin Chadwick, in support of some resolutions, for the direction of the inquiries of the congress, for its next meeting, on the means of economising war expenditure. W. Newmarch,

* For the production of sulphur, see *Journal*, vol. xvi., page 390.

Esq., president of the Statistical Society of London, took the chair.

Mr. Chadwick spoke to the effect following:—"Viewing the check to consumption, to demand, and to production, and the consequent manufacturing and commercial depression now prevalent throughout Europe; feeling the interruptions to education and training, and to science and art progress, by greatly needed public, civil, sanitary, and productive works; considering the heavy indebtedness of the great states; looking at the greatest and most grievous obstacle, the total of our respective budgets, for the maintenance of upwards of three millions of men kept under arms, in unproductive and commonly in demoralising conditions, in camps and cantonments, at an estimated collective expenditure of two hundred and eighty millions sterling annually in Europe, I venture to ask whether there is any topic on which the economists and statists of Europe can more usefully direct attention and researches, in their several states, than as to the incidents of this vast burthen and the means of reducing it. England may do this most befittingly, because her declared policy, her position, and her interests, as regards other states of Europe, is no longer offensive but simply defensive. Indeed it will be admitted, on impartial consideration, that her present army, considering the extent of her dominions and her colonies, may be regarded as in great measure a police force for internal security. The British army for all India is not much more numerous than that of France for Algeria alone. For defence, with our great volunteer force, we are secure. Our economical interests, our mutual economical interests, are, however, in the augmentation of the productive power, that is to say, in the augmentation of the purchasing power of our neighbours. But, indirectly, we pay commercially, more or less, towards our neighbours' armaments, independently of the heavy amount we are made to pay by the augmentation of our own military expenditure, in rivalry of large adjacent offensive forces. If France could be led to reduce her military expenditure, and to devote the capital saved thereby to the real and complete conquest of the soil of France, that is to say, if by land drainage and other works, so much needed, she were to bring up her production, say of wheat, which averages less than fifteen bushels an acre, to that of England, which is now upwards of thirty-two bushels, we of England should gain by it; our exports to France and our imports from France would be augmented by it, and it may be submitted to opinion there, that her real military power, which is now dependent on financial power, would not be reduced by it. But it is futile to occupy ourselves with preaching the utopia of universal peace, or proceeding on the basis of the reduction—even the notion—of the mutual of military efficiency. In England we base our proposals of the economical reform of our military expenditure on the maintenance or the augmentation of our military efficiency. Opinion is not yet, I believe, advanced beyond that. Now, I present an example of one topic for examination and consideration on that basis. In a branch of administration with which I was connected, I, some twenty-five years ago, advocated the introduction of military and naval exercises in a number of the primary schools of destitute orphan children, maintained at the public expense under our administration, and they were so trained under my principle of the half-school-time system. At the period of the last congress in England I endeavoured to call international attention to the experience obtained in those institutions, one military point of which was, that we could impart a complete military and also a naval drill to upwards of 130 boys well, at an expense of keeping and drilling one adult comparatively ill, and we find that when these drilled boys enlist, they are commonly accepted by the non-commissioned officers as having been in the ranks before. Whatsoever differences we may have with military men on army reform questions, we have hardly any on this. We have the highest military authorities with us on this measure as a means, amongst others, of promoting a more extended and higher order of voluntary recruitment. Besides good military qualities, the military exercises in the school stages have been found to impart qualities of so high an order for civil work, giving to three the efficiency of four or five for all ordinary labour, as to make the general adoption of the exercises worth while as a pure matter of civil economy. The evidence I collected on this topic was promulgated in some parts of Canada and in the United States, and has led to the introduction of the practice there, and its extension to all the primary schools is now a pending question of educational administration. In some parts of Switzerland military exercises have long been made part of elementary school-training. Under an enlightened educational administration in France it has recently been obtained that military exercises shall form part of the training in all the Lycées, the secondary schools, comprising some forty thousand children; and the like progress is making here in Holland. Now, may we not well obtain statistics of the extent of those efforts in the several states, and of how much is yet to be done, to extend the practice to all primary schools—to the whole of the rising generations? And may we not then advance to the great economic question, how far the full exercises practicable in the non-productive school stages may serve to reduce the large amount of time now occupied in the productive adult stages of life? Such observations as I have been enabled to collect in England warrant the expectation of a considerable reduction of the period of adult training for military service, more than half of that in use in Prussia, and the greatest proportion of that in use in France; and consequently a great reduction of military expenditure, and that, too, with an increase instead of a reduction of military efficiency; I say an increase of military efficiency, for it is to be observed—what military men, used only to old systems, are with us slow to note—that the new arms of precision require a higher order of education and intelligence to wield them most effectively. The officers of our training schools, and of the volunteer army, declare that the order of merit in shooting is very much as the order of intelligence of the shooters. A further question appears to me to arise, from consideration and discussion, viz., whether as a stimulus to serious attention in the schools, exemptions, or reductions of the periods of forced service, may not be shot for and competed for by exercises in attainments? Prussia has, I understand, made a good advance in that direction, by allowing reductions and exemptions from forced service to be competed for, on proof of attainments. In England, economical opinion, as elicited at late discussions at our Society of Arts in London, points at the substitution of a popular and numerous army, with a scientific cadre, on the basis of the Swiss army, for the less numerous, but far more expensive standing army. Mr. Henry Cole showed that, on the basis of the Swiss army, and with a good scientific cadre, we could obtain a popular army of a million of men for ten millions of money as against an inferior standing army for which we now pay fifteen. We hope that popular opinion will support our present Prime Minister, Mr. Gladstone, in effecting in that direction important economies, which are needed in our financial condition. The progress of constitutional government in France and on the Continent will, we may trust, favour the substitution of economical popular armies for large expensive standing armies. And in favour of this policy, and of basing military force on a higher order of education and intelligence, which will more readily adapt itself to the great changes which science is making in war, economists may observe, what old military men are very slow to acknowledge, that, whilst the new arms of long range and precision, and penetrating power and rapidity, give one to offence, they give two and more to defence. We have recently

had some decisive experimental proofs of that with artillery. Mr. Whitworth's smallest new gun, a three-pounder, has a longer range than the heaviest of the old field guns in our service. Asking one of our old generals how it would have been had that gun been available for Waterloo, he answered that that battle could not have been fought with front lines within half the range of its shell; and, with the necessity of keeping reserves at such distances as to be out of its reach, that they could not be brought up over the open plain. A military writer of an important article in the *Journal des Economistes* adduces military reasons (which able military men have told me they consider to be good) to show that, with the new arms of precision, an army of a hundred thousand men, trained to their use, may defend France effectually against invasion. That being so, since France needs little more than one-fifth of her present army for defence, and as a cadre, indeed, for more than that, would it not be better for her to apply the great expense of the unproductive maintenance of the other four-fifths, which science renders now unnecessary, unless for immediate offence and menace, for the extension of her dominions by conquest by war, to the conquest of her own dominions by the due development of its great resources? Will it not be better for her to double the yield, as is practicable, of her own soil and its resources, by high and, what I call, intensive culture, than to obtain a double yield from extended and thin culture if by conquest, for augmentation by conquest, except at ruinous loss, is no longer practicable as against nations armed by science. Science, which gives one only to France for offence, gives as much as three to Belgium, three to Switzerland, three to Holland and to each of the surrounding states, for defence, if their governments have the wit to avail themselves of science. The hundred thousand men, that, with science, will suffice for France, will, with science, if she chooses to avail herself of it, suffice for Belgium. Little Belgium is by the new science made big, and may now "talk tall" as to with whom she chooses to cast her lot. So little Holland is, by the new arms of defence, made great, and may keep herself to herself, or dispose of herself as she pleases. In respect to offensive naval warfare, I may mention that my friend Mr. Whitworth (who always does more than he says he will do) says he has now got a gun he calls a "peacemaker," which, with a hundredweight of powder, will throw a shell of fifteen hundredweight more than five miles, with superior accuracy, that will penetrate twelve-inch armour plates. Little Holland, therefore, with one such gun, in a small and quick-moving boat, which is relatively small mark, may keep at a respectable distance our large *Warrior*, or the large and slower *La Gloire* of large France, or the small boat may send an enormous and fatal shell, which will penetrate the six-inch armour plates of either. Other existing guns will indeed go through all existing armour plating. Science places the war administrations of large countries in the position of having incurred enormous useless expense for what is like a return to plate armour for the foot soldier, or for the cavalry soldier, as against the new small arm, the Whitworth rifle, which, with a steel bolt, will go through three men in armour—three of the heaviest-armed cuirassiers. Indeed, for that matter, our military reporter on the small arms at the International Exhibition admits, in effect, that he who now flourishes a sword flourishes a folly, for combat against a six-shooting revolver. Science suppresses the old panoply of war, and makes fools of sabreurs. Civilian opinion is needed on this great question, because old military men (and young ones too), military writers, hate what they do not possess—new science. They resist it as an enemy; they contend against its advance determinedly; they yield to its introduction grudgingly; and as yet it has only been introduced into any army—even the Prussian army—most reluctantly and sparingly, and its real and advancing power has yet to be displayed and made known. You see accounts of sham-fights and field manœuvres which are indeed shams, for such movements as constitute such manœuvres are now rendered by science all but impossible. What chance has now the cavalry man, with his walk, trot, and gallop, for a charge against the improved long range breech-loader, which discharges twenty shots a minute? or when he, by marvel escaping, gets near, against the six-shooting revolver, which, almost in as many seconds, will deliver three shots into himself and three into his horse? It was admitted by French military men that, in the Italian campaign, charges of cavalry were found impracticable against the then inferior arms of precision; and if it were so, what would it be with charges of infantry? How would it be with those closed columns for rushes to carry bridges, against the new cannon with improved long range shell, and grape and canister? What plumed and starred commander will now defy science, and lead them, à la Murat, in real warfare? Governments have military attachés at their embassies, who have to report examples and invite extensions of military expenditure. What is wanted is competent and impartial international observers and reporters of the means of economising force and expenditure in the respective states. One other economical topic I will notice in the way of illustration. It is admitted that the future of war, since men will not readily be got to stand up to be mowed down, as heretofore, by these new guns, small and large, of long range and precision, will be very much a war of earth-work, and of engineering. Now it is proved, by our Indian and other experience, that officers as well as privates are the better prepared for such warfare who are the most occupied in civil works in time of peace. Sweden, I believe, affords an important example of a large economy of military expenditure, by the extensive occupation of her army in civil work. Even France, to my knowledge, has recently afforded a brilliant example of the kind, by the occupation of a portion of her army in Algeria with the drainage and improvement of land, for civil as well as for military occupation, has removed fever nests, and reduced the death-rate of her army there to one-fifth of what it was, and has set a good example for our use in India, as shown by an English military commission. Is it not then becoming for economists and statists, representatives of international opinion and interests, to collect, examine, and discuss the statistics of such important economies? The congress did enter somewhat into military questions, those chiefly of military hygiene in London, where our lamented colleague, Dr. Boudin, of France, presented very valuable information on the sanitary means of economising military force, now in very successful progress. I had the honour, at the Congress of the Association for the Promotion of Social Science, to read a paper on the need of better care of the sanitary condition of our soldiers in India, for the maintenance of our force there. This led to the appointment of the army sanitary commission for India, which has led to large reductions of the death-rates there, and to works of great importance for the benefit of the people of India. A special congress, on military hygiene chiefly, held at Geneva, was not without international fruit, as it led to an agreement to the mutual recognition of the distinctive dress of medical officers for their service in battle. Indeed, the great Emperor of Russia—the liberator of the serfs—in whose domains we may hold our next congress, has taken one step for an international agreement for the reduction of the horrors of war, by an agreement not to use shell with small arms, and thus avoid horrible and unnecessary mutilations. As it may be due that I should submit notices of definite topics for consideration, I beg respectfully to submit the following." [The resolutions moved were that the congress should move for the collection of statistics from the respective states, as to the extent to which military exercises had been introduced into schools and

the results; as to the extent to which reductions of the time of military service, or exemption from it, had been allowed on competition or proof of capacity; as to the extent to which the scientific cadres or private soldiers had been employed on civil work, or in private service.]

Mr. R. Ruggles, of New York, the delegate from the United States, had the greatest pleasure in supporting the resolutions. He thought it would be well that the important address they had heard should be translated and circulated in every language in Europe, showing the changes of condition that science had made. Mr. Chadwick's proposals would save perhaps one-half of their military expenditure, and the object of science, and therefore of the congress, was to save useless labour. The world wants all its money, and much for education to make it wiser and better. Whilst the European monarchies imposed upon the people the burthen of the maintenance of three millions of men as standing armies, the people of the United States would have none of that waste, or the least possible part of it. To suppress the horrible rebellion, and to extirpate the great cancer of slavery, they had raised an army of a million of men, taken from the forge, the desk, and the counter; and to the plough, the desk, the counter, and the forge, all that had not sacrificed their lives for the cause returned, except, as he was informed, about thirty thousand men, whose services were needed against the savages who tried to impede progress on the Pacific railway, and elsewhere. The war had cost them upwards of seven hundred and fifty millions sterling, and it was worth the money, and they would pay every dollar of it, but to do so they must not impoverish themselves and weaken themselves for the future as Europe did, by standing armies.

Mr. Vischers, the delegate from the government of Belgium, declared himself in emphatic terms entirely in accord with the views set forth by Mr. Chadwick, and supported the resolutions.

Mr. W. T. Newmarch, of England (the son of the Chairman), gave an account of the successful results of the training of a corps of skilled mechanic volunteers, belonging to a manufactory on the River Tyne with which he was connected. Royal military engineers declared the military superiority of these men to the common run of men in their corps of sappers, in intelligence, zeal, and aptitudes. The exercises were beneficial, morally, socially, as well as civilly.

Mr. Max Wirth, the delegate from Switzerland, in giving his warm support to the proposals, described the military system of the cantons as deserving of inquiry and study for its economy.

Dr. Berg, the delegate from Sweden, gave an account of the economy of the army of Sweden, only a small proportion of which was under colours at one time, the rest being employed in civil works and in productive industry, some being allotted lands for cultivation on the tenure of military service. The inquiries proposed were of the highest international importance.

Mr. Valpy, of the statistical department of the Board of Trade of England, stated that the military expenditure in most countries in this time of peace equals one-third of their whole taxation. Great as might be the economy of Mr. Chadwick's measure, of the transference of a great proportion of the expenses of military training from the adult to the juvenile stages of life, he (Mr. Valpy) considered that the advantages of the training, in augmenting the intelligence and physical aptitudes of working men, would be yet greater.

Mr. Van Karnebeck, of the War Department of Holland, supported the propositions, but he assured the meeting that his government was proceeding in the way indicated by Mr. Chadwick. In the secondary schools military exercises were now provided for. Military men only asked for time—for delay, and he thought they were right in doing so.

After some discussion, in which Mr. Hammick took part, the chairman strongly supported the resolutions, which, with modifications, were carried unanimously. A committee, consisting of Mr. Chadwick, Dr. Berg, and Mr. James Heywood, was appointed to submit them to the consideration of the general meeting of the congress. At that meeting on the following day, they were presented in a speech by Mr. Chadwick, and were warmly received and adopted, the Prime Minister of Holland applauding them.

FINSBURY MIDDLE-CLASS SCHOOL.

The successful effort of the Rev. W. Rogers, rector of Bishopsgate, and Master of Dulwich College, to establish a reasonable and economical day-school for the lower middle classes, has lately produced the establishment of permanent buildings for the schools, which are thus described in the *Times*:—

"This building, erected under the auspices of the Council of the Middle-class School Corporation, established in the city of London a few years ago, and the foundation-stone of which was laid with modest ceremony in December last, by the present Lord Mayor, is now on the eve of completion, and, in many respects, is worthy public notice. It is designed to accommodate 1,000 boys of the class indicated by its name, of whom 850 have already entered upon the occupation of the building, under the superintendence of the Rev. William Jowitt, the head-master, and is destined, we hope, to be the first of a series to be planted in various parts of this great metropolis, under the fostering care of the same corporation, for carrying on the work of education among a large section of the community which has long been comparatively neglected in that respect—the lower middle-class, as it is often called. The new school is situate in Cowper-street, a little to the east of the City-road, and a few minutes' walk from Finsbury-square, which street it fronts, and is bounded on the east and south by Tabernacle-row and Tabernacle-walk, long and still associated in the public mind with the ministrations of the Wesleys and Whitfield. It occupies, with its adjacent playgrounds, nearly two acres of ground, and is a substantial lofty structure of brick, three stories in height, exclusive of the basement. It is in all respects admirably adapted to its requirements, but has little or no pretensions to architecture in the ordinary acceptation of the term. Every thing in the nature of ornamentation appears to have been eschewed for the greater advantages of light, ventilation, and drainage. It may be said indeed to be severe to a fault in regard to simplicity, and yet, as a whole, it is symmetrical and imposing, especially when compared with the surrounding neighbourhood, to which it is really an ornament. Broad corridors, accessible by wide stone staircases at each end, traverse the whole length of the building on each floor, and the basement is used for dining and kitchen purposes; the dining-hall alone, which is lofty and well-lighted and proportioned, being sufficient to accommodate 500 boys at a time. There a hot dinner is provided daily, at 6d. a-head, for such of the boys who choose to avail themselves of it. The most of the class-rooms afford space for 50 boys each, and there are rooms of larger proportions adapted for lectures. Towards the fitting up of those for scientific purposes, the trustees of the Gilchrist Educational Fund have voted £100. There are other apartments on the top floor, partially lighted from the roof, and, therefore, well suited for the study of drawing. Attached to the building is a playground about three-quarters of an acre in extent, with a gymnasium, and other arrangements, dependent at present upon the expectation of funds, are contemplated with a view to recreation. A hall is still required in which, on special occasions, not only the 1,000 boys being educated in the school from time to time may be assembled, but also their parents and friends. The humanising influences of good lavatories has not been forgotten in the internal

arrangements, and the head master looks forward to the time, not, he hopes, far distant, when the grounds will be adorned with handsome fountains. A playground, as all know, is a most important element in the educational influences of a school, and a portion of the area set apart for that purpose remains to be covered in for the use of the pupils in wet weather. The school is erected on part of the Finsbury estate, of which the Corporation of London long held a lease, but which has now lapsed to the Ecclesiastical Commissioners. The freehold of the site of the school has cost £30,000, and the structure itself about £16,000. The architect is Mr. Edward Norton Clifton, of East India-avenue, Leadenhall-street; the builder Mr. William Brass, and Mr. Vincent has acted as clerk of the works.

"The experiment of a middle-class school, on the principle contemplated by the council, was first tried for three years in the old French Protestant Hospital in Bath-street, City-road, and its success was so marked as to justify them in erecting the present building, with the intention of carrying the idea out on a much larger scale, and one commensurate with the evident and growing want of education among that section of the community. From the original 'hive,' as the head master calls the school in Bath-street, the boys have been allowed to swarm, in a hundred at a time, to the new building, until, as we have said, it now contains 850, and the remaining 150, making up its full complement of 1,000, will shortly migrate thither. It may be stated that the age of admission is eight years, and none are eligible, under any circumstances, after the age of 15. Very satisfactory references before admission are required from the former schoolmasters of a boy coming at all after the age of 13. Latin is not a part of the regular curriculum, but it, and German, and shorthand are taught at a small extra fee per quarter to such of the boys as desire to learn one or other. The council, having regard to the probable destination of the great majority of the pupils, lay great stress upon teaching them their mother-tongue as a first requisite, and, next, arithmetic, mathematics, French, music, and drawing. They endeavour to impart to them a good critical knowledge of a play of Shakespeare and of a canto in Spencer, and to teach them to use their own language with precision and judgment. In this work, the head-master, who is a host in himself, is assisted by 20 others, and the school has already acquired a high reputation. The boys come from all parts of the metropolis and its suburbs to the school—many of them by the North-London, the Metropolitan, the Great Eastern, and other railways. In one case the railway authorities allow them to travel on their lines at reduced fares. Already the institution has a history and a corporate life of its own, akin to those of the old public schools, and one of its great recommendations is that the education imparted in it is combined with residence at home and with family associations and influences."

Fine Arts.

International Conference on General Instruction in Art.—The Union Centrale des Beaux Arts Appliqués à l'Industrie has taken advantage of the remarkable exhibition now open, under its management, in the Palais de l'Industrie, in the Champs Elysées, to hold a conference within the same building, to discuss the subject of general artistic instruction in the primary and superior schools; and, in order to give a more general scope to the conference, invited the attendance of gentlemen from other countries who are connected with, or interested in, art-education. The invitation was well responded to, and during four successive days from fifty to sixty professors, artists, art-manufacturers, and others, including a few representatives from England, Austria, Germany, Belgium, Russia, Italy, and perhaps some other countries, met and discussed the subject with great earnestness and talent; and a series of resolutions have been drawn up, which will shortly be published. It may be said that the efforts made in England, with the view to instruction in art, supplied material for much discussion, and it seemed to be generally acknowledged that Great Britain had found, and was following, the proper path. The Union has done much towards furnishing means of improvement for designers and art-workmen, but it is not satisfied with the results it has achieved to the present moment, and hopes that, by giving the movement an international character, it will attract more attention to this important subject of art-education than it could otherwise hope to obtain.

Commerce.

Revision of the Commercial Treaty between France and England.—The representatives of the mining, metallurgical, and cotton interests, in the western, northern, and north-eastern provinces of France, have made great complaints to the government of the asserted effects of the existing and expiring commercial treaty between England and France, and full inquiry has been ordered to be made on the general results of the application of the principles of free-trade, and of their partial adoption in France. It may be safely assumed that such an inquiry can have no other result but the proof of the groundlessness of most of these complaints; but as it is certain that the most energetic endeavours will be made by M. Thiers, and other prominent members of the Corps Legislatif, to cause the treaty in question to be abrogated, or at least materially modified, it is most important that the facts of the case should be brought clearly to light, and that the progress towards free-trade made by the imperial government should not be interrupted by the one-sided statements of interested parties. It is not believed by anyone that Napoleon III and his ministers will retrace their steps, and the inquiry will, it is hoped, furnish them with all-sufficient reasons for further reducing some of the still heavy duties which weigh upon commerce.

Alteration of Spanish Export Duties on Ores and Metals.—A complete change has been made in the regulations respecting the exports of metals and minerals from Spain. Even the recent order of the Regent, issued in July, has been abrogated, and the only duties now levied are as follows:—Galena, about 6d. per cwt.; silver lead ore, about 5d. per cwt.; litharge, about 4d. per cwt. This is the end of a vicious system, which has always stood in the way of commercial progress, which it is hoped will never again be brought into practice.

Colonies.

Queensland Gold Fields.—The following is taken from the report recently published by the late Assistant Geologist and Mining Surveyor of Queensland:—"The Gympie gold-field is situate on the Mary River, about thirty-five miles south of Maryborough, and thirty miles from the coast. The area comprising the diggings consists of a succession of low ridges, spurs, and gullies of a rounded character, presenting no steep inclinations or sections. This is surrounded on all sides by higher ranges bearing the same general character. The surface is covered with bush and grass, except in the gullies, where there is a dense scrub. This gold-field, no doubt, contains the greatest known number of quartz reefs within a given area, and at the same time a variety of rocks. Prospectors' claims have been granted for 175 reefs, ten of which have proved to be distant communications of the same reef, leaving 165 as the real number

of the reefs known and worked, comprising 1,200 claims. These are mostly contained within an area of 4½ square miles, within a belt of three-quarters of a-mile in width, and six miles in length, bearing N. 40 deg. W., to S. 40 deg. E. This belt or zone consists of a series of strata of greenstone shale and slate rocks, differing in mineral composition and texture, but exclusively of a basic variety of rock. Skirting this belt on both sides is a series of silicious slates and quartzites, highly metamorphosed, and in many places jasperised, banded, and cleaved. In this latter formation no gold has yet been found, although many reefs have been explored. The reefs vary in thickness from a few inches to six feet. The gold is found in irregular masses, plates, wires, curved and resembling roots of trees. It is also found as a cementing mass, joining several pieces of quartz together, as well as finely disseminated through the stone. Rich finds and specimens are very numerous, and yields of 30 oz. to the ton are not uncommon, the average being above 1 oz. per ton. The gold is all amorphous, no absolute crystals or faces of crystals having yet been found. The quantity of gold forwarded from Gympie by escort already exceeds 100,000 oz., of which above half was obtained from alluvial workings. As regards the permanence of gold, I am of opinion that a certain number of reefs have now been fully proved to be continuous in depth, both in respect to the thickness of the reef and the quality of the stone in the lowest workings. Several shafts are now 120 feet deep, or 60 feet below the permanent water level."

Bismuth in South Australia.—A valuable discovery of bismuth ore is said to have been made near Balhannah. Some workmen were engaged in opening up the hill-side in search of a copper lode, believed, from surface indications, to exist there, and attention was directed to the weight of the stuff dug up. A number of specimens were examined, and they proved to be bismuth of a very rich description, and only impregnated with copper to a very slight extent. On assaying, about 1¾ lbs. of stuff, 1 lb. 3 oz. of of bismuth, in its rough state, was obtained. When purified, this yielded at the rate of 5 per cent. At present the property has not been sufficiently developed to prove the extent of bismuth-bearing country, but a company has been formed to conduct the necessary operations.

Revenue of Victoria.—The following statement shows the total revenue of the colony for the quarter and year ended 30th June, 1869, as compared with those of 1868:—

	Quarter.		Year.	
	1868.	1869.	1868.	1869.
Customs	£298,264	£357,184	£1,376,140	£1,356,794
Territorial	148,515	195,551	678,643	821,417
Public Works	164,872	168,335	624,514	676,512
Postage	28,892	31,142	112,489	119,214
Fees	16,806	18,372	61,472	66,778
Miscellaneous	4,049	9,439	40,360	70,672
Ports and harbours	2,528	3,823	15,659	18,516
Fines	869	1,423	4,869	5,094
Excise	14,489	12,599	57,665	66,594
Total	£679,284	£797,868	£2,971,811	£3,201,591

The above returns show an increase on the year of £229,783. The duty on spirits show a deficiency of £127,824, but the new duties show an increase of £92,916. There is also an increase of about £9,000, and on the territorial an increase of £142,774, of which £72,368 is derived from the sales by auction.

Pearls from West Australia.—The *Melbourne Argus* states that a number of fine pearls, discovered at the fisheries carried on in the vicinity of Nicol Bay, have been exhibited in the town. They are of great size and beauty, the most valuable among them representing, in shape and dimensions, the eyeball of a large fish. This is said to be worth upwards of £200. This collection of pearls is the richest which has been found in Australian waters.

Railways in Victoria.—The following statement shows the gross revenue of Victorian railways, from the 1st of January in the following years:—

	£	s.	d.
July 13th, 1865	287,597	10	5
„ 12th, 1866	293,512	14	4
„ 11th, 1867	274,338	16	4
„ 16th, 1868	297,426	5	11
„ 15th, 1869	304,408	13	7

The aggregate returns of the Melbourne and Hobson's Bay Railway Company amount to £69,349 9s., from the 1st January to 1st July, 1869, against £67,309 17s. 3d. during the corresponding period of 1868. This, as well as the government railways, shows a very satisfactory increase.

Publications Issued.

Note Book on Practical Solid Geometry, containing problems, with help for solutions: by J. H. Edgar, M.A. *(Macmillan and Co.)*—This book is a collection of examples progressively arranged, with help for solutions. It is intended to assist teachers who have to deal with large classes, and students who desire to continue their class-work by themselves. It has been prepared with special reference to Professor Bradley's "Elements of Practical Geometry."

Forthcoming Publications.

Nature: a weekly illustrated Journal of Science *(Macmillan and Co.)* is about to appear this month; royal octavo, 24 pp. weekly.—The object which it is proposed to attain by this periodical is stated as follows:—It is intended, first, to place before the general public the grand results of scientific work and scientific discovery, and to urge the claims of science to a more general recognition in education and in daily life; and, secondly, to aid scientific men themselves, by giving early information of all advances made in any branch of natural knowledge throughout the world, and by affording them an opportunity of discussing the various scientific questions which arise from time to time.

A Handbook of British Fungi. By M. C. Cooke, *(Hardwicke)*.—This work will be in one volume, small octavo, and will contain full descriptions of all known species of British fungi, with illustrations of the principal genera, and references to figures of the species. The publication will be commenced as soon as the names of sufficient subscribers (at half-a-guinea each) have been received to warrant the undertaking.

The Academy. Demy 4to. *(John Murray.)*—The first number of a new periodical under this title is advertised to appear to-morrow; a monthly record of literature, learning, science, and art.

Notes.

Effects of Idleness and Want of Education in the Army.—The report on military prisons is made, this year, by Captain Du Cane, as inspector-general. He has not had a very satisfactory account at present. The average number of effectives in the army was 186,508, and the number of convictions increased to 25,612, or 13·73 per cent. The number of corporal punishments, however, decreased to 36, or 0·01 per cent. The number of soldiers sent to military prisons at home was 5,470 in 1864, 6,390 in 1865, 6,520 in 1866, 6,674 in 1867, 7,553 in 1868; these numbers being 6·97 per cent. of the force in 1864, 7·98 in 1865, 8·18 per cent. in 1866, 8·01 per cent. in 1867, 8·88 per cent. in 1868. The daily average number in confinement in military prisons at home was

1·27 per cent. of the force in 1864, 1·29 per cent. in 1865, 1·25 in 1866, 1·29 per cent. in 1867, and 1,241, or 1·47 per cent., in 1868. The report states that drunkenness forms a considerable item in the list of crimes causing the increase of prisoners; this offence is now to be punished, as in civil life, by fine. Prominent among military offences stands that of desertion, for which 1,776 of the 7,553 sentences were passed in 1868. Captain Du Cane represents that, as one considerable cause of desertion is the desire to get bounty by re-enlisting, a remedy might be found in the abolition of the bounty system, or in payment by instalments as the man becomes efficient, or on inquiry into his antecedents. The army might thus be relieved of men of hopelessly bad character, who, passing much of their time in prison, are useless as soldiers, and nothing but a disgrace to the profession. He maintains it is not beyond the bounds of a reasonable hope, that a time is coming when it may be possible to refuse or dismiss men of marked bad character. The advantages a soldier enjoys in pay or its equivalent, with the training he receives, and the prospect of employment on honourable discharge which such training may procure for him, are high enough to constitute it a real misfortune for men of the class to which the soldier belongs to be deprived of them. It is believed that this feeling is gradually being realised by the soldier, and that in many districts it is understood that a man who enlists is well started in life. The more a soldier is made to see that the army may be a stepping-stone to future remunerative employment, the more likely it is that dismissal will be a sufficient punishment. Captain Du Cane has to add that the governors of military prisons generally concur in the opinion that insubordination increased in the army in the past year, and that the increase is evidenced by the number of men charged with that offence received at the prisons, 608 in all; the number is now for the first time distinguished in the returns. The governor at Aldershot reports that a prisoner being checked at drill by one of the warders, wished that "God Almighty would strike the warder dumb;" the prisoner himself was struck dumb on the spot, and did not recover his speech for seven days. He was very much frightened, and on recovering speech, made great promises of amendment; but his good resolutions vanished, and he was soon in prison again. The report presents the usual tables, one of which shows that the increase in the number of prisoners, in 1868, was chiefly in men who had served between seven and fourteen years in the army. 2,070 of the prisoners had served not more than two years, 1,870 between two and seven years, 3,244 between seven and fourteen, 327 between fourteen and twenty-one, and forty-two above twenty-one years. The stoppages of pay and beer money of prisoners while in confinement amounted to £30,323; the total pay of prison officers and charge of maintenance of the prisoners was £27,750. The average length of sentences was fifty-nine days.

Concrete Buildings. — This mode of building is gradually attracting attention in this country. The *Builder* has the following notice of some buildings lately erected in Southwark on this system:—"Some time ago we alluded to the erection of a large warehouse, wholly of concrete, in Great Guildford-street, Southwark. We have recently visited it, and find it standing remarkable well. It was built by the owner, Mr. H. Goodwin, Mr. E. I'Anson being the architect. Mr. Goodwin, who is laying himself out to execute other buildings in this material, has given us some particulars of the work, which may be usefully printed:—'The concrete is composed of one part of best Portland cement to seven parts of material consisting of clean Thames gravel, crushed slag and clinkers from furnaces, crushed bricks, stone chippings, oyster-shells, pottery, hard core from dust yards, and any other hard and incombustible material I could get. After waiting twelve months for the Metropolitan Board of Works to consider whether or not Portland cement concrete was applicable to building purposes, I at last got consent to proceed with the work. We built upon an average per day about 12 inches all round the walls, grouting in with sand and cement at every fresh layer of concrete. We also put in hoop-iron bond at each floor. We could have built 18 inches per day, which is the depth of the apparatus, but I considered 12 inches quite fast enough for a building so high; though at other smaller jobs I have often built three feet per day. The building is 70 feet by 50 feet, and 60 feet nigh. It consists of basement and five floors, each floor supported by twelve iron columns. The roof is of concrete three inches thick, laid between tee-iron three feet six inches apart, covered with asphalte. The thickness of the walls is to the brick rule—those 70 feet, two floors 27 inches, two floors 22 inches, and two floors 18 inches; the 50-feet walls are, two floors 22 inches, and four floors 18 inches. The cost of the walls, considering I got a great deal of the material for nothing, was under £6 per rod; or, take the whole of the building as a cube, the cost was about 3d. per foot. It is very strongly built, and as good as one of the warehouse class can be. It is now loaded with goods, every full, and has never shown the slightest crack or settlement. It is harder than most kinds of stone used for building purposes, and is of one solid mass from beginning to end. While in course of construction, I was honoured by visits from many members of Parliament, most of the members of the building profession, and many other gentlemen, who took much interest in this great test and experiment in building, as well as by yourself. The concrete villa at Addiscombe-road, Croydon, is now completed and occupied; it gives great satisfaction, and, it is said, will be the only house the rain will not penetrate in that neighbourhood. The lower floors are all of concrete, and perfectly smooth and warm; there is no channel for a mouse or any creeping thing in that house, unless it take up its abode with the family."

Telegraph Statistics. — The following statistics relating to telegraphs in Europe have been published by the Prussian government. From this it appears that in Switzerland there is a telegraph office to every 8,000 inhabitants; in Belgium, to every 12,000; in England, to every 13,000; in Holland, to 18,000; Italy, to 24,000; Prussia, 28,000; France, 31,000; Portugal, 32,000; Austria, 42,000; Spain, 77,000; and in Russia, to 185,000 inhabitants. In Holland there is one telegram a year to every 3 persons; in Belgium, to every 4; in Switzerland, to every 4; in England, to every 6; in Italy, to every 7; in Portugal, to every 9; in Prussia, to every 12; in France, to every 13; in Austria, to every 17; in Spain, to every 21; and in Russia, to every 69 inhabitants.

Correspondence.

Amsterdam International Exhibition.—Sir,—As the nature of some of the awards made at the exhibition is not thoroughly understood, and I find it impossible to answer all the letters I receive from exhibitors or their agents on this subject, I beg to furnish the following explanation:—The official regulations for the guidance of the international jury, appointed by the King of the Netherlands, prescribed that the objects shown were to be exclusively judged in reference to their importance as regards the material and intellectual wants of the working classes—the exhibition having been specially originated as one of articles of domestic economy. The awards placed at the disposition of the jury for recognising merit were—1. Grand diploma of honour; 2. Gold medal; 3. Silver medal; 4. Bronze medal; and 5. Honourable mention. As many other objects were allowed to be admitted by the Netherlands Commission, not specially suited for the working classes, the jury were authorised to award to these latter a diploma of excellence, corres-

ponding in rank with the gold medal, or a mention extraordinaire, equivalent to a silver medal. It was, of course, extremely difficult to draw the strict line of boundary as to what was, or was not, specially suited to the working classes, especially in the case of wines, spirits, liqueurs, &c., and many exhibitors unfortunately sent principally expensive classes of goods, mixed with only a very few cheap articles, preferring to address themselves to a better class of customers than those for whose material welfare the exhibition was originated. As, however, every facility was given, in reduced or free transit, and no charge was made for space, while very large sales were in most instances made by exhibitors, there are very few who have reason to complain.—I am, &c., P. L. Simmonds, British Commissioner, and Member of the Central Jury.

Exhibition Palace, Amsterdam, Oct. 6th, 1869.

MEETINGS FOR THE ENSUING WEEK.

Wed ...Microscopical, 8. 1. Lieut.-Col. Woodward, "On Immersion Objectives and Roberts's Test Plate." 2. Mr. Wm. Carruthers, "On the Plants of the Coal Measures."

Patents.

From Commissioners of Patents' Journal, October 1.

Grants of Provisional Protection.

Animals, machinery for clipping and cleansing the hair of—2611—W. H. Reade.
Beds, &c., machines for twisting and curling hair for use in stuffing—2734—P. Wisdom.
Boots and shoes—2615—W. S. Clark.
Buckle and button-hole combined—2693—G. Shaw.
Buildings, &c., movable partitions for the interiors of—2651—D. J. Williams.
Cages for birds, &c.—2699—C. Mohr and S. E. Smith.
Candles, &c., treating fatty and oily matters to prepare them for the manufacture of - 2679—C. Burke.
Carriage doors, fastenings for—2713—T. and W. Wheatley.
Carriages, axles for—2581—J. Grice and J. G. Harrison.
Cartridges—2659—A. H. Brandon.
Cartridges, holder for—2691—P. M. Fouque.
Casks, &c., bushes or shields for the bung-holes of—2653—J. Gillies.
Chains—2736—C. E. Brooman.
Cigars, manufacturing—2661—W. Morris.
Coffins—2518—J. D. Nietscke.
Copying presses—2738—C. E. Schoeller.
Cotton, &c., machinery for preparing, &c.—2680—R. Lakin and J. Bayley.
Cotton-wool, &c., instrument for obtaining samples from bales of—2717—M. Amberg.
Doors and windows, apparatus for preventing accidents through the closing of—2681—C. D. Abel.
Electric batteries—2655—H. A. Bonneville.
Electric telegraphs, &c.—2728—S. A. Varley.
Electro-telegraphy—2643—T. Walker.
Envelopes—2683—M. Grouse.
Felt and other cloths, machinery for the manufacture of—2697—W. E. Newton.
Fire-arms—2711—O. H. J. Krag.
Fire-places, &c., promoting combustion in—2665—L. Henrion.
Fires, &c., extinguishing—2678—A. V. Newton.
Flax, &c., breaking and softening—2707—G. A. C. Bremme.
Furnaces—2607—J. Juckes and E. Wood.
Furnaces—2708—J. Sawyer.
Furnaces and ovens or kilns—2686—W. E. Newton.
Furniture, casters for—2619—C. D. Escoffier.
Grain, treating—2730—J. Polson.
Iron and steel—2617—T. S. Webb.
Iron and steel—2684—J. J. Bodmer.
Key guards, &c.—2700—A. M. Clark.
Knitting machines—2639—H. B. Barlow.
Lithographic printing, &c., producing transfers and blocks for—2718—T. J. Denne and H. Billingsley.
Locomotives, centre rail—2641—C. P. Stewart and J. Kershaw.
Looms—2689—J. Holding and J. Eccles.
Looms—2715—J. Belicard.
Looms—2726—J. L. Norton.
Mariner's compass and dipping needle, correcting the deviations of the—2705—J. H. Johnson.
Mariners' compasses—2690—H. Allman.
Matches, fusees, &c.—2675—J. B. Palmer.
Meat, &c., apparatus for preserving—2667—B. Kershaw.
Metallic hoops, fastening for—2663—J. H. Johnson.
Metals, galvanising—2725—W. R. Lake.
Millstones, airing and ventilating—2526—C. Cérisier.
Musical keys, &c., apparatus for comparing—2647—A., G. E., and F. Earnshaw.
Nozzles for blowing air, steam, &c.—2605—J. Webster.
Ordnance—2687—C. C. Steenstrup.
Ordnance, apparatus for absorbing, storing, and utilising the force of recoil of—2539—A. Moncrieff.
Pianofortes—2633—T. King.
Pipes from lead, &c., apparatus used in manufacturing—2704—J. Hampson.
Piston rods, &c., metallic packing for—2645—W. E. Newton.
Potters' glaze and seggar wash—2702—W. Bettison.
Press beds—2732—W. E. Gedge.
Printing presses—2710—C. M. Waddie.
Pyrites, extracting the metals contained in burnt cupreous—2613—W. Wright.
Railway crossings—2637—R. H. Hill.
Railway rails, joints for uniting the ends of—2625—S. F. and A. B. Ibbotson.
Railway trains, apparatus for ensuring safety to—2649—W. Baines.
Retorts, apparatus for scurfing—2739—H. and F. C. Cockey.
Rings, plates, &c., grinding and surfacing—2657—J. A. Jaques, J. T. Oakley, and J. A. Fanshawe.
Ruches, &c.—2696—C. G. Hill.
Safes, &c., mechanism for locking the doors of—2759—H. R. Minns.
Safety lamps—2688—A. H. Gilmore.
Sewing machine and other needles—2757—W. R. Lake.
Ships, constructing and sheathing—2673—J. Betteley.
Ships, &c.—2631—A. M. Clark.
Signals and musical sounds, apparatus for producing sonorous—2669—J. H. Johnson.
Slide valves—2751—E. Hill.
Smoke, consuming—2703—W. Tipping.
Smoke, consuming—2714—R. S. Burkitt.
Steam boilers, apparatus for preventing the incrustation and the accumulation of sediment in—2701—H. B. Barlow, jun.
Steam boilers, preventing the radiation of heat from—2635—A. V. Newton.
Steam engines, &c.—2698—A. V. Newton.
Stoves and furnaces—2694—G. Shaw.
Submarine telegraph cables, stowing, &c.—2712—A. Collingridge.
Tape trimmings, machinery for the manufacture of—2737—W. E. Newton.
Telegraph posts—2671—W. A. Lyttle.
Tram rails, &c.—2755—C. L. Light.
Tunnels, &c., armatures for building—2573—F. Durand & C. Beslay.
Vegetable fibrous materials, utilising the waste arising in spinning—2722—H. A. Bonneville.
Vehicle for locomotion by land and water—2682—W. E. Gedge.
Velocipedes—2676—F. S. Cocker.
Waterproof coats, &c.—2334—G. Broadhurst.
Weighing scales—2723—H. J. Rogers.

Inventions with Complete Specifications Filed.

Anchors—2784—J. W. Morgan.
Beam-balance for weighing grain, &c.—2806—E. O'Brien.
Bisulphites, &c., apparatus for manufacturing—2768—W. J. Turner and H. Yewdall.
Greek fire-arm—2789—H. A. Bonneville.

From Commissioners of Patents' Journal, October 5.

Patents Sealed.

1020. G. A. Ermen.
1023. J. U. Askham.
1024. J. Fletcher.
1025. F. Tommasi.
1026. W. G. White.
1031. J. Greenslade.
1039. R. B. Hooper and T. and H. R. Nickson.
1042. W. Goodreds.
1048. W. E. Gedge.
1051. J. Menzies, sen., and J. Menzies, jun.
1060. L. Mond.
1068. A. Stewart and J. Wotherspoon.
1070. J. Pattinson.
1073. A. Fryer.
1076. J. Aspinall.
1080. J. Denis.
1085. C. Lungley.
1091. P. Jensen.
1094. E. Brasier & J. E. Hodgkin.
1099. J. M. Hetherington.
1100. J. B. Spence.
1101. P. Headridge.
1103. E. C. C. Stanford.
1107. J. Parry and R. Morris.
1108. E. T. Hughes.
1111. J. Wadsworth.
1112. D. Johnson.
1113. J. H. Dales and J. F. Maygrove.
1128. W. Brock.
1130. C. Turner.
1158. C. E. Brooman.
1160. H. J. Worssam.
1165. A. W. C. Williams.
1198. J. E. Ward.
1208. R. C. Rapier.
1209. W. E. Gedge.
1230. C. E. Brooman.
1252. S. Smith.
1263. A. Muir.
1305. J. A. Haberkorn and B. Rudolph.
1362. W. Seed.
1380. W. MacKean.
1388. T. Welton.
1612. M. Benson.
1626. F. H. Lloyd.
1906. T. and R. Nuttall.
2304. J. M. Clements.
2416. W. R. Lake.

Patents on which the Stamp Duty of £50 has been paid.

2623. A. H. Brandon.
2652. A. Albini and F. A. Braendlin.
2516. D. Imhof.
2518. J. Gueunier-Lauriac.
2526. A. M. Dix.
2540. W. Hope and H. Browning.
2541. T. Forster.
2533. J. Oetzmann.
2530. T. Berney.
2534. D. Barker.
2562. J. Ferrabee.
2539. J. R. Swann.
2563. F. W. Kaselowsky.
2564. F. W. Kaselowsky.

Patents on which the Stamp Duty of £100 has been Paid.

2736. H. A. Marinoni.
2509. T. Molineux.
2784. J. B. G. M. F. Piret.

Journal of the Society of Arts.

FRIDAY, OCTOBER 15, 1869.

Announcements by the Council.

National Education League.

The Council met on Friday last, the 8th inst., and resolved that a donation of twenty guineas be given to the National Education League which met at Birmingham during the present week, and that a deputation from the Council, with the Secretary, be requested to attend the meeting. The following letter has been addressed to the Secretary of the League:—

Society for the Encouragement of Arts, Manufactures, and Commerce, October 8th, 1869.

Sir,—The Council of this Society have much pleasure in sending (enclosed) a cheque for twenty guineas as a donation to the funds of the National Education League, and have directed me to attend with a deputation, and represent the Society at the meetings of the League at Birmingham next week. The Rev. Wm. Rogers, and Messrs. E. Chadwick, C.B., and E. Carleton Tufnell, have been requested to form the deputation. The Council think it right to say that they cordially concur in the programme of the League, in so far as its object is to ensure the groundwork of instruction to all the children of the United Kingdom, and that they shall not be less well educated than children in Germany, Switzerland, Sweden, and Norway; but as a question of general policy, and as representing many different opinions among the numerous members of the Society, they hesitate at the present time to pledge the Society to all the details of the League programme. The Council think it desirable that all the various modes of ensuring universal instruction to the children of the United Kingdom should be amply discussed from many points of view, and they intend to invite the members of the Society and others to a discussion of them after the meetings have been held in Birmingham, Manchester, Newcastle, &c. For the consideration of the Birmingham meeting, the Council transmit a paper, which has been prepared by some members of the Council, and which appears to be worthy of serious attention.

I have the honour to be, Sir,
Your obedient servant,
P. Le Neve Foster, Secretary.

George Dixon, Esq., M.P.

An account of the proceedings of the League will be given in a subsequent number of the *Journal.*

Improved Cabs.

The Council of the Society of Arts offer the following medals for improved hackney carriages specially suited to the metropolis:—

The Society's Gold Medal for the best and most convenient open hackney carriage for two persons.
The Society's Silver Medal for the second-best ditto.

The Society's Gold Medal for the best and most convenient closed hackney carriage for two persons.
The Society's Silver Medal for the second-best ditto.

The Society's Gold Medal for the best and most convenient hackney carriage for four persons, either open or closed, or both.
The Society's Silver Medal for the second-best ditto.

Lightness of construction, combined with adequate strength and durability, will be especially considered in making the awards.

The awards will be made after actual trials of the carriages extending over a certain period.

Communications describing the carriages must be sent to the Secretary of the Society of Arts before the 1st January, 1870, the carriages to be sent to a place hereafter to be appointed.

The Council also offer the Society's Silver Medal for the best instrument, to be affixed to a cab or other hackney carriage, for indicating the fare as between the passenger and the driver, whether by registering the distance travelled or otherwise, and which instrument shall also indicate, for the convenience of the cab-owner and of the driver, the total distance travelled during the day and the total amount earned. The instruments competing, with full descriptions of their construction, to be sent to the Society's House before the 1st January, 1870.

Competitors may, at their option, sign their communications, or may forward with them sealed letters containing the name and address of the writer.

The Council reserve to themselves the right of withholding all or any of the medals, in case none of the carriages or instruments possess, in their opinion, sufficient merit.

In the trials of the several carriages, the small amount of vibration and noise will be duly considered by the judges.

Subscriptions.

The Michaelmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Musical Pitch.

The following additional information has been received, and kindly forwarded through the Foreign Office to the Society:—

Stockholm.

Stockholm, August 11th, 1869.

My Lord,—I have the honour to acknowledge the receipt of your lordship's dispatch No. 1 of the 3rd instant, regarding certain information required by the Society of Arts respecting musical pitch, and to state, in reply, that your lordship's instructions to Mr. Jerningham, of the 16th of January last, on this head, were duly acted upon without delay

From information which I have just obtained from a competent authority, I learn that the subject is still under the consideration of the Academy of Music.

I have the honour, &c.,
Nassau Jocelyn.

The Right Hon. the Lord Clarendon, K.G.

Brussels.

Brussels, 14th October, 1869.

Sir,—At the request of the Minister of the Interior, I have the honour of forwarding to your Excellency, in answer to your communications of the 3rd of March and 5th of August, a printed copy of the report of the committee, appointed in 1862, for settling the questions relative to the maintenance of the pitch then in use, or to its being lowered in Belgium. In conformity with sections 4 and 5 of the report, a circular was addressed by the Minister of War, June 22nd, 1863, to the Commanders of the infantry and cavalry regiments, to request them to give orders to the military band-masters for carrying out the views of the commission. No other special measure has been taken for fixing the pitch. The Theatre Royal de la Monnaie, at Brussels, has adopted the normal pitch of 870 vibrations; the Conservatoire Royal de Musique at Brussels, and the Orchestra of Popular Classical Music, still keep the old pitch of 902 vibrations. The pitch of the king's private band is still higher.

I have the honour to be, Sir, &c., &c.,
Baron Lambermont.

Report made to the Minister of the Interior on the question of Lowering the Pitch.

Sir,—The committee appointed by Royal decree of the 12th of April, 1862, for determining whether the pitch now in use in Belgium should be lowered or maintained, after having carefully examined the question, having had under its consideration the pitch used in the principal cities in Europe, has arrived at the following conclusions:—

1. That the great rise in the pitch took place at the period when Glück published his first French opera ("Iphigénie en Aulide") in Paris, that is to say, since 1774 to 1810, and that in this space of thirty-six years the rise was more than three commas, or more than one-third of a tone, as has been stated in the report of M. Taskin to the Committee of Arts, in Paris, dated 27th March, 1826, on a tuning-fork for comparison, invented by a musician of the Royal Chapel, named Matrot.

2. That this tuning-fork gave the three pitches of the Opera, the Opera Comique, and the Theatre Italien, in Paris, in 1826; that that of the Opera then made 882 vibrations in the second; the Opera Italien, 891; the Opera Comique, the highest of all, 896.

3. That the operas composed since 1810 by the most celebrated composers, Méhul, Nicolo-Isouard, Boïeldieu, Auber, Hérold, Adolphe Adam, and others, for the Opera Comique, and which form the stock pieces of all the theatres of France, Belgium, and even of Germany, were written for this pitch of 896 vibrations, afterwards raised to 902, and that no fatigue in consequence has resulted to the singers, because these masters had regard in their works to the natural limits of the voice.

4. That M. Lissajous, professor of physics, member of the committee appointed by the French government on the 17th January, 1858, to determine the number of vibrations for a standard intended to become the model pitch for the empire, proposed a lowering from 898 (the pitch of the opera at that time) to 891; but for reasons which it is unnecessary for the Belgian committee to enter into, the majority of the French committee decided that the pitch should be lowered a quarter of a tone, and fixed the standard number of vibrations at 870. They had not observed that this number of vibrations does not correspond to two commas, one-fourth, the exact measure of a quarter of a tone, but to three commas, one-third, that is to say, more than a third of a tone below the pitch of the Opera Comique.

5. That no improvement has been effected in the voices of the French singers in the space of four years elapsed since the lower pitch, that is the normal one, has been adopted. That the artistes do not sing with greater ease those operas which they said used to fatigue them by reason of the high pitch. In fact, at no period has the personal condition of the singing body of the Paris theatres been so bad as at this time.

6. That the tuning-fork of the Royal Conservatoire of Brussels, an old fork in use at the Ghent Theatre, and at the Casino in the same town 30 years ago, an old fork of the Opera Comique of Paris in 1820, that of the Theatre Royal of Brussels, one belonging to a member of the committee (a maker of brass instruments in use all over the country, in the regiments of the army, exported to England, America, and the North of France), the tuning-fork of the Philharmonic Society of London, that of the Berlin Opera in 1861, and, lastly, that of the well known Choral Society of Cologne of the same period, all give the same pitch, with slight variations in the number of vibrations. The mean of these forks is 902 vibrations per second. It should be observed that the tuning-fork of the London Philharmonic Society gives C as the key-note, as well as the tuning-fork of the different States of Italy, instead of A, which, in Belgium, Germany, and France, is taken as the pitch-note. The committee ascertained that the C of the Philharmonic tuning-fork sounds a minor third above the tuning-fork of the Brussels Conservatoire, from which it follows that the A of the English orchestras is in unison with that of Belgium, except those slight differences of which we have spoken. This, therefore, does not offer any serious obstacle to the uniformity of pitch of wind instruments, because that is regulated by the lengthening of the tube of the oboes and the mouth-pieces of the clarionets and the bassoons, by the lengthening the tube of flute and the crooks of brass instruments. In regard to bow instruments, their pitch can be regulated at will.

7. That the only lowering of the pitch in use in Belgium should be the simple operation of transposing to an exact semitone lower for exceptional cases, or where the vocal parts are written too high, which is managed without difficulty by the good orchestras of the Conservatoire at Brussels, of the Theatre Royal, and by l'Association des Musiciens. By this simple plan the pitch remains in reality as it is, and there is no fear of any disturbance in the manufacture of instruments, a consideration of the highest importance, as was shown by the International Exhibition in London. In fact, the same French makers of wind instruments, who, at the Paris Universal Exhibition, in 1855, had deserved praise, and obtained first-class medals for the accuracy of their oboes, horns, bassoons, clarionets, and flutes, only showed at the International Exhibition of 1862 inferior instruments, because of the forced adoption in France of a pitch fixed at 870 vibrations the second, and which suddenly lowered the *La* 28 vibrations as regards the opera, and 32 vibrations for other orchestras. From that resulted the necessity for changing all the proportions for placing and dimensions of the holes on the tube of each wind instrument, a delicate operation in which the makers have only succeeded by experiment. Thus, suddenly, the result of a long experience, by which a satisfactory accuracy had been attained, the fruit of constant study by the most eminent artistes, and of the persevering efforts of the most skilful makers, has been set aside. All this work has to be gone over again to make the new proportions to suit the normal pitch. It can be done, without doubt, but until that end be attained, instruments made to the pitch of 870 vibrations will be more or less imperfect. The facts on which it has been thought necessary to lower the pitch have been exaggerated, or rather perverted. It is said the voices of the singers of the present time deteriorate rapidly, and singers willingly say the pitch is too high; but to those who know the truth of these things, this very evident evil may be attributed to other causes. Besides, it is not to be denied that the majority of singers go beyond the limits of the written music, according to their caprice, and they willingly reach extra high notes, with no other result than that of satisfying their own vanity. In comparison to the fatigue which results from this strain-

ing, a difference of pitch of four commas is nothing. Sometimes the fault may be attributed to a composer, who, writing for an exceptional voice, is induced to yield to the *spécialité* of a singer, without considering how his music will suit the limits of general voices, and prepares for the latter difficulties, as has lately been seen at Brussels, in a work written for a singer whose high voice reached notes impossible for other singers.

8. Another reason, no less certain and still more active in the destruction of the voice, is the habit which singers now have of prolonging the note with effort and with a screech, which the public has often the bad taste to encourage and to applaud. No voice can resist the violence of these attempts; the inevitable result must be the rapid destruction of the best-toned voices. The pitch is not, therefore, to be blamed.

9. That if the pitch be lowered to suit some establishments, such as the conservatoires of the kingdom and the theatres assisted by government funds, a sort of anarchy will result from it in a free country like Belgium, where no compulsion can be put on the makers of instruments, musical societies, and professionals, to oblige them to give up the pitch which they have been in the habit of using, any more than the forbidding of painters to use a certain colour. Instead of a uniform pitch which the public might adopt, there might be two sorts, if we could have, as in a neighbouring country, an inspector of the pitch.

10. That the question of expense for the change of instruments is of great importance for the artistes, to whom the sacrifice would be very distressing, and also for the pupils of the conservatoires and the schools of music who play on wind instruments, the greater part of whom would be obliged to give up their studies, and also for the communal bodies of the towns, where theatres are supported by them. For the army, this expense would be enormous, for all the regiments would be obliged to have a fresh supply of their musical appliances. In France, this operation, which is only now begun, and is in the course of being carried out, will cost a million and a-half; the regiments of Garde Civique, also, which have musical bands, will have similar expenses to pay.

11. That in Belgium, as well as in Germany, the custom has existed for two centuries of having masses and musical services in which the organ is played in conjunction with other instrnments, a custom which does not exist in France, or which is only in use in the northern provinces. Formerly, organs were tuned a half-tone lower than orchestral wind instruments; this is called church pitch, in Germany *chorton* or choir pitch. At that time they employed only for church music violins, violoncellos, and double bass; the organ took the part of the wind instruments. There is no difficulty in adjusting stringed instruments to the pitch of the organ or of the church. But, when the performance of religious music became similar to that of the opera, it was necessary to tune the organ to the pitch of the other instruments, an operation which has consisted in shortening proportionately the pipes and adjusting the reeds. As regards new organs, they have been built during the last thirty years to the orchestra pitch, according to the fork in use. One consequence of lowering the pitch to 870 vibrations will lead inevitably to the necessity of lowering the pitch of the organs. However easy it may be to raise the pitch by shortening the pipes, it is not so easy to lengthen them for a lower pitch; the operation can only be effected by suppressing the pipe of the last note, and shifting all the others, from which results the necessity to replace pipes of the lowest notes in all the registers, which for all the notes of a great organ of 50 or 60 registers will cost a great sum of money, especially for the flute stops and such like, of 8, 16, and 32 feet, in metal and in wood.

12. That the reason alleged for the lowering of the pitch to 870 vibrations deserves no consideration, viz., that the amateur Belgians who play on the flute, clarionet, oboe, bassoon, &c., can no longer join in concerts in France, where their instruments will not be the same pitch as the orchestra, for the artiste, whose talent is sufficiently remarkable to give concerts successfully in a foreign country, can procure, without difficulty, the instrument he requires.

After the preceding observations, the Commission arrives at the following decisions:—

a. There will be no advantage in lowering the pitch to 870 vibrations the second.

b. All the inconveniences of such lowering, enumerated above, will be inevitably produced.

c. It is desirable that a standard should be adopted, so that in future the pitch should not be capriciously raised, whether in reality by the makers of instruments, or by the influence of the leaders of military music, who wish to obtain more brilliant effects from the bands which they direct.

d. Comparative experiments show that the pitch of the Royal Conservatoire of Brussels, and of the Theatre Royal of that city, can be taken for this standard, whilst they are in unison, for the most part, with those of the largest cities of Europe, except in some slight differences.

e. The average difference of the pitches gives 902 vibrations the second; in consequence, the Commission is uanimously of opinion—

1. That the pitch should not be lowered.
2. That it ought to be fixed, taking for standard that of the Brussels Conservatoire.
3. That a tuning-fork should be deposited with the Royal Academy of Sciences, of Letters, and of Beaux-Arts of Belgium, as well as in the offices of each of the directors of the Conservatoires of the kingdom.
4. That each of the military regimental bandmasters and of the Civic Guard should be provided with standard tuning-forks.
5. That the interference of the Minister of War will be necessary to compel bandmasters to use only instruments of the standard pitch.
6. That the leaders of orchestras will assist materially in maintaining the pitch invariable by no longer giving *La* from an oboe or any other instrument whose sound is changed by the length of the pipe, by influence of temperature, or by accidental causes, but by furnishing themselves with a pitch-pipe carefully tuned in unison with the standard fork.

(Signed) Fetis, President and Reporter.
Daussoigne-Méhul.
J. Blaes.
C. Mahillon.
C. Hanssens.
V. Bender.
A. Samuel.

Dated Brussels, 9th April, 1863.

Proceedings of Institutions.

EXAMINATION PAPERS, 1869.

(*Continued from page* 854.)

The following are the Examination Papers set in the various subjects at the Final Examination held in April last:—

SPANISH.

THREE HOURS ALLOWED.

Candidates for the first-class certificate will have to translate the following passage into Spanish, to render into English or French several proverbs and idiomatic phrases, and to write in Spanish a short essay on the liberty of nations

Don Quixote was surprised at what he heard from the goatherd, and being still more desirous of knowing who the unfortunate madman was, he renewed his determination to search every part of the mountain, leaving neither corner nor cave unexplored until he should find him. But fortune managed better for him than he expected,

for at that very moment the same youth appeared descending towards them, and muttering to himself something which was not intelligible. The rags he wore were such as have been described, but as he drew near Don Quixote perceived that his buff doublet, though torn to pieces, still retained the perfume of amber, whence he concluded that he could not possibly be of low condition. When the young man came up to them, he saluted them in a harsh and untuned voice, but with a civil air. Don Quixote politely returned the salute, and alighting from Rosinante, with graceful demeanour and address advanced to embrace him, and held him a considerable time clasped within his arms, as if they had been long acquainted. The other, whom we may truly call the tattered knight of the woeful, as Don Quixote was of sorrowful figure, having suffered himself to be embraced, drew back a little, and laying his hand on Don Quixote's shoulders, stood contemplating him, as if to ascertain whether he knew him, and perhaps no less surprised at the aspect, demeanour, and habiliment of the knight, than was Don Quixote at the sight of him.

Don Quixote, translated by Jarvis.

Translate into English or French :—

1. Ausencias causan olvido.
2. A buena gana no hay pan duro.
3. No hay mal que por bien no venga.
4. Mas puede maña que fuerza.
5. A quien se hace miel, moscas se le comen.
6. No hay mejor testigo que el papel escrito.
7. Quien no se aventura, no pasa la mar.
8. Sancho Panza dormia como una piedra.
9. El pobre hombre se echó tierra en los ojos.
10. El Capitan defendió el terreno palmo á palmo.
11. No se meta V. en lo que no le va ní le viene.
12. Cada uno puede hacer de su capa un sayo.

Write a short essay on the liberty of nations.

Candidates for the second-class certificate are to translate the third part of the passage for the first-class, and two letters of business, to render into English six of the proverbs and idiomatic phrases, and to answer some grammatical questions by translating a few examples.

Translate into Spanish :—

Sir,—We are exceedingly sorry to be under the necessity of becoming now urgent, but as you are backward with your remittance, and our profits are so small on the goods we have sent you, we expect an immediate draft or order for the sum which has been so long due, otherwise we shall be obliged to take such measures as must prove very disagreeable to you.—Your humble servant.

Sir,—In answer to your favour of the 6th inst., I shall, by to-morrow's mail, send you a few articles which I shall submit as a specimen of both the quality and cheapness of all my things. Should it be your pleasure to repeat your order, I shall endeavour to prove myself deserving of your favour.—I am, with wishes for your success, yours faithfully.

Translate into English :—

1. La primera casa está para concluirse y la segunda por habitar.
2. V. está equivocado y su amigo tiene razon.
3. Se me olvidó lo que V. me dijo.
4. Heteme aqui, amigo, sin un cuarto y tendré que salir manana.
5. ¡ Desdichado de mí padré ! murió de repente.
6. ¡ Plegue al cieto que nunea seamos tan infelices !

Candidates for the third-class certificate will translate the precedent six examples, the next extract of Nueva Floresta Española, and to render into Spanish some phrases to elucidate a few grammatical rules.

Translate into English :—

Durante el sitio de Gibraltar, en el momento, en que los ingleses esperaban un ataque general, un centinela, que habian colocado al anocherer frente á la torre del diablo, estába á lo ultimo de la muralla silbando y figando sus miradas sobre las lineas españolas, no soñando mas que balas, bombas, minas, brecha y fuego de fila. Al lado de su garita tenia un puchero, donde habia ocultado su comida, que consistia en un potage de garbanzos. Una mona (sabido es que la cima de esta roca está siempre cubierta de estos animales) muy grande alentada par el silencio del centinela, y llevada del olfalo se acerio al puchero y metió la cabeza para regalarse con lo que tenia ; cuando quiso escarparse, no púdo sacar la cabeza, y se llevó el puchero por gorro, marchando con los pies de atras. Esta terrible aparicion ápenas se presentó á los ajos del centinela, dando con cuanto encontraba, convirtió al pobre Beltran (la mona) en un granadero español ensangrantado y herido mortalmente. Exaltado con esta idea y lleno de miedo disparó su fusil gritando con todas sus fuerzas, que el enemigo habia escalado la muralla.

Translate into Spanish :—

1. Whoever may be personally at the meeting will be honoured by the acquaintance of the Prince.
2. I shall make up his accounts.
3. He makes himself loved by everybody as much by his modesty as by his merit.
3. However relishing may be the draughts which physicians prescribe, few are the patients that like them.

FREE-HAND DRAWING.

THREE HOURS ALLOWED.

1. Make an outline of the ladder and hamper.
2. Make an enlarged drawing, not less than fourteen inches in length, of the photograph.
3. Draw from knowledge eight muscles of the human body, giving their names, and their origin and insertion.

Directions for the Local Boards.

Put a hamper with the lid open under a step ladder before the candidates in free-hand drawing.

Provide each candidate with a carte-de-visite photograph.

PRACTICAL GEOMETRY.

THREE HOURS ALLOWED.

The constructions must be strictly geometrical, neither calculation nor trial being admissible. All those lines which are essential to a correct solution must therefore appear on the drawing. The figures may be left in pencil provided they are distinct. No deviation from the given conditions will be allowed, nor may a candidate attempt more than two questions in any one section, Whatever number of solutions may be attempted, one half, at least, must be from those of "Solid Geometry."

Plane Geometry.

I.

1. Draw a triangle whose sides are 2, 2·5 and 3 in. respectively, and the circle circumscribing it.
2. Draw a hexagon on a base of 1·75 in., and the circle inscribed.
3. Draw a square of 3·5″ side and within it place four equal circles touching one another and the sides of the square.

N.B. These questions are for displaying neatness and accuracy of execution.

II.

1. Divide a line 3·5 inches long in extreme and mean ratio.
2. Divide the same line so that the rectangle contained by the segments may be of 2 square inches area.
3. Show (without any calculation) a line whose length is $\sqrt{5 \cdot 5}$ inches.

III.

1. Draw a triangle whose vertical angle is 40°, its base 2·5 in., and its sides in the proportion of 2 : 3.

2. Draw a triangle circumscribing a circle of 1 in. radius, and having its sides in the proportion of 2 : 3 : 4.

3. Construct a triangle whose sides are in the proportion of 2 : 3 : 4, and its area 6 square inches.

IV.

1. Bisect the triangle in I. (1.) by a straight line perpendicular to its longest side.

2. Draw a square on a base of 2·5 in., and divide it into 5 equal parts by lines drawn through one corner.

3. Draw a square whose area is half that of the last.

V.

1. Draw a circle of 1·5 in. radius, and from a point 4 in. distant from its centre draw a line, cutting it so that the chord intercepted may be 2 in. long.

2. The centres of two circles are 3·5 in. apart; one has a radius of ·75 in., the other, one of 1·25 in. Draw a common tangent (by construction, not mechanically).

3. Draw an indefinite straight line, and take two points 2·5 in. apart; the one being ·75 in. distant from the line, the other 2 in., and on the same side of it. Draw a circle to pass through these points and touch the line.

Solid Geometry.

VI.

1. Draw the plan of a line 3·5 in. long when inclined at 42°.

2. Draw a line 3 in. long, and figure one end of it 7, the other 18. Find the true length and inclination of the line of which this is the plan. Unit ·1 in.

3. The plan of an indefinite line makes an angle of 27° with the ground line, its elevation one of 40°. Determine the inclination of the line to each plane of projection.

VII.

1. Illustrate the terms "plan," "elevation," and "sectional elevation," by showing those of a pentagonal prism resting on one face. Side of pentagon 1 in.; length of prism 3 in.

2. Draw the plan of a hexagonal pyramid lying on one face, and give an elevation on a line making an angle of 30°, with the plan of the axis; side of hexagon 1 in., length of axis 3·5 in.

3. Draw the plan of this pyramid when one edge is vertical.

VIII.

1. Draw the plan of a cube of 3 in. edge when one face is inclined at 55°, and one diagonal of that face is inclined at 35°.

2. When two edges of one face are inclined at 27° and 37° respectively.

3. When two faces are inclined at 40° and 62° respectively.

IX.

1. The "horizontal trace" of a plane makes an angle of 35° with the ground line; the "vertical trace" one of 50°. Determine the true angle contained by these traces (*i.e.*, when the co-ord. planes are perpendicular to each other).

2. Taking the same traces as in the last, determine the angle that a horizontal line perpendicular to the vertical plane makes with this given plane.

3. The horizontals of two planes make an angle of 40°; one plane is inclined at 50°, the other at 60°. Determine the angle between them.

X.

1. A cylinder 3 in. diameter, 4 in. axis, has the latter inclined at 40°. Determine the section of this cylinder by a vertical plane bisecting the axis.

2. Draw a tangent plane to the cylinder in the last, having an inclination of 60°, and show the line of contact.

3. Draw the plan of three spheres standing on the horizontal plane, and touching one another, their radii being ·75, 1·2, 1·6 in. respectively.

XI.

1. A box 5 in. long, 3 in. broad, 1 in. deep, having three equidistant partitions across it, is made of wood $\frac{1}{4}$-in. thick. Draw its isometrical projection.

2. Draw the isometrical projection of a piece of wood 5 in. long, 3 in. broad, and $\frac{1}{2}$-in. thick, with a circular hole bored through its centre of 2 in. diameter.

3. Draw the perspective projection of the box in the first question of this section, taking conditions at pleasure, provided that the eye is above the box, and no side of the latter is parallel to the picture plane.

(*To be continued.*)

FISHING TACKLE FACTORY.

Redditch, world-famous for its needles, is equally celebrated for the excellence of its fish-hooks and fishing-tackle. Thirty years ago, Messrs. Allcock and Co. employed about a dozen hands in this trade; now they have upwards of 150 on their books, their premises have been necessarily extended, and they have found it desirable to have a branch establishment (Allcock, Laight, and Co.) at Toronto, Canada West. The manufacture was originally begun by Mr. Samuel Allcock's father, who was also one of the earliest needlemakers in Redditch; but the present head of the firm has had the management and sole control of the works for twenty-two years. Of the history of fish-hook making in Redditch comparatively little is known. The trade appears to have been first followed, not at but near Redditch, by a Mr. Tolly, the date of whose enterprise is not very clear. At the little village of Sambourne, three miles from the Needle Town, Mr. Tolly set up his sign as a maker of hooks, and there he taught the grandfather of one of the largest and most respected of Redditch manufacturers of to-day—Mr. R. Hemming. About ninety years ago, the Mr. Richard Hemming referred to as having been initiated in the manufacture by Tolly, commenced business at Redditch. So the trade spread, Mr. Allcock, sen., being amongst the first to embark in it. Now, the trade gives employment to about 600 persons in Redditch alone, and something like four million hooks are sent out every week to all parts of the globe.

The first process in the manufacture of fish-hooks is very similar to that in needle-making, viz., the cutting-up of the steel wire into the required lengths. The wire intended to be made into hooks is next "bearded," —notched, the untechnical would term it—then filed, and sharpened to a fine point. There is here a difference between foreign and English fish-hooks. The latter are notched, and the former flattened at the end; for fly-making they are tapered, to give them a neater appearance than their rivals possess. The hooks have now to be shaped and bent. They are curved—"bent," as the manufacturers would say—by women, on a "bend," a very simple process, consisting of crooking the wire over a piece of wood. To harden and anneal the steel, hooks go through a similar process to needles; they are hardened in the fire, and tempered in sand, in a pan which has a fire under it. The small hooks are put into bags containing oil and emery, and shaken by hand. After they have been scoured, they are well washed in soapsuds, by which means the oil is removed from them. Next, the hooks are put into sawdust for the purpose of being dried, and subsequently we find them in clean bags, polished as bright as new coins. After being blued, the hooks are once more washed and dried again with sawdust to prevent their rusting, and then finally dried in that material. For this purpose, it is said that dry sawdust is indispensable. Certain sorts of hooks are now ready for papering and packing, done by girls, whose duties include the individual counting of every hook. The variety of fish-hooks is something astonishing. There are made at the Standard Works fifty-three different sorts of hooks, and many of the sorts have from

twenty to thirty sizes. These "loose hooks" include the sorts known as common and best ringed Kirby, flatted and ringed hollow Limerick, hollow-pointed Dublin Limerick, treble-brazed, single and double trimmers, eel and sneek hooks, Kendal Kirby-bent, short-shank Kendal, Carlisle round, Norway hooks, black fish-hooks, Kirby and round bent Sea, Exeter Sea, blue and tinned, &c. Of these the most popular are the Limerick, sneek, the hollow-points, the Kirby, Carlisle, and Kendal hooks.

Quite as important as the manufacture of hooks is the fishing-rod department, where every description of rod is made—from the lowly two-jointed "hazel," at three shillings a dozen, to the aristocratic salmon rod, at three sovereigns. The best rods are variously made of bamboo, hickory, and East India cane, with ash for the bottom joints. Hickory is used for the second and middle joints of the best rods, with tops of lance-wood and bamboo. There are fly-rods made of all hickory—others for spinning, of cane, which is imported from South Carolina and from the East Indies. After leaving the saw-mill, the wood is turned into joints, the butts of which are then bored to contain spare joints, and then planed ready for the fitting-on of the brass ferules, the best of which are hand-brazed to give them great strength. Certain of the rods—those for use in Irish waters especially—are screwed together, not merely placed in the sockets. That beautiful appearance which fishing rods present is obtained by staining the wood with aquafortis and nut-galls. The stain is burned in immediately after it is put on; the rods are then rubbed with sand-paper, and highly polished—a dozen coats of varnish being not at all unusual. The waxed silk which binds the tops of the joints, and the rings through which the line runs, are put on by hand, and the rods undergo another varnishing as far as the rings are concerned.

Fishing floats form another department. The cork of which they are made having been cut with a hand-knife, is pierced with hot wire, and then is ready to be turned by a machine to any size or shape required. They are put on a grindstone to have the knife marks taken out, and then painted and varnished by children. Before the float is complete, it has gone through twenty-one pairs of hands; yet the dealer in tackle may purchase a gross for fifteen shillings. So simple an article as a float is not made without wood, cork, wire, putty, silk (for binding one end), quill, paint, and varnish. The reels for lines are all cast and finished like other brass objects, and require no description; the swivels used in trout and pike fishing are stamped like needles, one by one, filed and drilled, and finished in the same way as the hooks. Leads for sinking hooks and nets are made on the spot in moulds; the small shot used for general lines are split by a splitting machine. The shot is put into a trough containing one hole, and let drop on to a circular knife turned by machinery. Besides the tackle which has been mentioned, they make lines at the Standard Works—hair lines being spun, without any knot, in one length; and the better lines plaited at a machine by girls. Like the cork, all the "gut" used is imported from Spain, and is looped and tied on with wax thread. "Fly" making—one of the most important features of the manufacture—deserves more space than can be given here, and, after all, can only be understood by being seen. The hooks are first tied on to the gut; then the body of the fly is made; the hackle is next put on, and then the wings—girls, whose aptitude is great, and their artistic powers not inappreciable, having sole sway in the fly-making department. Of course there is a great demand for the material wherewith to make the much-sought-after flies. Some of the feathers used at Redditch for this purpose come from America, others from Germany, but our own feathered tribes are laid under heavy contribution. More useful to the artificial fly-maker than the vocal portion of their tribe are jays, starlings, woodcocks, and golden pheasants. There is a warehouse, 65 ft. by 18 ft., full of patterns for home and foreign markets, and the whole establishment bears marks of the great care bestowed upon it by the energetic gentleman (Mr. Samuel Allcock) now at the head of the firm.

INDIAN ARCHITECTURE.*

Nearly three years ago, Mr. Fergusson read a paper on this subject in the Society's rooms (see *Journal*, vol. xv., p. 71), when the Under-Secretary of State for India presided. Mr. Fergusson's object was to advocate the preservation of Indian architecture, and awaken an interest in this country, so that the government of India might be led duly to appreciate the buildings in their charge. Mr. Fergusson's teaching has at last borne its fruit, and some quite practical measures have been taken to give effect to it. The Society may be congratulated that in this matter, as in many others, it was the earliest to take the lead in promoting a very useful public object.

In a recent number of the *Times*, the proceedings which have taken place in reference to Indian architecture, and a full account of what is now doing and intended to be done by the several authorities—the Secretary of State for India, the Government of India, and the Science and Art Department—are stated, and will interest the members:—

"The hilly tract of country surrounding the native village of Bhilsa, in Central India, is covered with a number of curious ancient ruined monuments, which years ago attracted the attention of General Cuningham, and gave rise to his archæological treatise called the "Bhilsa Topes." A new interest for the subject has lately been created by Mr. James Fergusson's beautiful series of photographs in his work on "Tree and Serpent Worship," which illustrate the most perfect of the remains near Bhilsa—the Sanchi Tope.

"This monument consists of a huge dome or mound of earth faced with stone, and stands in solemn loneliness on the summit of a small hill overlooking the few scattered native huts of Sanchi. The village is in an isolated part of Central India, seventy-seven miles from the nearest English cantonment—Saugor, and twenty miles from Bhopal, the capital of the native state of that name. The surrounding country is covered with ancient ruins, which, like the Druidical stones of Great Britain, are but the records of a past age and an almost forgotten people. Small hills dot the not too well cultivated plain, and the merest tracks, the only substitute for roads, wind across river and jungle, between the small villages which are sparsely scattered about.

"As one of the earliest monuments erected by the worshippers of Buddha, the Sanchi Tope claims the special interest attaching to the history of a religion which originated more than two thousand years ago in Upper India, and, after rising to ascendency throughout the country, spread its doctrines to Thibet, China, Japan, Ceylon, and other countries east of Hindustan. It has long since ceased to be the governing religion of India, and at the present time has no followers in that country. If, however, we wish to study the history of a creed which in other parts of the world has upwards of 200,000,000 votaries, it is to India that we must look for the means, which exist in the various Buddhist monuments scattering the country in ruined heaps. At different times a certain amount of interest has been taken in the translation of inscriptions, and archæologists have from time to time brought to light new facts which have given some insight into the history of Buddhism.

"It is not, however, until we come to study its stone sculptures that a more complete idea can be formed of

* "Illustrations of various Styles of Indian Architecture;" a series of 15 photographs of some of the most important buildings in India erected between B.C. 250 and A.D. 1830, with a lecture on the Study of Indian Architecture, read at a meeting of the Society of Arts on the 19th of December, 1866, by James Fergusson, F.R.S., and a report of the discussion which ensued. London, printed for the use of Schools of Art in the United Kingdom, 1869.

the growth of that wonderful religion, and the circumstances under which it gave birth to an art full of character, beauty, and a quaint originality of its own.

"The public is on the eve of being awakened to this interesting study, and we hear that the government of India has deputed a young officer of Engineers to organize a party of modellers, for the purpose of taking plaster casts of some of the most remarkable Indian sculptures. We understand that the first cast is to be one of four great gateways which surround the tope of Sanchi. It is a large work, requiring expedition, in order that the limited cold season, when such work is alone possible, may not expire before the whole is completed. The party about to be employed will consist of three Sappers of the Royal Engineers specially trained in England, and some eight native modellers, who will proceed to Bhilsa and remain encamped there until one cast has been obtained. The party, after reaching Calcutta, will travel by railway as far as Jubbulpore, and there collect the necessary camp equipage for crossing into the Bhopal dominion. It may be imagined that a march over 185 miles of rough country without a road is not without its difficulties, especially when the materials for casting a large monument have to be conveyed on carts drawn by bullocks. We can picture the long string of waggons slowly moving from Jubbulpore to Saugor, and thence to Sanchi, halting each day after the usual march of 15 or 16 miles, and forming an encampment for the night near some village, where water for man and beast is plentiful, and where the native drivers can buy and cook their meal of rice and flour.

"Country produce is often thus transported from town to town, but it will be perhaps for the first time that an expedition passes through this part of Central India, having for its object the instruction of the natives in their ancient art, and the enlightenment of Europeans in the history of a people who, some thousand years ago, raised huge religious monuments to the memory of their great teachers, and in dedication to the Supreme Buddha.

"The Tope at Sanchi was probably of a dedicatory character, and appeared to have been erected about 500 years B.C. The stone railing was probably built about 250 years later, by a number of religious devotees, and in the commencement of the Christian era the four great stone gateways were erected. Each of these is 33 feet high, and covered with the most elaborate and artistic sculptures. The whole surface is divided into panels, containing bas and alto reliefs, representing domestic and warlike scenes, processions, and modes of worship, forming, in fact, the most perfect existing record of early Buddhist history.

"There are three, perhaps four, distinct races of people represented in these sculptures; of two there is no difficulty in recognising one as Hindoos, meaning the civilised race who, at the time of the erection of the gateways, were the occupiers of the valley of the Ganges, and who had for 2,000 years before that time been the dominant class in India. The second race are described by General Cuningham and Colonel Massey as priests or ascetics, but Mr. Fergusson affirms that the sculptors meant to represent them as the aboriginal inhabitants of the country of Malwa, to whom the Hindoos came either as conquerors or as missionaries. Although a careful study enables anyone to discriminate between the different races of men represented, the task is more difficult when we attempt to determine what each bas-relief is intended to represent. One half of the bas-reliefs represent religious acts, dagobas, trees, once or twice the wheel, and once the serpent figure as objects of adoration. Some scenes depict events in the life of the great Sâkya Muni, and numbers are representations of domestic life, in which it is hopeless to try to identify the actors. The more important bas-reliefs represent historical events, and, considering the self-denying character of Buddhism, it is probable that the events represented had passed into the sphere of religious history before they were sculptured, and that they were actions sanctified by tradition. The whole of the inscriptions record gifts, and gifts only, and are, therefore, no guides to the meaning of the sculptures. It would, however, seem probable that Asoka is the chief hero in all, or nearly all, the historical bas-reliefs.

"The sculptures at Sanchi are rude, but they make atonement by their vigour, and by distinctness of expression. All the people represented are human beings acting as men and women have always acted, and there are none of those monstrous combinations of heads of men with those of elephants, or lions, or boars, which form the staple of modern Hindoo sculptures, and which are more usually brought home from India.

"Mr. Fergusson says:—'Perhaps, however, the crowning point of interest in these sculptures is, that they complete our knowledge of the history of stone art in India. Hitherto we have been groping our way backwards with uncertain steps, never knowing at what conclusions we might ultimately arrive. As far back as the tenth or eleventh centuries, we had abundant examples of structural buildings, and we found that each was perfect in the direct ratio of the age. The history of art in India, so far as we could trace it, was written in decay, and, finding each example more perfect than the one that followed it, there was reasonable hope that some day we should find something that would stand comparison with the arts of the Western World.'

"Sanchi is in the territory of the Begum of Bhopal, and this Mahommedan Princess, with little personal interest in the Buddhist or Hindoo relics of her dominions, had nearly permitted the removal of one of these gateways to Paris. The timely interference of the Indian Government happily prevented such a catastrophe, and a pledge was given to send a plaster cast in place of the original, All archæologists must concur heartily in the policy of retaining ancient Indian monuments *in situ*, and we hope they may look forward to the time when the government will also keep the chief ones in repair.

"Besides the cast of the Sanchi Gate, about to be sent to France, the Science and Art Department has requested that three copies may be supplied, for London, Edinburgh, and Dublin. Prussia, also, seems anxious to secure a copy, and it is probable that other European countries will follow suit.

"Until the late Disraeli Administration, the subject of Indian architecture has been greatly neglected by both India and England, and one of the most active steps towards creating an interest worthy of the subject was taken by Sir Stafford Northcote himself, when Secretary of State for India, by moving the Indian Government under Sir J. Lawrence to take action. Up to this time, General Cuningham and Mr. James Fergusson were among the few writers who had enlightened us with any success on the subject; and although the latter often protested against the barbarity of desecrating ancient Indian buildings by turning them into barracks, and by the use of them, when whitewashed, as government offices, no steps had been taken either to make records of, or to preserve the architecture of India. Now, however, we hope in a short time to have a complete series of illustrations of both archæology and architecture, as official published documents inform us that a survey party has been established in Bengal, Madras, Bombay, and the Upper Provinces, and that plans, photographs, and plaster casts are being prepared of some of the most remarkable Indian buildings. A step so liberal cannot but succeed in its objects of educating natives, and adding to the scanty and imperfect knowledge of Indian art in Europe, and we trust that the results will justify Government for taking the initiative in a matter which more commonly depends on private liberality for support.

"Last year, towards the close of the season, when Englishmen are allowed the privilege of travelling in the Rajah of Cashmere's dominions, a somewhat rapid survey was made of some of the most important ancient Cashmerian temples, and a series of photographs and

plans will, we believe, be among the first series of illustrations to be published by government. The Cashmerian style of architecture is very remarkable, and sometimes suggestive as regards modes of treatment in external decoration. The style is unlike anything to be met with in other parts of India, and appears to have had some connection with that of Greece. In the case of Cashmere it is well that records have been made before the ravages of climate—snowdrift, torrents, extreme heat and cold—complete the ruin commenced by the bigoted Mahommedans after their conquest of the valley.

As a first step towards making the study of Indian architecture accessible to the Schools of Art in the United Kingdom, the Science and Art Department have printed a small book, which contains 15 photographs of some of the most important buildings in India, erected between the years 250 B.C. and 1830 A.D, so that the student is offered an opportunity of studying some of the examples marking the progress of an art which had a splendid existence for a period of 20 centuries. These photographs are permanent, being printed by the new Woodbury process.

"This little work opens with a photograph of the Sanchi Gateway, which we have alluded to as about to be reproduced in plaster of Paris. We are then shown two views of a Cashmerian Temple, superstitiously believed by the natives of Cashmere to have been erected by a race of giants. Hindoo, Jain, Mahommedan, and modern buildings then follow, showing how the peculiarities of each style have been kept distinct, and demonstrating that the greatest architectural successes are those in which the style has grown out of national wants allied with national character and instinct. The book ends with a paper read by Mr. Fergusson at a meeting of the Society of Arts, and in it we are told of the importance of the study of Indian architecture, as affording a direct means of ascertaining the ethnological relations of the different races inhabiting India, as giving the best pictures of the religious faiths of the country, as furnishing a means for testing any historical conclusions we may arrive at, and as giving a measure of the greatness or decay of the dynasties that ruled in ancient times.

"Then, as bearing on architectural art in our own country, Mr. Fergusson tells us that such a study helps to widen the base of our observations, and extends our views to styles wholly differing from our own. enabling us to master principles which are wholly hidden when our study is confined to local styles so mixed up with adventitious associations as ours inevitably are.

RECREATION AND EDUCATION.

At the Church Congress, held at Liverpool, the following discussion took place on the great importance of providing recreation for the people:—

The Rev. J. Erskine Clarke said the subject was not one which he should have chosen himself; and the evils flowing from the present recreations were so vast, and so comparatively little could be done to mitigate them, that he was afraid the subject would fall under the common censure that it would lead to no tangible action. After pointing out the instructive distinction between recreation and pastime, viz., that recreation was a creating anew of fresh strength for coming work, while pastimes were devices for the passing of time away—he said that by the people he meant the rank and file of labour's army. That the poor were not worse than the rich in the viciousness of their pastimes was proved by the manner in which horse-racing, pigeon-shooting, &c., were pursued, the popularity of such dramas as "Formosa," &c., and he by no means wished to imply that the recreations of princes and nobles were wholly commendable. Limiting his subject to the indoor recreations of the people in towns, where there was the greater need of wholesome recreation and less chance of obtaining it, he proceeded to comment on the prejudical influences exercised by the public-house, the music-hall, dancing saloons, and the theatres. He said the public-houses did nothing for the recreation of the workman, but much to debase him, and absorb the money which would procure him healthful pleasures; the evils of the music-hall were illustrated by an extract from Mr. Greenwood's "Seven Curses of London." With regard to dancing saloons, he said, the apparent impossibility of excluding drink, and the licence allowed by parents, seemed to make them useless in large towns as a source of recreation for the poor; the presence of the clergy was absolutely necessary to ensure anything like decorum, and it almost appeared that the recreation of dancing in our towns was so vitiated that it must be abandoned. The theatre was especially the recreation of the poor, but, as it was at present represented, it was no true recreation. It was closely linked with drinking and licentiousness, and the plays of the so-called high-class theatres that were most popular were vicious and immoral; while the "penny gaffs" of the poor acted on their boards the "blood and murder" tales so attractive in the cheap vicious literature of the million. He thought it a matter well worthy of the attention of the benevolent that they should try to elevate the drama, by the experiment of putting a theatre under the firm supervision of a committee, such as that which managed the Polytechnic Institution, London, severed from drinking and licentious temptations; such a theatre might not only afford harmless but healthy recreations; while the theatre as at present existing was of the most fearfully depraving character. In the course of a few practical suggestions he urged that they should do what they could to improve public opinion as to what recreation was; let both the clergy and the press plead for the recreation of the people as a part of religious duty. A love of music was no sin; and a hearty laugh was no sign of depravity; and it ought to be felt that God did not provide all the bright things of the earth for those who despised and disobeyed Him. Let them keep bringing the fact before the public that strong drink was the worst foe in this land at the present time to the real recreation of the people. Much of the money wasted in indiscriminate alms, which often directly leads to drinking, could be profitably applied to the establishment of well-conducted places for the amusement of the people. And it was worthy of a trial whether the real recreation of the people was not to be found in the church itself, as well as in the Sunday-school, by simple but attractive week-night services. In conclusion, he urged that both the clergy and laity should "tackle" the subject in thorough earnest.

The Rev. J. C. Chambers read the next paper. He contrasted the spectacles and games provided in the past by heathen governments with the almost total neglect of such provisions in the present day, when commons and waste lands were being enclosed without any regard to the recreation of the inhabitants of the country. Christianity sanctioned the doctrine that amusement ought to be to the life of the man what salt was to food. While reminding his hearers that religion was never intended to make our pleasures less, he said it must be confessed that we had greatly fewer means of amusement than our forefathers, instancing the long list of sports mentioned by Burton in his "Anatomy of Melancholy." It was quite evident that the people were not to be won over to goodness by sour asperity or unsympathising disdain. and he urged the formation of institutions partially of the nature of the clubs of the upper classes. It was not by setting their faces against all recreation that they could hope to raise the present standard, but, by energetically seeking to purify the present so-called recreations, they might do a great deal to bring back the days when the land was known as "merry England," and at the same time do much in the service of religion.

Mr. James Cropper urged that the spare time of the people was that in which those who most loved them

could best and most influence them. He spoke strongly in favour of railway excursions, having often seen the advantages they afforded. The laxity which was frequently observed in penny readings resulted mainly from the fact that the direction was vested in a committee instead of one person; and he argued that penny readings should not be ventured upon unless one person had the entire management; though, in the abstract, everything was to be said in favour of making music and reading popular.

Captain H. Toynbee, Rev. Mr. Scott, Mr. J. F. Watson, Rev. W. Glaisher, the Archdeacon of Ely, Rev. James Irving, and Rev. Rector Griffiths followed. The Venerable Archdeacon Denison spoke strongly in favour of harvest homes. He did not feel at all horrified at dancing, and in his own parish he very much wished he could have joined a recent dancing party. He also advocated cricket between the services on Sundays. The Rev. N. Loraine strongly dissented from these views.

The discussion then closed.

At the same meeting, Mr. Alderman Hubback, of Liverpool, read a paper:—He said that, in his address, he should chiefly devote himself to the subject of elementary education, by which he meant the ability to read with ease and intelligence, to write with some degree of facility, and to know the simple rules of arithmetic, coupled with such acquirements as would fit children when they grow up to lead a proper life. They should, at the same time, have a moral and religious training, be taught to love and fear God, to love their fellow creatures, and be schooled in industrious and cleanly habits. At present, the ignorance prevalent amongst the great mass of the people was the most fruitful source of crime and poverty—a disgrace to us as a Christian nation, and a scandal to the Constitution under which we are governed. The people ought, in his opinion, to be educated at all hazards, and, at any rate, efforts ought to be made, without further delay, to materially lessen the gross ignorance now so universal. To effect such an object, the work must be undertaken in a thorough spirit; that is, the mind of the nation will have to be made up that, at all costs, the rising generation shall for the future be properly instructed in their duty to God and man. All narrow, bigoted, and sectarian proclivities must be given up, our individual responsibility must be fully realised, and everyone interested in the subject ought to unite and call upon the Legislature to assist them in grappling with this vital subject, and that without delay. A portion of the prevailing ignorance was due to inefficient masters and mistresses, and the fact that schools were not made attractive. Schools thoroughly efficient ought to be erected throughout the land, children ought to be compelled to attend them, and parents to pay the requisite cost, and, if they refused, to be fined, and their children to be sent to industrial schools. But, first and foremost, there ought to be appointed a qualified and responsible Minister of State, with a seat in the House of Commons, who would have charge of the education of the people. He would have to divide the country into districts, with a head inspector in each, together with a board of education elected by the ratepayers, with sub-inspectors of various grades, according to the requirements of the population. As to religious matters, he (Mr. Alderman Hubback) would suggest that the management of existing schools, in respect to their connection with the various religious bodies, should be interfered with as little as possible. He was strongly in favour of the denominational system, but would make secular education the sole test upon which government aid is granted. Industrial schools should also be largely increased, and it should be the duty of the inspectors to compel the authorities to provide the necessary accommodation for the complete education of their districts. "In order to procure good masters and mistresses—who ought to know each of their pupils individually—a provision in the shape of a superannuation allowance for their old age should be granted; for the present condition of teachers prevents them from saving, and they have now nothing but the workhouse before them when they are obliged to rest from their labours. In fact, everything connected with the progress, position, and prosperity of this country must, in a great measure, depend upon the manner in which the rising generation are instructed."

HOSPITALS AND ASYLUMS IN FRANCE.

A full report has lately been made by the inspectors-general of charitable establishments, and has been printed and distributed by order of the Minister of the Interior. The following is a *resumé* of the general facts contained in the report:—

The funds placed at the disposal of these establishments since the commencement of the present century have been very large, and great efforts have been made to increase the extent of accommodation, and to improve the system of management. The gifts and legacies, which amounted to less than two millions sterling in the time of Louis Philippe, have nearly doubled since; between the years 1852 and 1868, the funds received for charitable purposes amounted to £3,260,000. The sums voted by the communes have also considerably increased, having risen from £332,305, in 1847, to £568,034, in 1864. The municipal council of Paris votes an annual subvention of £351,492; Marseilles, £23,720; Rouen, £18,880; Bordeaux, £16,800; and Nantes, £15,200. The hospitals have also benefited largely by the general increase in the value of land and house property. The annual income of the Paris hospitals from this latter source amounts to £133,100, Lyons about half as much, and other great towns in proportion. The total amount devoted annually in Paris alone for all kinds of charitable purposes has risen from £320,000, in 1804, to £815,254, at the present time.

Previous to 1790, there were 1,224 hospitals and asylums existing in France; the number is now 1,557. These 1,557 establishments contain 141,576 beds, and receive more than half a million of persons annually, either as patients or pensioners. Paris possesses 18,785 beds; Lyons, 4,176; Nantes, 2,716; Lille, 2,188; Rouen, 2,073; and Orleans, 1,641.

The increase in the funds devoted to such institutions has been divided between the erection of new and the improvement of old hospitals and asylums. Of these, 115 have been entirely rebuilt since 1852, and all the others have either been enlarged or improved, or are being placed on a much more efficient footing than formerly. Amongst the most important ameliorations may be mentioned the greatly-improved supply of water; the creation of separate buildings for contagious diseases; the formation of gardens, and the introduction of vapour baths, douches, and other means of cure; libraries and reading-rooms; and isolation of the schools attached to asylums. The work of reconstruction and improvement is still carried on with energy, not only in Paris, where the historic Hôtel Dieu is being completely rebuilt on a grand scale, but also in many other places.

The report is not confined solely to existing hospitals and asylums, but deals with other very important questions connected with the succour of the unfortunate, such as what is called *domicile de secours*, that is to say, the difficulties which surround the admission of rural poor into the asylums, and the very important one of home medical assistance, which the reporters desire to see developed side by side with the treatment in hospitals of those who are without families.

The directors believe that a complete reform is required in the existing law. They propose—1. To make the communes answerable for their poor, as in Belgium. 2. To unite the hospital and charity bureaux under one administration. 3. To connect with the indoor service of the hospital the medical visitation of the poor at home, as in England.

Another, and a very sensible proposition is put forth, namely, that as when an architect has to erect an

hospital or asylum, he has often to make long and expensive journeys in order to study what best fits the requirements that he has to meet, the directors propose to collect plans of all the best hospitals and asylums in France and other countries and deposit them at the offices of the Minister of the Interior.

Fine Arts.

Exhibition at Rheims.—The Society of the Friends of Art, in the famous old city of Rheims, organised its first exhibition of works of art with great success. The place of exhibition was the circus, which the authorities of the city placed at the disposal of the society. The pictures were arranged around the interior of the building, while the drawings and sculpture were placed in an exterior gallery. Here is also a collection of the works of the pupils of the schools of design in the district. The society has achieved a great success; the collection of pictures is large, and the list contains the names of a considerable number of the first artists in France, although the exhibition was got up somewhat hurriedly. The works sold amount to 45,000 francs.

Monument to Lamartine.—The Council General of the Saône and Loire has voted the sum of 5,000 francs towards the statue to be erected in memory of Lamartine, by the town of Mâcon. This sum, with what is already in hand, will enable the projectors to raise a worthy memorial to their famous townsman.

The Ink-stained Sculpture at the New Paris Opera-house.—The great blotch of ink has been entirely removed from M. Carpeaux's "dancing figure," as well as from the group in the Luxembourg Gardens, but the sensation caused by the act of vandalism has scarcely subsided. A writer, who signs himself "An Enemy of Debauchery," has sent a letter to the *Gaulois*, in which he says, that in spite of all the precautions that may be taken, the group will be destroyed,—that air-guns, for instance, are very effective; and he adds that he and two other persons have sworn to destroy so indecent a work. The letter is probably only a silly hoax.

Manufactures.

Indian Cotton.—The *Times of India* says:—For some reason or other, which ordinary minds cannot comprehend, the report of the Cotton Commissioner, Bombay Presidency, for the year 1868-69, has not yet been published, and may, perhaps, not be published till the information embodied therein shall have lost its current interest. The government resolution thereon has appeared, however, bearing date the 6th instant, and from it, meagre as it is, a few gleanings may be made. Financially, the department prospered during the year under review, its receipts having been 2,73,889 rs., against an expenditure of 2,59,611 rs., leaving a balance of 14,278 rs. This, added to the balances of former years, gave a net cash balance, on the 1st of January last, of 1,71,656 rs. Proposals for increased establishments are held in abeyance, pending the re-organisation of the department, on the passing of the new Act, when the above large balance, raised under the working of the Cotton Funds Department, will be utilised, as it ought now to have been, for the advancement of cotton cultivation in the presidency, and the improvement of the staple. A proposed fee of four annas per bale, in place of three, as at present, will not, we trust, be necessary, as aid will be given from imperial funds, which has not hitherto been done. In all, 1,294,291 bales were exported from Bombay, Kurrachee, and Carwar during the year, being 70,241 in excess of the quantity exported in 1867. The cultivation of cotton extended over 2,165,714 acres, being a decrease from 1867 of 15,460 acres. The deficiency in actual produce for 1868 is estimated at 78,154 bales, accounted for by decrease in acreage, and the badness of the season. Drought affected the presidency generally, and blight the southern Mahratta country. The penal provisions of the Cotton Frauds Acts are condemned as being utterly insufficient; the Act, as it stands at present, is considered as a sort of scarecrow, of the harmlessness of which dishonest traders have repeatedly satisfied themselves. If the trade is to be protected at all by special enactments, as its best friends consider desirable, fresh legislation is absolutely necessary, police supervision being confined to the presses, where most of the cheating is carried out. The establishment of additional facilities for the transaction of business at the cotton marts is expected to be productive of good results, as it must necessarily be. The resolution makes reference, but that is all, to the systematic experiments that are now being made with the different varieties of cotton, under practical and trained supervision; but what those experiments are there is nothing in the document to give the least idea. Luckily, those interested in the subject do not need the information; but it might have been supplied nevertheless. The following is an extract from the government resolution above referred to:—"Several proposals for increased establishments have been submitted, and it has also been suggested that the fees should be increased from three to four annas per bale. The consideration of these proposals may be deferred, pending the thorough reorganisation of the department, which will be effected on the passing of the new Act. In all, 1,295,291 bales were exported during the year from the three ports of Bombay, Kurrachee, and Carwar. This number is 70,241 in excess of those exported in 1867, which was stated to be the year in which the greatest quantity had, up to that time, been exported—Bombay, 1,240,692; Carwar, 25,363; Kurrachee, 27,206; total, 1,294,291. The cultivation of cotton extended, it is said, over 2,165,714 acres; last year (including Kolapoor and the other native states in the southern Mahratta country, the Maheekanta and Rewakanta) 2,181,174 are reported to have been cultivated, showing a decrease of 15,460. The deficiency in actual produce is estimated at 78,154 bales, a quantity quite out of proportion to the difference in the area of cultivation. The deficiency is mainly attributable to the badness of the season. The crop suffered much from drought throughout the presidency, and in the southern Mahratta country was subjected to heavy loss from blight. The officers of the department are unanimous in condemning the utter insufficiency of the penal provisions of the Act. Only eight convictions were obtained during the year. For police purposes, the Act may be said to be inoperative, and now that its imperfections have become widely known, the terror once inspired by it in the minds of the ignorant but dishonest trader is rapidly disappearing. Adulteration and fraud seems to be on the increase, and notably so at Broach. If the cotton trade is to be protected at all by special enactment, it is clear that the present law must be revised, and that, too, without delay. It is sufficient to remark that police supervision, to be effectual, must mainly be confined to the presses. The establishment of markets will doubtless afford much facility to the trade, and will tend to fair dealing. Government are glad to learn of the success that has attended the efforts in this direction at Julgaum and Barsee, and hope that similar success may be met with at Broach and Sholapoor. Very important results may be anticipated from the systematic experiments that are now being made, in different parts of the presidency, with varieties of cotton, under the supervision of the practical men whose services have recently been secured. As yet, there has not been sufficient time to judge of the success or otherwise of these experiments. Mr. Hewett appears to have met with marked success in his attempt at cultivating indigenous cotton, in a description of soil not hitherto supposed to be adapted to it."

Commerce.

The Government Telegraphs in France.—A few remarks will serve to illustrate the manner in which government control over the telegraphs in France is exercised, for the convenience and benefit of the public. After the 1st November next, the charge for a message from any one port of France to another will be reduced from 2frs. to 1fr., or to something under one shilling. The reduction of the uniform rate of 1fr. was enacted by the Chamber of Deputies in July, 1868; but more than a year has been required to make preparations for the increased correspondence which is expected to ensue on the increase of facilities and diminution of charge. Besides the construction of numerous branch lines, the Morse instrument has been replaced by the Hughes' printing apparatus at all the important stations. The use of Hughes' apparatus doubles the rapidity of communication, in other words, will enable twice as many messages to be forwarded in the same time. The number of offices has been greatly increased; it now amounts to 2,701, of which 1,071 are government offices, the remaining 1,000 being at railway stations, whence messages are forwarded according to an arrangement made with the government. No difficulty is experienced in obtaining the required number of signallers. At the last examination 230 were admitted. At present the French telegraph extends over 25,000 miles of line, and the number of messages annually amounts to 3,500,000. In the year 1865, according to Mr. Bright, the United Kingdom possessed 16,000 miles of line, over which 4,650,000 messages were forwarded. The principal improvements effected by the French government, within the last few years, may be briefly enumerated:—1. Reduction of the charge to the uniform rate of 1fr. 2. The introduction of Hughes' printing apparatus, improved by the late M. Froment, who rendered the instrument workable, which it was not previously. 3. A new and very efficient organisation of the pneumatic system, by which messages are forwarded collectively from the centres of various districts to the centres of other districts, instead of transmitting the messages successively, or one after the other, as was formerly the case. 4. The introduction of Meyer's instrument, which forwards a *fac-simile* of the message received, and thus renders any error on the part of the telegraph impossible.—H. G.

Commerce of France.—The import and export accounts for the first six months of 1869 have recently appeared. The following are the most remarkable items of information:—The value of the foreign goods entered for consumption is set down at 1,442,000,000 francs, which was 30,000,000 more than in 1867, but considerably less than last year, when the amount was 1,668,000,000. The deficit, however, was accidental, and would have been converted into an increase of 43,000,000, but for the late good harvest, which caused the import of cereals to fall from 296,000,000 to 27,000,000. The following is a list of the most important items of import and consumption:—

	Francs.
Sugar	45,000,000
Coffee	37,000,000
Cattle	51,000,000
Oil	25,000,000
Flax	130,000,000
Silk	171,000,000
Cotton	159,000,000
Oleaginous seeds	34,000,000
Timber	69,000,000
Coal	59,000,000
Indigo	23,000,000

As regards exports, there appears, according to the estimated values, a decided advance. The following are the totals given:—

	Francs.
1867	1,367,000.000
1868	1,352,000,000
1869	1,552,000,000

The chief items are:—

Woollens	131,000,000
Silks	234,000,000
Cotton goods	52,000,000
Prepared skins	37,000,000
Mercery	85,000,000
Articles of clothing	37,000,000
Refined sugar	34,000,000
Chemicals	24,000,000
Cereals	38,000,000
Wine	170,000,000
Spirits	40,000,000
Butter	35,000,000
Silk	78,000,000

The exports of wine exceed in value those of 1868 by 34,000,000, and of 1867 by 44,000,000 francs, the quantities being, in 1868, 598,000 hectolitres, and this year 829,000 hectolitres. During the six months, the customs receipts amounted to 8,739,000 francs, being 2,750,000 francs over 1868, although there was a diminution under the head of cereals amounting to 3,500,000 francs. Sugar yielded 23,500,000 frs., in lieu of 18,500,000 frs. last year. Woollens show an augmentation of 500,000 francs; coffee a slight falling off.

Colonies.

Progress of Victoria.—A very interesting statistical paper, on the religious, moral, and intellectual progress of Victoria, up to the close of 1868, has been issued from the Registrar-General's office, and presented to Parliament, by his Excellency's command. From it we gather that there are 1,006 churches and chapels, 331 school-houses, and 537 dwellings, or public buildings, making a total of 1,874 buildings used for public worship. The number of services yearly is 151,003; there is accommodation for 271,753, but only 167,894 avail themselves of this on the Sabbath. The number of graduates in the Melbourne University during the ten years ending 1867 is 221. There are 1,385 schools, and the number of children attending them amounts to 91,336; of these 48,374 are males and 42,962 females, having 1,261 male and 2,852 female teachers. The common schools, numbering 779, receive about £230,979 annually. There are 1,082 Sunday-schools in the colony, the average attendance being 77,282, in proportions of 37,681 males, and 39,601 females. The National Museum was visited by 67,954 persons. There are 76 mechanics' institutes and public libraries in the colony, containing 134,067 volumes, and 767,933 visitors availed themselves during the year of the benefits offered by these institutions. There are 26 hospitals in the country, giving in-door and out-door relief to 47,470 patients. There are six benevolent asylums, affording relief, in-door and out, to 40,846 destitute people, and there are six orphan asylums, which take charge of 1,022 of the waifs and strays of humanity. £30,858 are annually raised in the colony from private contributions in aid of its hospitals, £10,000 in aid of its benevolent asylums, and £6,370 for its orphan asylums; all this is independent of the public grant in aid. The Melbourne Ladies' Benevolent Society relieved 3,783 persons, at a cost of £5,074; a similar institution at Geelong relieved 993, at a cost of £1,368; the Jewish Philanthropic Society relieved 146 persons, at a cost of £146; the Magdalen Asylum, at Abbotsford, expended £4,622, and the Refuge in Madeline-street, expended £659; the Industrial Schools at Princes'-bridge, Sunbury, Geelong, and the Naval Training Ship expended £45,782 in the reclamation of the forsaken and the precocious viciousness of the colony. £1,899 was spent by

the Deaf and Dumb Institution, in imparting education to these afflicted ones; and 1,680 lunatics cost the country £61,849 for their care and maintenance.

Notes.

Appearance of the Cattle Disease in France.—The *fièvre aphtheuse*, or mouth disease, has made its appearance in some of the cantons of the Vosges; it is said to have been imported by the dealers who purchase cattle in Alsace and Switzerland. Several cattle fairs have been interdicted on account of the appearance of the disease, and stringent means are being taken to arrest the spread of the evil. The appearance of the disease at the present moment is peculiarly unfortunate, as the season is approaching when large numbers of cattle are collected in farms around the beetroot sugar works, and the consumption of pulp by the animals is one of the elements of success in sugar-making. Of late years, in order to avoid the great expense of carting the fresh beetroots to the sugar-houses, and afterwards the pulp back to the farms, great rasping establishments have been set up amidst the farms themselves, where the juice is extracted from the roots on the spot, and only the former conveyed to the sugar-houses; in some cases the juice is conveyed for miles in iron pipes laid in the ground. Of course this system brings a large number of cattle together on one spot, and thus the calamity of the appearance of such a disease would be increased in proportion.

Naval School in France.—It is said that the French Government is about to establish a great central school in Paris for the instruction of youths intended for the navy and mercantile marine. The education will not only include navigation and all connected with it, but the pupils will also receive a thorough commercial education, so as to render them fit for employment in any part of the world.

Light-houses.—A French writer calculated that, at the commencement of 1867, there existed in the world 2,814 light-houses, or *phares*, of more or less importance, viz., 1,785 on the coasts of Europe, 674 on those of America, 162 in Asia, 100 in Oceania, and 93 in Africa. As regards Europe, the best lighted coasts are those of Belgium, France following immediately afterwards. Then come, in the order in which their names are given, Holland, England, Spain, Prussia, Italy, Sweden and Norway, Portugal, Denmark, Austria, Turkey, Greece, and finally Russia. Besides Europe, the best lighted coasts are those of the United States, which have one light for every twenty miles, whilst the Brazilian coast has only one light for every 87 miles. Of the 2,814 in existence at the commencement of 1867, about 2,300 had been established since 1830, while the power of the greater part of those existing prior to 1830 has been increased.

Patents.

From Commissioners of Patents' Journal, October 8.

Grants of Provisional Protection.

Axles, &c., bearings for—2786—I. Farrell.
Bobbins or spools—2740—J. Elce.
Boiler tubes—2803—J. R. Swann.
Bottles, stoppering—2782—G. L. Morton.
Braces, &c., buckles for—2790—J. P. Turner.
Cartridges—2747—R. L. Hickes.
Chair and trunk nails—2629—W. H. Richards.
Coffee, apparatus for extracting the essence of roasted—2546—E. A. Campbell.
Crucibles, &c., manufacturing—2719—N. J. Dor.
Dampness and saltpetre, compositions for the prevention of—2442—H. Dupland.
Dyeing and printing, green colouring matter for—2818—C. D. Abel.
Fire-bars—2788—J. T. Gaze and J. Hymas.
Floors, roofs, &c.—2709—R. Stone.
Furnaces, feeding with fuel—2774—J. B. Spence.
Furnaces—2812—W. Kendall.
Furnaces—2830—W. Walker and D. Davies.
Gas lamps, lighting and extinguishing—2534—H. P. Stephenson, E. G. Bartholomew, and R. King.
Geographical game—2695—W. E. Gedge.
Gig mills, &c., scrays or tables applicable to—2834—W. & A. Kempe.
Goods, machinery for folding piece—2792—J. Worrall & J. Kershaw.
Gun carriages and slides—2796—G. W. Rendel.
Harvesting machines—2826—W. R. Lake.
Head, coverings for the—2800—W. Boulderson.
Horse-shoe nails—2824—A. V. Newton.
Horses, &c., shoes for—2766—J. F. R. Badiou and F. Bernard.
Iron and steel—2724—J. G. Willans.
Iron kegs, &c.—2741—R. Swift.
Lifting apparatus—2638—H. D. P. Cunningham.
Liquids in ebullition, apparatus for preventing boiling over—2677—W. E. Gedge.
Locomotive engines and railway carriages—2480—W. N. Hutchinson.
Looms—2802—J. Peel, J. Sharp, and J. Walworth.
Looms—2820—J. Bullough.
Metal and wood fencing—2760—E. Hernulewicz.
Metal surfaces, producing devices, &c., on—2776—W. H. Hewett.
Metals, machinery for cutting or shaping—2727—C. Winn.
Millstones, &c., chisels and picks for dressing—2794—J. C. Cushion.
Motive-power, obtaining—2804—J. Hastie.
Porcelain-faïence and pottery—2531—A. F. Cederwaller and A. F. Westerlund.
Pots for containing butter, &c.—2828—A. J. Dulake.
Pumps, &c.—2752—R. R. Gibbs.
Railway switches, &c., locking apparatus for controlling—2742—J. I'Anson, jun.
Sanitary purposes, apparatus for—2748—M. Macleod.
Shafts, &c., pumping water from—2754—J. Tarbuck and T. Burns.
Ships' compasses—2780—J. H. Davis.
Spirits, &c., purifying—2746—A. V. Newton.
Steam boilers—2716—H. W. Harman and W. Lancaster.
Sugar and syrups, purifying solutions of—2756—W. R. Lake.
Tapes, manufacturing binding—2720—C. Belier.
Threads, &c., machinery for untwisting—2770—G. A. C. Bremme.
Threshing machines—2758—A. V. Newton.
Timber, machine for tenoning—2832—D. Duthie.
Umbrellas, &c.—2750—G. H. Chatwin.
Velocipedes—2729—J. N. Steiner.
Velocipedes, &c., motive-power for driving—1645—G. J. Pedley and H. Grabowski.
Vessels, propelling—2762—D. Witty.
Water taps and cistern apparatus—2731—A. Tylor.
Wheels, tyres for—2764—J. Watson.
Wool, machinery for preparing 2621—T. H. Blamires.
Wool, &c., machinery for carding—1718—J. and R. Tatham.
Wool, &c., machinery for roving and spinning—2816—W. Whiteley.
Yarn, removing dye wood from—2798—T. Hall, J. B. McKerrow, and T. R. Shaw.

Invention with Complete Specification Filed.

Balance for ascertaining the specific gravity of liquids, &c.—2859—A. Bodart.

From Commissioners of Patents' Journal, October 12.

Patents Sealed.

1132. R. E. and C. Marshall.
1133. W. Gillespie.
1137. F. Erskine.
1141. E. Dowling.
1145. W. H. and T. Hacking and J. Chambers.
1152. J. H. Johnson.
1163. E. Cooper.
1169. J. H. Johnson.
1170. W. J. Cowlman & A. Doe.
1171. A. K. Rider.
1172. F. Mulliner.
1177. S. Harrison.
1190. T. Page.
1212. G. Green.
1224. M. Henry.
1232. J. H. A. Bleckmann.
1275. O. Engholm.
1281. I. Farrell and W. Turner.
1338. R. Ward.
1359. E. Tutte.
1361. P. Southern.
1363. E. Thomas, sen., E. Thomas, jun., and J. Morris.
1373. A. V. Newton.
1374. W. E. Newton.
1486. J. H. Johnson.
1490. I. M. Milbank.
1534. R. E. Keen.
1566. J. P. Nolan.
1683. H. Holdrege.
1735. G. E. King.
1749. J. and S. W. Varley.
1824. D. Fitzgerald.
1825. P. Jensen.
1865. J. H. Johnson.
1892. R. Olpherts.
1930. R. Olpherts.
2001. W. Frazer.
2087. W. R. Lake.
2090. W. R. Lake.
2102. W. R. Lake.
2118. J. A. Horlick.
2119. J. A. Horlick.
2358. W. Manwaring.
2409. J. H. Johnson.
2438. T. Ward and W. S. Black.
2449. J. Lawson & E. G. Fitton.
2477. W. Campion.
2501. J. Baur.
2528. W. R. Lake.

Patents on which the Stamp Duty of £50 has been paid.

2566. J. C. Chapman.
2571. G. Gordon.
2720. J. G. Tongue.
3389. J. Rodgers.
2591. W. E. Newton.
2608. W. Dudgeon.
2630. A. V. Newton.
2645. E. Beanes.
2653. E. M. Boxer.
2601. M. Mirfield and J. Scott.
2607. T. Outram.
2609. C. J. Hill.
2613. G. Pitt.
2654. W. Rossetter.

Patents on which the Stamp Duty of £100 has been Paid.

2710. H. D. P. Cunningham.
2762. F. G. Grice.
2818. J. Tangye.
2735. J. Lowe and J. Harris.

Journal of the Society of Arts.

FRIDAY, OCTOBER 22, 1869.

Announcements by the Council.

Designs for Channel Steamers.

The very defective state of the accommodation afforded by the Channel steamers, plying between this country and the Continent, having been brought under the notice of the Council, they have determined to offer the Gold Medal of the Society, and the large Silver Medal of the Society, for the best and the second-best block model of a steamer, which shall afford the most convenient shelter and accommodation to passengers on the deck of the vessel crossing the Channel between France and England. The steamer is not to exceed in tonnage and draught the best vessels now in use between Folkestone and Boulogne, and the model must be on a scale of a quarter of an inch to a foot. The models, marked in cypher, are to be sent in to the Society of Arts' House, John-street, Adelphi, on or before the 1st November, 1869, with a sealed envelope, giving the name and address of the designer.

The Council reserve the right of withholding either or both medals, in case, in their opinion, the models sent in do not possess sufficient merit.

The following particulars of the South-Eastern Channel steamers, *Victoria*, *Albert Edward*, and *Alexandra*, are given for the convenience of competitors, but it is not intended to confine the designs to them, except as to tonnage and draught:—

Length between perpendiculars, 200 ft.
Breadth of beam, 24 ft.
Depth underside of deck amidships, 12 ft. 6 in.
Draught of water, 7 ft.
Bow, clipper.
Stern, elliptic.
Rig, polacca with two masts, lug foresail, gaff mainsail, staysail, and flying jib.
Engines, oscillating.
Paddle wheels, 17 ft. 6 in. diameter.
Tonnage, 568 tons.
Speed, 17 miles an hour.

Subscriptions.

The Michaelmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of Institutions.

EXAMINATION PAPERS, 1869.

(*Continued from page* 867.)

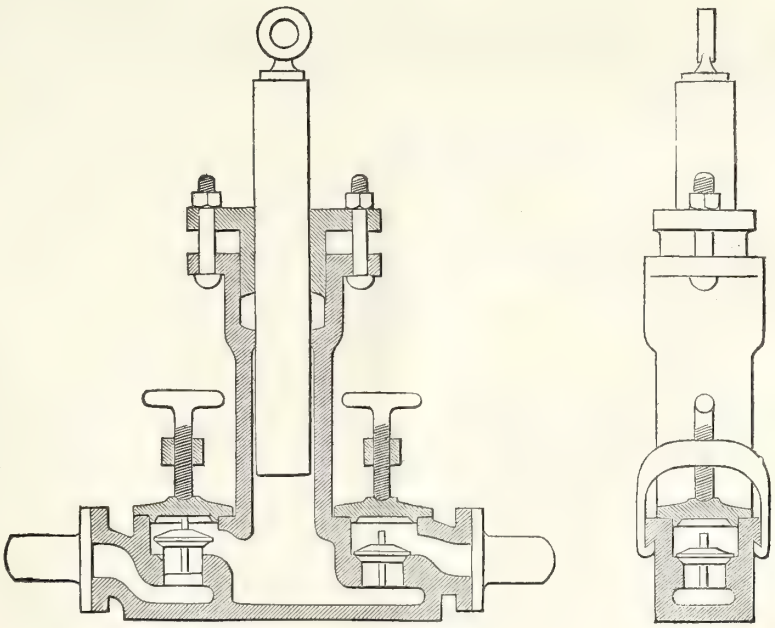
The following are the Examination Papers set in the various subjects at the Final Examination held in April last:—

MECHANICAL DRAWING.

THREE HOURS ALLOWED.

Feed Pump.

A sectional side elevation and sectional end elevation, as per sketch, to be drawn to a scale of one-half (six inches to a foot).



Cast iron in section to be coloured indigo.
Wrought iron in section to be coloured blue.

Description.

The plunger is $1\frac{3}{4}$ inches in diameter, and 10 inches long from the centre of the eye to the bottom; the eye is $1\frac{5}{8}$ inches in external diameter, $\frac{3}{4}$ inch in internal diameter, and $\frac{1}{2}$ inch broad.

The body of the barrel of the pump is 2 inches in internal diameter, and $\frac{1}{2}$ inch in thickness. It is expanded at the top into a stuffing box $2\frac{3}{4}$ inches in internal diameter, and $2\frac{3}{8}$ inches deep; also $\frac{1}{2}$ inch in thickness. Its top flange is $\frac{5}{8}$ inch thick, and the distance apart of the bolts is 5 inches from centre to centre; the bolts are $\frac{1}{2}$ inch in diameter, and 3 inches long, with hemispherical heads; the cover of the stuffing box is $2\frac{1}{2}$ inches deep, and $\frac{1}{2}$ inch in thickness; its flange is $6\frac{1}{8}$ inches long and $\frac{5}{8}$ inch thick.

The pump barrel is expanded at the bottom, at a distance 9 inches from the top of the stuffing box flange, into a chamber $3\frac{1}{4}$ inches long by 2 inches deep.

The centre line of each valve is $3\frac{1}{8}$ inches from the centre line of the pump barrel. The valve chambers are 2 inches in diameter, and 1 inch deep. The valves, which are of brass, are $1\frac{11}{16}$ inches at their greatest diameter. The level of the top of the valve chamber is $8\frac{5}{16}$ inches below the top of the flange of the stuffing-box.

The valves close. Openings $1\frac{1}{4}$ inches in diameter, and $1\frac{1}{16}$ inches deep, the top of the openings being chamfered to an angle of 45° to make seats for the valves. The total depth of the valves is $1\frac{3}{4}$ inches; a cylindrical piece, to prevent the valve opening too far, is cast on each valve; it is $\frac{7}{16}$ inch long by $\frac{3}{16}$ inch diameter.

The bottom of the pump is $\frac{1}{2}$ inch thick, and the height of the pump to the top of the flange of the stuffing-box is $11\frac{1}{2}$ inches (including the thickness of the bottom). The extreme width of the pump is 12 inches, the flanges for the junctions of the supply and delivering pipes are $3\frac{1}{4}$ inches in diameter, and $\frac{1}{2}$ inch thick. The supply and delivering pipes are $1\frac{7}{16}$ inches in diameter, with flanges $3\frac{1}{4}$ inches in diameter by $\frac{5}{16}$ inch broad.

The diameter of the entrance and exit orifices is $1\frac{1}{8}$ inches, and their centre lines are $1\frac{7}{8}$ inches above the lowest surface of the pump.

The covers of the valve chambers are 3 inches in diameter, $\frac{5}{8}$ inch thick near the centre, and $\frac{5}{16}$ inch thick at the edges. They are held down by screws $\frac{1}{2}$ inch in diameter; the handles of the screws are $\frac{1}{2}$ inch in diameter and $2\frac{1}{2}$ inches long; the total length of the screw and handle is $3\frac{3}{8}$ inches.

The wrought iron clamps are $\frac{13}{16}$ inch deep by $1\frac{1}{8}$ inches broad where the screw passes through them, and $\frac{1}{4}$ inch thick where it clasps the side of the valve chamber; they are similar in form to those shown on the sketch.

The title "feed pump" is to be printed in block letters $\frac{3}{8}$ inch deep, and a scale of one-half showing a foot divided into inches, with one inch divided into $\frac{1}{8}$ of inches, is to be drawn below the title.

If time permits a plan should be drawn below the sectional side elevation.

(*To be continued.*)

NATIONAL EDUCATION LEAGUE.

The first general meeting of the members of this league was held at Birmingham, on Tuesday, the 12th inst. There was a large attendance both of ladies and gentlemen, the latter including many of the most forward promoters of the educational moement in all parts of the country. Mr. George Dixon, M.P., is Chairman of the Provisional Committee; Mr. John Jaffray has accepted the office of treasurer, and Mr. Jesse Collings is the hon. secretary. A deputation from the Society of Arts, consisting of Mr. Edwin Chadwick, C.B., Member of the Council, and Mr. Le Neve Foster, Secretary, attended. On the motion of the Mayor (Mr. Holland), Mr. George Dixon, M.P., was called to the chair.

The Chairman, in his opening address, remarked that the movement which they had met to inaugurate was one of national importance, involving in its issues not merely the future material prosperity of the nation, but its intellectual, moral, and, he would venture to add, its religious progress. The originators of this movement had met with a response far exceeding their expectations. On their behalf, he offered a hearty welcome to the many eminent men who had come from various parts of the country to assist in their deliberations, and he trusted that they would all return home with a deeper sense of the importance of the scheme, and a stronger determination to exert all their influence in its favour. To create an irresistible public opinion was a work of the greatest magnitude, which would task their powers to the uttermost. The Chairman then read the letter from the Secretary of the Society of Arts (see last *Journal*, p. 863), which he said had afforded the committee great satisfaction. Still greater gratification had been afforded by a letter from a working man, who wrote as follows:—"I am an engineer; and am at times utterly astonished at the fearful amount of ignorance among my fellow-workmen. In the works in which I am foreman, out of 200 hands not 20 either read the daily papers, or care for the welfare of their fellow-men. I assure you it is a deplorable fact, and if it was not for our glorious free library, it would be much worse. If I could do anything towards improving this state of things, I will willingly subscribe 7s. 6d. (a day's wages) every month. I know the want of education, as I could not write until I was fifteen." Having referred to the course proposed to be adopted on the occasion, he observed that they were not met for the purpose of discussing their principles. Their platform was already laid. They had accepted the bases of their constitution, from which they must not vary. But what they had met to discuss was the best manner in which they could carry out their principles. The assembly was not a conference, but simply a meeting of the members and friends of the league, pledged to a certain course of action. The league was not answerable for individual opinions, but simply for the scheme which they had submitted for consideration. He explained that in the fourth clause of the means to be adopted, although it was stated that all schools aided by local rates should be unsectarian, it was meant that in all schools it should be prohibited to teach catechisms, creeds, and theological tenets peculiar to particular sects during school hours. The prohibition did not go beyond this, everything else being left to be decided by the school managers, who, as representatives of the ratepayers, would follow the best guides in such matters—mainly the wishes of the inhabitants of the district. The school managers would have power to permit or prohibit the use of the Bible; but if sanctioned, the Scriptures must be read without sectarian note or comment; and they would have power to grant or to refuse the use of the class-rooms, out of school hours, for the purpose of religious instruction; but if granted, unjust preference must not be given to particular sects. He trusted they were all agreed—at least in that room—that the best way of dealing with the religious difficulty was to put it on one side. Having decided to adopt the principle of excluding from their curriculum of primary schools all those religious subjects about which there were differences of opinion, they could leave the carrying out of the principle to the school authorities in the spirit of generous confidence, which a self-governing people ought to have, in the discretion of representatives whom it chose and could remove.

Letters expressive of regret at inability to be present were read from the Marquis of Lorn, Mr. Jacob Bright, M.P., Colonel Sykes, M.P., Mr. T. Grieve, M.P., Mr. George Melly, M.P., Mr. Peter Rylands, M.P., Mr. James Howard, M.P., Mr. Thomas Hughes, M.P., Sir Sydney Waterlow, M.P., Professor Huxley, Sir John

Lubbock, and many others. Letters were also read announcing the co-operation of the writers, from the Rev. Charles Kingsley, Sir Henry Hoare, Mr. L. Schmitz, Mr. E. H. Brodie, inspector of schools, Mr. J. C. Buckmaster, Mr. P. A. Taylor, &c.

Mr. Edward Miall, M.P., wrote as follows:—"As I have already made you aware, I heartily concur in the 'Object' which the Conference has been assembled to promote, and generally in the 'means' to be adopted with a view to it. I am anxious, however, to reserve my freedom of action, as well as of speech, to the extent which I will, with your leave, endeavour to describe. With regard to the sixth article in the programme, that 'the State or the local authorities shall have power to compel the attendance of children of suitable age, not otherwise receiving education,' I give in my adhesion to the principle involved. I confess I have tried hard to escape the necessity of acceding to a resort to compulsion in furtherance of the end we have in view, and have been driven only by the force of facts to surrender my objections to it. Consequently, I am a little more sensitive on this point than on others, and I can easily imagine modes of compulsion resorted to which I could not bring my mind to approve. I wish, therefore, while agreeing to the principle, to refrain from committing myself beforehand to any particular scheme for carrying it into effect. As to free admission to all schools aided by local rates, I suggest that the provision should be coupled with this condition, that in every case in which a school is rate-supported, it should be by a separate rate, to be called a 'school-rate.' In order to prevent that non-appreciation of education which would inevitably come of the idea that it can be got for nothing, every ratepayer should be made to understand distinctly that, in availing himself of a free school for his children, he is but receiving back in value that which in proportion to his means he has paid for. He will readily understand and feel this, if he is periodically called upon to pay a specific rate for the purpose, and I think he will be the less disposed to trifle with the right he has thus acquired. My chief anxiety, however, is to guard myself from being committed, under the fourth article of the programme, to conclusions which in my honest judgment I reject. In that article, as now worded, I thoroughly concur. It is of the utmost importance that schools aided by local rates should be unsectarian. Denominational education I take to be the greatest obstacle to national education. It causes an enormous waste of teaching power. It misleads a large proportion of the public as to the true end of public schools, and it serves to stereotype instead of softening down religious distinctions. I do not believe it to be in any sense necessary. The public, generally, do not care to perpetuate it. The demand for it is almost exclusively a clerical demand, and I think the time has come for attempting to get rid of it—cautiously and gradually, of course, but, in due time, effectually. But whilst I attach high importance to unsectarian education, I am bound to say I do not feel obliged to exclude the religious element from rate-supported schools. I would not insist upon it as a condition of receiving public aid, but neither would I insist upon its being eliminated from primary education. Thus much, I think, might be safely left to the decision of the local authorities—to be authorised to open and close their schools, if they please, with some catholic form of devotion, and to adopt the Bible as one of the books to be read, of course, protecting every parent from being compelled to subject his children to either. My reason is this:—I feel convinced that, if by 'unsectarian schools' the interpretation is to be the rigid exclusion of all religion from the schools, the nation will lose the very best teachers, for, *cæteris paribus*, they are the best teachers who bring a religious spirit and motive to their work. I am sure the working-classes, as a body, would not care to shut out Christianity altogether from the schools to which they send their children. I think it would be a mistake so tightly to tie up the hands of teachers as to make all reference to the great facts and precepts of Christianity a forbidden thing to them. At any rate, it might well be left to the local authorities to exercise their free choice in the matter. Such being my opinion, I beg to hold myself uncommitted to the article in question, if by the epithet 'unsectarian' be meant necessarily and exclusively 'secular.' I have no objection to give public aid to schools confined to secular education; but I do not think it would be wise to impose upon local authorities the obligation to shut out the religious element to this extent."

The following is an abstract of the report of the Provisional Committee, which was read by Mr. Collins, the hon. secretary:—The document set out with a statement of the reasons which led to the formation of the National Education League. Alluding to the defects of the present system, which, it was urged, failed to meet the requirements of the country, it stated that voluntary efforts reached only the richer districts, and these imperfectly; while the poorer districts were left practically uncared for, Government aid being wholly dependent upon previous local expenditure. The reports of the Manchester Educational Aid Society and of the Birmingham Education Society revealed a state of things calculated to arrest attention and excite alarm. An inquiry instituted by the Manchester Society showed that, in Manchester and Salford, the number of children of all classes, between three years and twelve years, was 100,000. Of these, only 55,000 were on the books of public elementary schools, and of this latter number the average attendance was but 38,000. In Birmingham, out of 35,018 children between the ages of three and twelve, visited by the agents of the Education Society, only 15,490 were at school. Of 45,056 children between three and fifteen years, 17,023 were at school, 6,337 at work, and 21,696 were neither at school nor at work. Of the 17,023 who were at school, 10,890 were under nine years of age. The results of such education as had been given were shown to be equally unsatisfactory. In Manchester, in 1,916 families visited, there were 1,660 persons between the ages of twelve and twenty. Of these, 759 were unable to read. Out of 1,672 fathers, 465 could not read; and out of 1,857 mothers, the number unable to read was 815. The facts thus ascertained are corroborated by the statements of the Right Hon H. A. Bruce, in a recent address, in which, quoting from a report of the London Diocesan Board of Education, he said there were in London from 150,000 to 200,000 children without the means of education, and that during the preceding five or six years all that had been done served only to prevent retrogression. The report of the Committee of Council (1867-8) demonstrated the inefficiency of instruction, even in the best primary schools—those under government inspection. Of the children attending, a large proportion were declared to be unfit for examination; and of those examined above ten years of age, "only 31·3 per cent. passed in the three higher standards without failure," those standards being of an extremely elementary character. Adverting to the present voluntary system, based upon denominational effort, the report maintained that the system could not cover in the future, with increasing population and more urgent demands, the ground which it had failed to cover in the past. Considering the new conditions of political arrangements, and the rate at which education had progressed, it would not be prudent to wait until the present system had received a longer trial. The advocates of extended education found themselves obliged to conclude that the voluntary system had failed to meet the wants of the country; that, considering the new political conditions resulting from an extended franchise, it would be imprudent to persevere with a system admitted to be inadequate; and that, considering the right of all children to instruction, a national system was demanded, not less by justice than by expediency. Referring to the Bills introduced by Mr. Bruce and Mr. Forster, as marking the advance of

public opinion, it was remarked that the formation of the National Education League indicated a still greater and more important progress. It was felt by several gentlemen in Birmingham that the time had come for the establishment of an organisation uniting all those throughout the country, who desired to promote a really national system of education, reaching all places unprovided for, based, as to means, upon local taxation supplemented by imperial grants, becoming, therefore, unsectarian and free, and having the power to compel attendance as the only way of overcoming parental neglect. Accordingly, at the beginning of this year, the National Education League was formed upon a basis which the founders regarded as fundamental, and upon which educational reformers throughout the country were invited to join the league. It was now proposed to complete the working organisation of the league by electing a council and an executive committee, charged with the transaction of general business, the appointment of officers, and the formation of branch committees. The last-mentioned work had already been commenced. It was intended that it should have been deferred until after this meeting; but the response to the invitation of the provisional committee was so great, that it was found necessary to form branch committees without delay, and branches had accordingly been constituted in London, Manchester, Bradford, Bristol, Leicester, Sheffield, Liverpool, Leeds, Huddersfield, Exeter, Bath, Warrington, Devonport, Carlisle, Merthyr Tydvil, Wednesbury, South Hants, and the Isle of Wight. With reference to the funds necessary for carrying on the operations of the league, it was thought desirable to abstain from issuing an appeal until after the general meeting of members; but a number of gentlemen (twenty), having the work strongly at heart, have offered sums amounting in the aggregate to £15,000, to be paid by instalments spreading over ten years. As regards the general meeting of members, it was thought desirable that it should be held annually, in different parts of the kingdom. It is proposed that the council, to be chosen at each annual meeting, shall be a consultative body, assembling at such intervals and in such places as may be required, and shall include all members of Parliament who may join the league, large donors to the funds of the association, and at least one representative of each branch committee. A body so numerous, and consisting of persons so widely scattered, being obviously too large for the transaction of current business, it is proposed to appoint an executive committee, to whom, subject to resolutions of the annual meeting, and the general revision of the council, shall be entrusted the conduct of the business of the league. This committee will meet at the central offices of the league in Birmingham. The work of the league will be to collect and disseminate through its various branches, by means of meetings, publications, lectures, and otherwise, all available information on the subject of education; to stimulate discussion upon educational reforms; to create and guide public opinion; to influence members of Parliament through their constituents; to hasten and strengthen the action of government; and to promote the adoption by the legislature of measures which shall ensure the education of every child in the country, and which shall provide instruction so accessible and so graduated, that the child of the poorest artisan shall have it within his power to fit himself for any position capable of being attained by a citizen of the United Kingdom. To this work the members of the league have set themselves with a serious conviction of its vital importance, and under a sense of personal responsibility and public duty; and to this work they intend to remain constant until it is accomplished, and the reproach and curse of ignorance is wiped away from the land.

The Ven. Archdeacon Sandford, in moving the adoption of the report, said the great object of the league was to provide the means of education for every child in England and Wales; and, as a pastor of 30 years' standing, in view of so momentous a subject, he felt they stood in presence of an overwhelming necessity and a great material danger. There were tens of thousands of children utterly neglected, and for whom they were answerable in the sight of God. He endorsed the report. It was their bounden duty to educate the wretched class of children referred to in it; and hitherto the voluntary principle had failed. He had long been of opinion that they would have to resort to compulsory education; to obtain such an education there must be a rate; and in a country like this, with so many denominations and so many differences, it would be impossible to have an education supported by rate, unless they had the teaching undenominational. He was prepared to do what he considered his duty upon that point, even though he stood alone.

Mr. George Dawson seconded the motion for the adoption of the report. The right of the children of the poor to be educated was now admitted by all; that education must be provided out of the rates; a rate would reach the selfish manufacturer, and lay hold of the man who went to neither church nor chapel. The time had arrived when the nation must take the matter in hand, and the education must be altogether unsectarian.

The resolution for the adoption of the report was carried unanimously.

Mr. Edmund Potter, M.P., moved a resolution for the appointment of 40 members as the executive council, with power to add 10. It was, he said, a well known fact there were not less than four millions of our population in ignorance, and, as a consequence, living in crime and poverty. There was a large class which the State religion had hardly touched—there was a hard and fast black line which denominationalism had not reached. Government would probably bring in an Education Bill next Session, but he urged the league to press theirs.

Dr. Hodgson seconded the resolution, which was carried.

Professor Fawcett, M.P., moved a resolution to this effect:—"That a Bill embodying the principles of the league be prepared for introduction to Parliament next Session." The resolution, he said, gave a pledge to the whole nation that the league was resolved to take prompt and decided action to secure an educational system for the people. The question had gone beyond the stage of inquiry; it was ripe for legislation. A reproach was too often made against such congresses as that. They began with talk, it was said, it was talk throughout, and resulted in nothing. From that conference a Bill should emanate, and the people would be able to judge of their views, and decide upon the great question which had taken hold of public attention. It had been said that government intended to introduce an Education Bill, and, reposing confidence in the government, they should wait to see what was submitted. In reply to that possible objection, it would be only necessary to remark that, if the government measure came up to what they required, if it embodied the principles of the league, all they would in such case have to do, would be to withdraw their own measure joyfully and support the Bill to the utmost of their power. If the government Bill ignored any of their essential principles, and was such as they could not accept, the only course left to them would be to insist upon their own measure, and the two being before the country, the country would decide which they would support. It was impossible for a great body of men to be entirely agreed upon all the details of a programme relating to so important a question, but what they should do was to sink minor points to secure a great object, and, for his own part, upon matters of detail, he was prepared to yield to the majority. In his own case he entertained an opinion which differed from that of others as to free education. He would prefer that the parent be made to feel his responsibility in the matter of the education of his child as in his clothing and maintenance; but, although feeling

strongly upon the point, he would give way to the majority to secure a great and comprehensive system of education, such as that they were seeking.

Professor Thorold Rogers seconded the resolution, which was supported by Mr. Lloyd Jones, and carried.

At the afternoon sitting,

Mr. Dixon, M.P., read the first paper, which was on "The Best System for National Schools based upon Local Rates and Government Grants." He said that the central idea in the scheme of the National Education League was that the education of the people should no longer continue to be based exclusively upon the isolated and often fitful efforts of individuals, however valuable those efforts might be; but that the State should become responsible for the education of the whole of its children. This responsibility need not involve taking charge of all existing schools. Where education was being satisfactorily carried on, no further action from the State would be required. It would suffice if provision were made for the transfer to the school boards of those schools whose managers desired it. No measure for a national education will be complete unless it contained the following enactments:—The entire cost of erecting or maintaining national rate schools to be defrayed out of the rates and taxes of the country, in the proportion of one-third from the former and two-thirds from the latter. The principle of payments on results to be continued. Power to be given for the compulsory purchase of school sites. In every county and large municipality a school board to be elected of the ratepayers or their representatives. These boards should ascertain where schools were wanted, and see that they were provided; should negotiate the transfer of existing schools to the local authorities wherever such transfer was desired by the managers, or would be of advantage to the district; should appoint committees to manage schools, or groups of schools; should levy the necessary rates, claim the government grants, and pay all the expenses of the schools; should keep registers of all the children of school age in their district, and should appoint school officers to make out and periodically revise the above registers, and undertake the duty of enforcing attendance. The duties of these school officers might be performed by the schoolmasters in thinly-populated districts. The boards should provide also for the due repair and maintenance of the schools, and the punishment of absentees or their parents. By this plan, Mr. Dixon contended, they would by no means destroy the influence of voluntaryism, and would retain the advantages of local government, and avoid the evils of centralisation.

Professor Thorold Rogers read a paper on the question as to the source from which the funds necessary to provide for the machinery of secular learning should come; this was a point which ought to be settled at once. The Professor discussed the question at great length, and said that he was driven to recommend that the tax for education should be derived from the public funds.

The Rev. Dr. Steinthall, of Manchester, read the next paper.

The discussion was initiated by—

Mr. William Symonds, of Merthyr Tydvil, who exposed the abuses of the existing schools, and argued that the league might with advantage make its platform still broader and more comprehensive than was proposed.

Mr. Applegarth, of London, Secretary to the Amalgamated Society of Carpenters and Joiners, reviewed the speech of the Archbishop of York at Liverpool, as to the proposal to introduce compulsory education being likely to meet with a hard reception at the hands of the working classes. He maintained that, from his acquaintance with the working classes, instead of being unfriendly to compulsory education, they were most desirous that the principle should be carried out to its fullest extent. There were two classes among artisans, the industrious and the dissolute. The latter were a burden to the former, and depreciated the advantages of education; but the wish of the intelligent workman was that his less gifted fellows should be properly educated. Those who did not value education should be made to value it. The working classes needed and demanded good education, and he gave this advice to their friends, Gladstone, Bright, and Forster—"Don't be too long about it, or the working classes will take it out of your hands."

Mr. Thomas Green, President of the Trades Council of Birmingham, also eulogised the scheme proposed by the league.

Sir Christopher Rawlinson expressed his cordial adhesion to the programme of the league. He protested against the work being entirely turned over to the government, fearing that in that case there would be jobbing and gross extravagance, and because it withdrew from local self-government one of the greatest sources of an Englishman's honour and pride. He concluded by eulogising the common school system of America, and urged that it should be the foundation of the English system.

The discussion was continued by Sir Wm. Guise and the Hon. Auberon Herbert.

At half-past five o'clock the congress adjourned.

When the league re-assembled on Wednesday morning,

The Rev. Rowland Williams read a paper on the legislative enforcement of "attendance," particularly in the rural districts. There were great difficulties in the way, and he directed attention to them in the first place. The agricultural labourer was not so ignorant and wretched as was sometimes represented; but a great deal of the criticism directed against agricultural employers was merely part of the wrongs habitually done to silent men. Nevertheless, the labourer's lot was hard. An extremely favourable estimate of his wages would be, to suppose them stretched by piecework, harvest work, and allowances, from 9s. to 13s. a-week. This barely covered the necessaries of life, and, if the family were numerous, hardly gave them bread? How did these people live? In part by the aid of their children's labour; and was it justifiable, in an access of scholastic zeal, to ask the legislature to interfere, not merely between parents and children, but between children and their bread? There was a further difficulty. It was alleged that lads trained in school and not in the field would not, when they grew up, be worth their salt in the field. These were difficult questions, but, fortunately, they had been already discussed and answered. The legislature and the country answered them when the Factory Acts were passed. His proposal was that the legislature should be asked to fix an age (say ten) within which field labour and staple labour should be restricted or forbidden, and another age (say twelve) within which the employment of boys should be permitted only upon the production of satisfactory proof that schooling for three or four years had secured fair results. Such a system would reach all the squatters on the borders of parochial civilisation; it would stimulate opinion among the average peasantry; it would protect the mother who unwillingly sees her children taken from school sooner than is necessary; it would prepare children for those instructive agencies, such as night schools, lectures, newspapers, and the pulpit, which, in the absence of preliminary training, were almost thrown away. The half-time system he would only admit on condition of some three years' continuous training being its preliminary—mere infancy not counting in these three years. One of the most direct and one of the happiest results of education would be to increase the facilities for comparing the value of labour in different parts of the world. A peaceful and voluntary distribution of labour, leaving the laws of supply and demand to operate in the assessment of wages, would not be any injustice to employers. Suppose, as another result, that political economists and

legislators should find themselves called upon to exercise their joint services in rendering the condition of the labourer, by means of house and pasture-land, so attractive as to prevent the depopulation of districts already sparsely peopled, this would be a result not unworthy of means so peaceful and innocent as education.

Mr. Alderman Rumney, of Manchester, also read a paper on compulsory attendance at schools, and the best means of enforcing it.

A discussion then ensued upon the papers.

Mr. Potter, M.P., said he considered the operation of the Factory Act had been unsatisfactory for one reason, because the system was partial; and what they required was a Bill that would ensure the education of every child in the kingdom. He thought the League should be kept free from the denominational system. There was nothing more damaging to denominational schools than having to educate half-time children. He did not deny that the half-time system had its benefits, but he thought it ought to be perfectly distinct from any other, and it would be a source of regret to him if the denominational system sustained injury.

The Rev. C. Clark said it was not the intention of the League to exclude the entire use of the Bible, but in certain cases it would be allowed. With regard to compulsion a great deal of apprehension existed, but when in was called into operation he believed it would be found to exercise the most beneficial results. There would be no use in having schools unless the children were compelled to attend.

Mr. Mundella, M.P., said, after the remarks of the last speaker, he thought he could not do better than submit to the audience something of his experience of what compulsory education had done abroad, what was the machinery by which it had effected its marvellous results, and the absolute necessity for the adoption of the same system at home. He first saw it in Switzerland, then in Savoy, then in Prussia, and of late years his visits to Saxony had been annual. He had found that the results which had arisen from compulsory education there were perfectly incredible,—there were very few people in this country who would believe them. He had gone the length and breadth of Saxony, and had examined children by the wayside, in the cottages, and in the factories, and he had never found one at twelve years of age who could not both read and write—not as they understood reading and writing in England, but such as would do credit to any gentleman sitting on that platform. He made an attempt to find some corner in Saxony and the Swiss Cantons where children were uneducated, but he had always failed. His manager had lived in Saxony for many years, and had had a large and practical acquaintance with the people, and he had never yet met with a workman who was not able to correspond with him intelligibly about whatever work he might have in hand. Under such circumstances as these, it was not to be wondered that the North German Confederation was making such vast progress. He would say a word or two about the machinery by which such great results had been accomplished. Some persons in this country affected to think compulsion consisted of the espionage of the policeman. There never was a greater mistake. In Saxony, he was shown one school with 3,000 scholars, and the director stated, "that for twenty-five years he had never, in a single instance, had to call in the aid of a police officer." The machinery abroad was simply this, that every child in every cottage was registered. In England, now, they had a household registration. To register the children would be but one step further. There were in Germany abundant schools for the children to attend; the population was poor, but still they paid; the child at six years of age must go to school; even for children under that age there were children's schools, but compulsion began at six years of age, and did not end until fourteen. At the commencement of the sixth year the parents received notice from the Education Board that the attendance of the child was required at the school. Supposing the child not to be sent, the criminal law never was called into operation. What the inspector did was, if the boy did not attend, to send for the parent and read or place the law before him; showing him that his duty was to send his child to school. If the parent subsequently was contumacious, he was sent for again, and fined a franc, but beyond that the matter rarely went; indeed, in a district where there were 50,000 inhabitants, he had been informed that over a period of no less than eight years there had only been 42 cases of contumacious parents. With regard to the American schools, although he had great admiration for them, and none were so magnificent, they possessed one great defect, and that was the want of compulsory attendance. And what was the result of this? Why, that American schools, according to reliable reports, were of little use, and the population were gradually sinking into ignorance. In the North German Confederation no child began to work till twelve years of age, having had six years' schooling. Between the ages of twelve and fourteen they were not allowed to work more than six hours, and between fourteen and sixteen it was provided they should attend school for six hours per week, and then commenced the learning of that technical education so desirable for the workman. It should not be supposed he was opposed to religious instruction. They all knew its necessity; and the system of education they proposed would facilitate rather than obstruct religious instruction. He had just received the new Austrian scheme of education; and it was clear from it that Austria had discovered that knowledge was power. The Austrian system would be the most complete of any. Was, England, he would ask, to allow her children to remain in an ignorance, the depth of which they could not fathom? To those standing aloof he would say, "Stand aloof no longer, for public opinion is running irresistibly."

Lord Campbell thought there should be a compulsory system of attendance. Neither the taxpayer nor the ratepayer, of whom either or both would be appealed to for money, would consent to be taxed without a guarantee that the schools would be used.

Mr. George Howell also spoke in favour of compulsory education. There was compulsion in the case of the punishment of crime and the support of pauperism. Surely a compulsion might be used which might have the effect of preventing both.

Dr. Hodgson thought the indifference of parents, and the consequent indifference of their children, justified a compulsory clause.

Mr. Paget, of Nottingham, said he had been alluded to as an employer of agricultural labour, who had for many years insisted upon the education of his farm boys, that they should spend some days in the schools as well as at work; and what was the result of that system? Upon his farm he had 34 boys employed, upon the condition that they spent the alternate days of the week in school. He had done this without any sacrifice on his own part, because he felt at the outset that it must be a business success; and it had proved, commercially speaking, successful. He had, too, been better served under the system than before its introduction. His system was this:—He received the boys at nine years of age, on condition that they were able to read decently; and, at the annual examination of his school, it was proved that his boys fully maintained their own with the boys of those persons who sent their children to school in the regular way. At 13 they were examined, and those who could write accurately from dictation, read correctly, and do the first four rules in arithmetic, received from him a prize. He wrote to the employers of some of the children who had been taught under his system, and the uniform reply of the masters was, that they were perfectly satisfied with their servants, and the servants themselves wrote to him letters of the most creditable kind. That was a proof that after leaving his

farm they continued their education. After they left his farm, they had no difficulty whatever in obtaining situations, because they were better servants than the majority of their class. To obtain admission to his (Mr. Paget's) farm, the children of the locality attended the village school to learn to read, a proof that in education they saw promotion in the distance. As to the general question of how far education should be compulsory, he had contended for many years, while member for Nottingham, that, as society was bound to provide for the poor and criminal classes, it was bound to see that the poor were brought up in such a manner that there should be the least probability of their becoming paupers or criminals.

Mr. Fawcett, M.P., thought it superfluous to say a word in favour of compulsory education. Every member of the league believed that no plan should be listened to unless it included the principle of compulsory education. He pointed out that the great danger of the future was in accepting a compromise in Parliament.

After a few words from Mr. Webster, Q.C., and Dr. Langford, the morning sitting was terminated.

At the afternoon sitting, Mr. Field read a paper on Free Schools.

The Rev. F. Barham Zincke, Vicar of Wherstead, Suffolk, and Chaplain in Ordinary to the Queen, submitted various reasons why the teaching of the schools which the league desired to see established should be unsectarian, meaning by "unsectarian" the omission of the inculcation of those particulars of religious instruction which differentiate the conflicting religious bodies of the country. There was no question of bringing up children without religion; the question was, what was the best way of making people religious?

The Hon. Auberon Herbert read a paper on "Secular Education."

Mr. George Jacob Holyoake read a paper on "Misconceptions as to Secular Instruction." The term secular, he said, in no way denied or questioned spiritual education. Secular knowledge was not opposed to religious knowledge; it was merely distinct from it. All that the advocates of secular instruction asked, was that the education given at the cost of the State should relate to the duties exacted by the State, and these duties were that a man should maintain his family, pay taxes, and give no trouble to the police, make no demands on the parish, and fight whomsoever the government thought fit to involve us in war with. It was in the interests of public economy that secular instruction should be given by order, and religious education by option. Anyone who had experience of the working-class knew that what they suffered most from was confusion of mind. This habit of the untrained mind, instead of being corrected, had been confirmed by that mixed education—that confusion of things sacred and secular which charity and misconception had made the rule in this country. Doctrinaires demurred to secular knowledge because they did not know why it was wanted, nor see what it would do. They forget that in England every inch of land had a proprietor—every fish in the river, every bird in the air, every flower on the bank, an owner. A mechanic, as a general rule, found that employment came by chance, and wages by caprice. He must not steal, or conspire, or fight. Secular knowledge and secular skill alone could save him from the poor-house. Piety, ever so conspicuous, brought no price in the market. The State was bound to expend the people's money in teaching productive knowledge, and the only knowledge which was productive was secular. This knowledge would make children clear-minded, grateful, and reverential; would give religion *prestige* and force, and the clergyman a double influence, because his ministrations would have dignity and definiteness. In conclusion, Mr. Holyoake pointed out that there was a misconception as to the extent of the question before the country. It was not the question of education in its full sense at all. The State could not deal with education in its full sense. What was asked was, that in every district in England the children of the working classes should surely get as good an intellectual training as the children of the working classes in any other country. The State student would still be under the influence of the mother, the nurse, and the minister. The only change would be that the nation would be more intelligent, the brains of the common people would be cleared and trained, and every working father and mother would thank with grateful hearts the State who gave their children the priceless blessing of self-defensive knowledge.

A paper, written by Mr. T. Stack, "On the Principles of Denominational Schools," was read.

In reply to a question, the Chairman said that several resolutions had been sent up to him, but the Provisional Committee having desired that no resolutions should be taken, he should adhere to that course. But Mr. Auberon Herbert had asked, "What is unsectarian education? Is it education excluding all dogmatic teaching, creeds, or catechisms?" On behalf of the Provisional Committee he (the Chairman) replied in the affirmative. Mr. Herbert further asked whether the scheme of the league necessarily excluded from the national rate schools the Bible without note or comment. To that question he (the Chairman) replied in the negative. The Bible was to be left to the decision of the school committees, who were the representatives of the parents of the children.

The meeting was afterwards addressed by Mr. Beales, the Rev. Septimus Hansard, the Hon. George Broderick, Mr. F. Osler, and soon afterwards adjourned.

The proceedings of the conference was brought to a close by a public meeting, numerously attended, held at the Town Hall, on Wednesday night (13th inst.), the Mayor (Mr. Holland) presiding.

Mr. George Dixon, M.P., moved the first resolution—"That, in the opinion of this meeting, the scheme of the National Education League is the one best adapted to secure the education of every child in the country." The league did not propose to interfere with the existing system where it was effective, but it wished that, where voluntaryism and denominationalism had failed, there the State should step in—that it should be called upon to recognise the highest of all its duties, viz., that of bringing up every citizen to an understanding of the laws which he was bound to obey. He proposed that the schools which the league desired to establish should be maintained in the proportion of two-thirds for the central government, and one-third for the local authorities. The objection of opponents was that the system would kill voluntaryism; but his reply was that it need do no such thing—they would leave voluntaryism alone. Sectarian theology was to be excluded from the proposed State schools; but yet they believed there would be as much religion in the system as in nine-tenths of the schools which now existed. If schools were to be national schools, they must be unsectarian. Notwithstanding the objections, that it would be harsh and un-English, he believed that a system of compulsion might be exercised in a manner completely in harmony with the wishes of the people; and that, after the operation of a year or two, there would be very few indeed who would not cheerfully and willingly send their children to school. What the league said was, that when a parent neglected his duty, the State should step in and act the parent for the innocent victims. It was the State alone which had the power to exercise that duty, and it would exercise it. They had now in Mr. Forster a Minister of Education who had the will to do so; but he was afraid there were difficulties in the way. To Mr. Forster the members of the league would say, "We have taken upon ourselves the performance of a duty than which none can be higher, the duty of seeing to the education of every child in this country. That duty we will perform with you as our leader, if you will; but, if not, in spite of you."

Professor Fawcett, M.P., in seconding the resolution,

said, perhaps the greatest danger that threatened the movement was the possibility that some might be tempted to accept a compromise. That was the rock that had imperilled so many great movements. But he asked that great meeting, representing a great body of the industrial classes of this country, to authorise Members of Parliament, who were also members of the League, to say in the House of Commons that nothing would be satisfactory to the people short of a measure which would impose rates where educational appliances were insufficient, and which would compel the attendance at school of those children upon whom, by their parents, the irreparable wrong was being inflicted of allowing them to grow up in a state of ignorance. That was a great movement, and it would require hard labour to bring it to a successful issue. Its aim was to raise millions of the people who were sunk deep in the depths of ignorance. It would require the popular support which such vast audiences as that could give it. No one could tell the effect which would be produced upon the minds of our statesmen and rulers by such a meeting as that. It was the privilege of the people to be governed, at present, by a Prime Minister who was ever ready to be instructed by the intelligently-expressed opinion of the country; and if Mr. Gladstone had not made up his mind on the educational question yet, nothing was so likely to give clearness and distinctiveness of view and firmness of resolution as the expression of the opinion of such an audience as that in favour of unsectarian, compulsory, national education. It was sometimes said that the propositions of the league were revolutionary. The league cheerfully accepted the title. It intended to effect a great revolution, because it intended, if possible, to root out ignorance, with its attendant misery and vice, and substitute all the independence, all the moral elevation, all the happiness, and all the material welfare which resulted from intellectual culture. Should that revolution be successful, the displacement of the worst tyrant that ever afflicted a nation would not confer greater blessings upon their country. It was almost unnecessary to speak of the moral aspects of the question. It was almost a truism to say that no social reform, no scheme of philanthropy, could produce any permanent effect unless it made the labourer self-dependent. Sometimes it was said that the propositions of the league with regard to compulsion were anti-English. There was something that was not only anti-English, but anti-human, and that was the spectacle of millions sunk in such ignorance as if they were living in a heathen land. Painful facts were daily brought under the notice alike of employers and workmen, to show that without national education it would be impossible for England to maintain her commercial position. Every year the competition of foreign countries became keener, and it was impossible to expect that an uneducated country could compete successfully against an educated country. Signs of material wealth were too apt to deceive. Pæans and exultations were sung over increasing imports and exports, but behind all this glitter and show — behind all this evidence of material wealth — there was the ugly — the portentous — fact, that one out of twenty of the population was a pauper, and there were countless thousands in misery, and on the verge of pauperism. For years various influences had tended to stimulate the production of wealth. Free trade, mechanical inventions, extension of the railway system —these were great facts; but did not the contemplation of them lead to the conviction of a great truth which ought never to be lost sight of—that there was something more required to make a nation great, and happy, and prosperous, than mere material agencies? The mind, and in that way the morality and social character, of the people must be acted upon. The idea might be Quixotic, but he did not mean to relinquish it, that the poorest child in the country, if he had the requisite ability, ought to have the very best education the nation could afford, and he believed this could be attained by a wise administration of our vast educational endowments, which ought to be devoted to the reward of the meritorious, to whatever class and whatever religion they belonged. He would not give a free education as a matter of right; but no child should suffer from want of education owing to the poverty of its parents. He held that the greatest of human responsibilities was incurred by bringing a human being into the world, and every parent should feel it as much a duty to give his children education as to provide them with food and clothing. With regard to the administration of the educational resources of the country, much had already been done by the Endowed Schools' Bill which passed last session. The main principle of that Bill was, that those endowments should be devoted to reward meritorious students. Therefore, wherever the elementary schools proposed by Mr. Dixon (representing the League) were established, poor boys might advance from the elementary school to the first grade school, and to the second grade school, and thence to the university, and there was no social favouritism there. They never asked at the universities what a man's father was. There were no governing families there—what a happy thing it would be if the same remark could be made with regard to English politics. There were indeed, still at the universities religious tests and disabilities; but the overwhelming majority of the country had already declared that those disabilities and tests should be completely swept away. Undenominational education was a great principle in England, but it was to be still more carefully cherished in Ireland. In conclusion, he said that a complete system of national education would enable the individual capacity of each member to be utilised in the best possible way for the benefit of his country. Many a person there might be, toiling monotonously in the fields, labouring in some deep-sunk mine, or carrying out, year after year, some work of mere routine, who—if his abilities had been properly developed—might have executed some work of art, invented some new machine, organised some political or social movement, or produced some literary work, which might have permanently enriched and benefited mankind.

Mr. Mundella supported the resolution, which was carried.

Mr. Joseph Chamberlain moved—"That the executive committee of the National Education League be requested to prepare a Bill, based upon the principles of the League, for introduction into the House of Commons during the next session of Parliament."

Mr. Alderman Carter, M.P., supported the resolution, which was carried by acclamation.

One of the papers put forth by the League cited the following portions of evidence in support of the question of compulsory education:—

It would be difficult to find a more able and painstaking body of men than our school inspectors; and their opinions, given as they are under the sense of official responsibility, are entitled to special notice.

Rev. H. W. Bellairs, her Majesty's Inspector of Church of England Schools for Berks and Oxon, reports as follows:—"My own conviction is, that until some means are devised to secure regular attendance for the children of the poor from four to eleven years of age, a very large amount of exertion and money will be wasted, and our jails, penitentiaries, and reformatories will show our shortcomings, by the presence of a mass of inmates untrained and untaught."

Rev. J. Rice Byrne, M.A., Inspector of Church of England Schools for the county of Gloucester, reports as follows:—"The early age at which children leave school, remains, as ever, an insuperable obstacle to any progress in national education, which shall neither disappoint our expectations, nor be to a certain extent

illusory. Except in legislative interference, I see no remedy for so deplorable a condition of things."

Rev. Geo. French, M.A., Inspector of Church of England Schools for the North and East Riding of Yorkshire, reports as follows:—"Loud and continual are the complaints of managers and teachers, of their almost entire inability to give anything like instruction which will be of permanent good to children who attend so irregularly."

The Rev. N. Gream, M.A., Inspector of Church of England Schools for Essex and Suffolk, reports as follows:—"It has been pressed on me that many of the children of the agricultural labourers are kept from school, and consequently brought up almost destitute of education, by the inability of their fathers to resist the solicitations and threats of employers, who, regardless of the education of such children, urge their fathers to send their boys into the field instead of to school. * * * It would be found, on inquiry, that the children's earnings do their parents very little good, in consequence of the extra food and clothing required by children at work."

Rev. W. W. Howard, Inspector of Church of England Schools for Devon and Dorsetshire, reports as follows:—"The chief hindrances in the way of education throughout the West of England are, the irregular attendance of the children, and the early age at which they leave school. With wages ranging from nine to eleven shillings per week, one can hardly wonder at the bad economy which leads the agricultural labourers to send their children to work as soon as they can earn a few pence. Where lace-making and gloving are rife, many girls never go to school at all, and live their lives and pass away to a hereafter in a state of ignorance which is a disgrace to humanity. I have no hope for much improvement in this state of things until we have legislative measures which will make education compulsory. One often hears that compulsory education is un-English; I hold it to be much more un-English to allow our people to live their lives in a state of brutal ignorance. With compulsory education would come, most likely, a separation of the secular and religious elements of instruction. I believe that both elements would be better cared for thereby, and there are, probably, many clergymen who give much of their time and more of their money than they can afford, to their schools, would think with me. Those who would clamour most against the separation, would be those who seldom set foot in their schools, or whose schools are so bad that they dare not face an examination."

Rev. R. L. Koe, Inspector of Church of England Schools for Kent and Sussex, reports as follows:—"It is not, however, altogether the fault of the parents that children are removed from school at such an early age. From the scarcity of hands, the farmers have, in some instances, refused to employ the parents if they could not have also the services of the boys."

Rev. H. A. Pickard, M.A., Inspector of Church of England Schools in Yorkshire, reports as follows:—"I wish further steps could be taken to make attendance compulsory by Act of Parliament."

Rev. H. R. Sandford, M.A., Inspector of Church of England Schools for Worcestershire and Staffordshire, reports as follows:—"My own opinion is—which is confirmed by what I hear in various parts of the country—that children now leave school at an earlier age than ever."

PUBLIC INSTRUCTION IN TURKEY,

By Hyde Clarke, Esq.

Leading articles in the *Times*, and other papers, are calculated to give a false impression as to the law of public instruction in Turkey, which is represented as an entirely new law, resulting from the Sultan's visit to the west, his having become civilised, and having introduced the English and French system. The present is only an amended law, matured before the Sultan thought of coming here, and introduces very little that is new, as will be seen from the paper I read before the Statistical Society, in 1867, on "Public Instruction in Turkey."

As Turkey is inhabited by a number of different races, professing various religions, speaking dissimilar languages, and most of them having distinct administrative institutions, there is a very great diversity in the state of education, and it is only possible slowly and steadily to bring about a general improvement. The Turkish Mussulmans, the Arab Mussulmans, Jews, and Christians, and the Greek-speaking Christians have a very fair position for education. The Armenians are partially provided, but the Mussulman and Christian population of the European provinces are in a very backward state.

The government, by the help of an organised Ministry of Public Instruction, has been for years engaged in the work of reform, but encounters great difficulty from the bigotry and antipathy to association of all the populations, and the seditious tendencies of some. It is not merely that the Christian will not associate with the Mussulman in education, but the Mussulman is opposed to the government infidel and godless schools; in fact, the Ottoman government has to contend with Irish difficulties.

The government has decreed compulsory education, but public opinion is not favourable to its enforcement. It has published improved school-books, which it has the greatest trouble in getting Mussulman or Christian schoolmasters to use; teachers prefer scriptural instruction to profane geography, history, arithmetic or book-keeping. The Greeks and Armenians are employed in building up separatist nationalities, and eschew what may promote community. The Jews are essentially separatists.

The government, however, perseveres and makes progress. In Bulgaria and Bosnia, Mussulmans and Christians show a disposition to frequent the same schools, as they are of the same race, and speak the same language. The instruction of the great body of the population, the Mussulmans, by means of the endowed schools, has been much improved, but there is great indisposition shown towards the middle schools by the Mussulmans in the provinces, and the Christians will not frequent them. The new Lyceum at Constantinople has been excommunicated by most of the clerical authorities; but this and the special schools are taking a large number of pupils, because they lead to public employment.

One main change in the amended law is the proposed abandonment of the mixed education of boys and girls in the same schools, which takes place among the Mussulmans; and public opinion would revolt against Mussulman girls going to the same school with Christian as well as Mussulman boys.

The Ministry of Public Instruction has for years enlisted the sympathies of the statesmen of Turkey, and has been under the guidance of learned and zealous men. I would particularly name Edhem Pasha and Kemal Effendi. The president of the new council, Munif Effendi, is a distinguished advocate of popular education. About eight years ago, the Society of Arts sent him a set of books for the literary institution he founded in Constantinople, and which I saw in the library there.

Some of the schools of the Greek and Armenian communities in Turkey are equal to anything in Europe.

I do not myself look forward to any great change in education in Turkey, but to the continuous course of improvement. As the Porte is giving an increased share in the general government to the Christian and Jewish communities, it is determined to take advantage of the occasion to get a greater hold on the administration of denominational education.

Perhaps the greatest practical benefit resulting from

the amended law will be that the Ministry of Public Instruction will get a better share out of the budget, and so be able to act with more vigour on the endowed schools of the Mussulmans and those of the various communities.

THE GREENWICH SCHOOLS.

A leader in the *Times*, of the 19th inst., says:—"The schools of Greenwich Hospital constitute an educational establishment of the very first importance. They furnish, under present arrangements, gratuitous teaching, clothing, and support, from the age of ten to fourteen or fifteen years, to 800 boys, the sons mainly of deserving seamen; and the Upper or Nautical School, containing eighty boys, ranks almost alone in this country as a technical school of high repute for the teaching of mathematics and navigation. More than £25,000 a-year out of the ample revenues of Greenwich Hospital is absorbed in defraying their cost; and we cannot but rejoice in the destination to such a purpose of so large a sum; for, while everything else in the hospital has dwindled and declined, the schools have been the one vigorous limb of the old decaying trunk. And yet there is probably no institution in the country which has, during the last ten years, been the subject of more inquiries and complaints. In 1859, an Admiralty Committee of very competent men investigated and reported to the Board on the actual teaching and domestic arrangements of the place. The ink was scarcely dry on their report, when their conclusions were referred to a Royal Commission upon Greenwich Hospital, which reported fully in the following year, and traced the shortcomings of the existing management. The schools were re-organised in 1863, and, in 1867, a fresh committee was appointed by the Admiralty to inquire into their management and expenditure. What can be the reason of this succession of investigations into schools so meritorious in their aim and highly-reputed for their teaching?

"The functions of the Greenwich Schools are partly eleemosynary, and partly preparatory for sea service. They exist for the purposes expressed in the original charter—namely, "The relief and encouragement of seamen, and the improvement of navigation." The qualifications for admission are, that the parent should have served in the Royal Navy, a preference being given to orphans and members of large families, and that the child should be physically fit for sea service, and be able to read an easy sentence. The physical and educational tests are, practically, however, but little regarded, the main characteristic of the children being their necessitous condition. By the misfortunes or the faults of their parents, they belong to the pauperised class. Now, there is no part of the education of this country in which greater discoveries and advances have been made, during the last twenty years, than in the education of pauper children. The history of the foundation, and early failures, and ultimate success of the great pauper schools is succinctly told, in the Report of 1868, by Mr. E. C. Tufnell, who has for twenty years superintended their administration, and than whom there is no man more competent to speak as to the mode of working a naval school. He was consulted by the Admiralty Committee of 1867, and his report upon the Greenwich Schools is full of interest. The first discovery of the Poor-law guardians was, that 'industrial training is absolutely necessary' as a part of their education, and, consequently, each boy now has three days' work and three days' schooling weekly in the pauper schools; and, after trying every industry, they have, inductively, arrived at the second discovery, that 'the worst thing we can do is to make them shoemakers or tailors, and we cannot do better than prepare them for the navy, the merchant, and the military service.' Music and seamanship are the two industries that are taught with the greatest success, and the result is that 95 out of every 100 boys who are educated in the Stepney Union School voluntarily enlist in either the army or the navy; whereas, from the Greenwich Schools, out of the same number, only 43 enter her Majesty's service. To sum up all that we are told of the Greenwich Schools, while it is admitted that the science of navigation is well imparted to the upper boys, it appears that the bulk of the school are sacrificed to the teaching of the few, and, from the want of industrial occupation, are disqualified from excelling, as seamen or otherwise, in the class to which they belong; and that, partly in consequence of this error, but mainly form the want (which is common to all establishments under the Admiralty) of one competent and responsible head, the expense of the education is excessive and always growing. It ought not to cost more than £18 a-head; it did once cost £19 only; but, in 1860, it cost £30, and it now costs £35. A charitable school, be its merits what they may, cannot deserve much praise if it expends upon 800 boys what would well suffice for 1,200; and our greatest naval school must have serious defects if one-third and more of its pupils are found to grow up into shopmen and clerks. And yet, to blend censure with praise, and avoid all suspicion of unfairness, we readily close our criticism with a quotation from Mr. Tufnell, who tells the Admiralty Committee:—" Having known something of the education on board the *Britannia*, I am satisfied that the scientific instruction imparted to the young gentlemen and noblemen who enter as cadets on board that ship, and will be the future Admirals of the Navy, is very inferior to what is given to the children of common seamen in the Greenwich Nautical School."

"The recommendation of the Admiralty Committee of 1867 seem to us to be admirably adapted to amend, without impairing, the education of the Greenwich Schools. They propose to adapt the instruction, up to the age of thirteen, to the model of the great union schools, teaching the several industries which are found practicable, with a distinct preference of music and seamanship. At the age of thirteen, those boys who have a turn for mathematics are to be draughted, as now, into the Nautical School, which is to have one section for navigating and another for engineering, and to be there taught for two and a-half years. The rest of the boys are to have the option either of leaving Greenwich at thirteen, or passing for one year and a-half to the Seamen's School, with the annexed condition of future service in the Royal Navy. The present buildings will well accomodate 1,000 boys, and the means of teaching and maintaining the additional 200 can be readily obtained by economies in the management, which the committee indicate in detail. We trust that Mr. Childers will give effect to these recommendations, and that it may be found easy to introduce them without displacing many of the present masters. But when this great eleemosynary school has been re-organised, and placed on a sounder and less pretentious basis, another question will remain, which was opportunely raised by a correspondent, under the name of 'Felix Summerly,' in our impression of the 4th inst. Are we to do nothing with the vacant quarters of Greenwich Hospital for the children of other 'seamen of all grades, in both the navy and commercial marine,' who are objects of consideration rather than of charity, or for whom we have no space in the existing schools? Previously to 1863, there were places reserved by Admiralty order in the Greenwich School for upwards of 100 officers' sons, but this privilege was granted to them at the expense of the proper objects of the charity, by the Duke of Clarence, when Lord High Admiral, and was rightly taken away in the reforms of 1863. Officers' sons can now enter under the same rules as the sons of common seamen, but have no longer a preferential claim. It is, however, impossible not to admit that there is no class of men in the country more entitled to our consideration than that of our naval officers. They are generally poor. The public policy which carried them to sea at an early age withdrew them from the ordinary

avenues to profitable civil employment, and their habits are little suited to any commercial pursuits. Moreover, such has been our practice, that our list of post-captains has always been three or four times as large as we can in peace employ, and the result is, a large body of deserving officers condemned, during the prime of life, to inaction and poverty on half-pay. What greater boon can the State offer, what smaller boon can we be contented to supply, than the opportunity of good and inexpensive education to the children of men who have given their lives and fortunes to the public service? We proposed, a few days since, to transfer to Greenwich Hospital the staff of pupils and instructors now located on board the *Britannia* and in the Royal Naval College at Portsmouth. But when all this is done, and our Naval University is founded, such is the size of these famous buildings, that space will remain to house separately one or more schools containing together at least 1,000 boys. 'Admit,' says 'Felix Summerly,' 'the child of the poor lieutenant, or even post-captain, at cost-price, say £20 a-year for teaching, maintenance, and clothes. Admit, also, the child of the common seaman at half this cost or less." Our correspondent writes of what he understands, and we can conceive no better use for the residuum of Greenwich Hospital than—without cost to the country, except the loan of the site and buildings—to set up this model school for seamen's children as a part of the University on the one hand, and by the side of the great charity school on the other."

NETHERLANDS INTERNATIONAL EXHIBITION.

The awards to the successful exhibitors were distributed by Prince Alexander, in the name of the King, on Monday last. The Ministers of State and the representatives of the various countries took part in the ceremony; and a report was read by Baron Mackay, the the President of the Central Jury, as to the results of the exhibition. A large party assembled at the banquet given in the evening; illuminations and a display of fireworks bringing the exhibition to a close.

MEMORIALS TO EMINENT MEN.

The following letter appeared in the *Times* of the 19th inst.:—

Sir,—With reference to Mr. W. J. Loftie's letter, in your impression of Saturday, in which he hopes that a tablet may be erected, or some other means taken to mark the site of the house where "glorious old Bunyan lived" and breathed his last, I take the liberty of thanking Mr. Loftie for having drawn public attention to the fact, and to assure him that the spot has not been forgotten by the Council of the Society of Arts; and, without compromising the Corporation of the City of London, I feel sure that either that body or the Society of Arts will record the abode of the immortal "Tinker of Elstow."

I have, &c.,
George C. T. Bartley,
Honorary Secretary to the Tablet Committee of the Society of Arts.

Herne-hill, Surrey, Oct. 18th.

Commerce.

The Trade of Aleppo.—The following is from a report by Mr. Consul Skene, on the trade of the province of Aleppo, in the year 1868:—"The number of English vessels entered and cleared at the port of Alexandretta, during the year 1868, has been 44, and at the port of Mersyna 9, all of them being steamers. Besides these, 72 French steamers, 48 Russian, and 96 Egyptian steamers have touched at each of the two ports. Amongst the three articles of which mainly consist the exports of this province, gall-nuts have been shipped to the amount of about 5,000 sacks, for Liverpool and Marseilles. Notwithstanding that the yield has not been abundant, the prices have not exceeded 1,800 piastres per quintal of 200 okes. This is explained by the declining demand for this article, in consequence of its diminished consumption in European manufactures. The chemical inventions introduced into the art of dyeing have lessened the demand for gall-nuts; and the crop of former seasons, amounting to 10,000 or even 12,000 sacks, used to find a ready market at 2,300 piastres per quintal, while half that quantity has been sold, in 1868, at 1,800 piastres. Wool, the next article of exportation, has also greatly suffered. In previous years 35,000 bales were generally shipped, but, in 1868, only 22,000 bales have been exported; and the prices have been 30 per cent. lower than they have ever been known before. This falling off is attributed to the increased importation of Australian wool in Europe, and the consequent retaining of Syrian wool for home consumption, on account of the expense of inland transport being so great that little profit could be derived from exporting it to markets where prices were low. The third article drawn from the province is cotton, of which 10,000 bales have been exported, at the rate of 1,200 piastres per quintal, in the commencement of the year, rising to 1,800 piastres towards the end of it, as the European markets become more favourable. Cotton might be exported from here in a much greater quantity, if agriculture were more encouraged and less burdened by the Turkish Government. It requires a greater outlay of capital than any other crop; and the villagers are so much mulcted by onerous taxation, vexatiously collected, that they have not the means of extending the cultivation of cotton. They prefer sowing wheat and barley, which, once in the ground, call for no advance of funds until the harvest. The little cotton grown is thus sown merely in order that the necessary rotation of crops may be obtained to keep the land in good order. As an article of trade, as well as an article of cultivation, cotton also suffers great disadvantages. The impediments thrown in the way of its exportation by the Turkish system of customs dues were not altogether removed when, through representations in the proper quarter, the receipt of 8 per cent. on cotton in pods, besides the export duty on it after it was ginned, was discontinued. There still exists a charge not less unjust. Smyrna being the principal market for the sale of cotton in the Levant, Syrian exporters often send their goods to consignment there for re-shipment to Europe, as ensuring a more easy channel of exportation; but the Turkish custom-house authorities, although perfectly aware of the destination of the cotton being to Liverpool or Marseilles, refuse to let it pass in transit, and insist on levying 8 per cent. for shipment from one Turkish port to another, in addition to 1 per cent. export duty, according to the rate for this year. Cereals are exported in small quantities, only 11 vessels having received cargoes at Suedia, and the two regular shipping ports of this province, Alexandretta and Mersyna. The expense of transport from the interior to the coast is an effectual bar to this trade. Importation is in a most unsatisfactory state. That of colonial produce fluctuates with the general prosperity or decline of the country, the radius of consumption always remaining the same, as there is no transit trade. The people cannot afford the use of luxuries; and sugar has been imported in very small quantities. Manufactured goods from Manchester and Glasgow were imported in the year 1868 to the amount of only 17,000 bales, while in the previous years their importation was generally about twice as great."

Forthcoming Publications.

The Garden Oracle for 1870 is announced for early publication. The speciality of the forthcoming issue is a new and select list of the choicest dessert fruits, so

arranged as to indicate the seasons when they severally attain perfection, the mode of culture, and their respective adaptation to large and small gardens, to forcing and high fruit-growing establishments, and the most humble and unpretending amateur's garden. The descriptions of new plants, new flowers, new fruits, new vegetables, and new horticultural inventions and appliances are to be as full and accurate as usual, and the greatest care has been taken to render the selections of flowers, fruits, &c., for 1870 perfect as possible.

Patents.

From Commissioners of Patents' Journal, October 15.

Grants of Provisional Protection.

Aërial carriages—2827—W. H. Noble.
Anchors, &c.—2877—F. R. A. Glover.
Annealing pots, &c.—2874—G. Rose.
Areas, vaults, &c., ventilating, &c.—2869—B. F. Stevens.
Bale ties—2863—A. Keen.
Bolts, &c., machinery for forging—2882—W. Horsfall.
Bottles, &c., apparatus for filling with soups, &c.—2854—J. Winter, jun.
Brad-awls—2815—J. Taylor.
Bricks, &c., machinery for making—2911—J. F. M. Pollock.
Carriages, &c., axletrees for—2902—H. and A. Holmes.
Cartridges—2862—E. Ludlow.
Cloth, &c., apparatus for damping and pressing simultaneously the surface of—2765—V. Chemery.
Coal, &c., apparatus used in getting—2889—T. W. Bunning and W. Cochrane.
Coal mines, &c., draining the gas from—2775—J. Faulkner.
Cocks or taps—2897—S. Farron.
Coopers' hoops—2879—J. B. Bradshaw.
Corkscrews—2885—F. Hazeldine.
Disinfectants, manufacturing—2771—J. M. and J. B. Spence.
Drying machines—2767—W. E. Gedge.
Drying stoves, suspending fabrics in—2787—W. Harper.
Electric telegraphs—2875—C. T. Bright.
Elevators for agricultural purposes—2822—J. W. Billiatt.
Engraving on metals—2871—J. A. Hartmann.
Fire-arms, breech-loading—2853—R. L. Hickes.
Fire-arms, breech-loading—2904—E. Russ and H. and E. Hammond.
Fire-arms, &c., breech-loading—2692—T. Restell.
Fountain pens and pen holders—2858—J. Butcher.
Funnels for measuring and pouring liquids into vessels—2892—E. Smethurst.
Furnaces, absorbing and utilising the noxious vapours and gases arising from—2849—F. S. Baiff.
Gas governors—2866—R. Broadbent.
Gas retorts, utilising waste heat from the furnaces of—2836—A. F. Wilson.
Grain, &c., drying—2772—W. E. Newton.
Guns, breech-loading—2797—G. W. Rendel.
Hat brims—2839—H. Woolf.
Horse shoes—2769—F. Trench and E. C. Warner.
Horses, &c., clipping—2791—J. W. More and J. Norman.
Knitting machines, &c.—2813—F. Armstrong.
Lamp sockets—2872—F. Gräu.
Leather driving bands—2810—T. R. and T. W. Harding.
Leather, manufacturing pressed—2852—E. A. A. Hugo.
Lifting jacks—2829—J. Williams.
Lighthouses, &c., apparatus employed in illuminating—2809—J. R. Wigham.
Locks—2846—J. Dewe.
Locomotive engines, &c.—2801—F. W. Fox and E. Walker.
Looking-glasses, apparatus used in silvering—2864—C. A. Maugin.
Looms—2811—W. E. Newton.
Mail bags—2250—J. Dewe.
Maize, treating and separating the constituents of—2837—J. Anderson.
Manual power, apparatus for utilising when employed in driving machinery—2799—C. de Bergue.
Metals, ornamenting—2901—B. Hunt.
Millstones—2821—H. Swann.
Monetary instruments, apparatus for preventing alteration of values in—2825—W. R. Lake.
Oakum, machinery for spinning—2793—S. G. Archibald.
Oil, &c., apparatus for expressing—2881—T. Atkinson.
Oils from minerals, distilling—2803—G. Bennie.
Ordnance, side arm for clearing the chambers and rifling of—2783—J. T. Greenfield.
Paper, &c., instrument for ruling lines on—2850—J. Bonn & J. Nitsch.
Penholders—2861—T. Buck and G. Messenger.
Pirns, winding thread or yarn upon—2838—J. P. Kerr and W. McGee.
Pottery kilns, &c.—2823—H. Y. D. Scott.
Printing and embossing, machinery for etching or engraving cylinders used for—2860—W. Edmondson.
Printing ink—2890—J. Kircher and E. Ebner.
Printing rollers—2817—R. and H. Harrild.
Printing without heat upon wood used for cases, &c.—2909—E. B. de Léon.
Pumps—2887—L. Byrne.
Pumps, &c.—2763—R. C. Wallace and D. Crawford.
Rag engines for preparing paper pulp—2905—T. F. Newell.
Rails or bars, machinery for bending—2896—C. E. Spooner.
Railway carriage, automatic—2777—B. Hunt.
Railway signals—2907—E. Tyer.
Railways—2903—W. R. Lake.
Railways and tramways—2910—W. E. Newton.
Railways, joining the rails of—2854—G. A. Huddart.
Refrigerators for cooling worts, &c.—2906—E. A. Pontifex.
Rock, &c., apparatus for boring holes in—2878—F. F. Villepigue.
Rocks, &c., apparatus for splitting—2847—H. L. Bolger & J. Meekin.
Screws—2851—J. H. Johnson.
Sewing machines—2855—W. E. Newton.
Sewing machines, hemmers for—2873—J. N. Batey.
Ships, &c., constructing and propelling—2865—E. D. Farcot.
Sized paper, manufacturing—2807—G. T. Bousfield.
Soda crystals, &c., substitute for—2819—J. Buchanan.
Steam boilers—2840—W. Horton.
Steam boilers—2894—J. Clayton.
Steam engines, metallic pistons for—2898—E. Wigzell and J. Pollit.
Steam engines, &c., slide valves and pistons of—2893—T. Adams.
Steel and iron, &c., welding—2870—P. R. Hodge, C. Hengst, and N. Wilson.
Stone, &c., machinery for crushing—2833—L. Wray.
Stoves and fire-places—2857—G. S. and H. Whitechurch.
Suspension bridges, &c., manufacturing bars of wrought iron or other metal used in constructing—2888—H. Howard-Keeling.
Umbrellas, &c.—2873—J. Critchley.
Umbrellas, &c.—2880—C. Montagu.
Valve cocks—2900—J. W. Powell.
Valves or cocks—2805—R. Harlow.
Vehicles, apparatus for indicating and registering the distances travelled by—2856—A. J. Eli and H. Sawahn.
Vehicles, self-acting apparatus for adjusting the load in ascending or descending a hill, &c.—2843—J. Lund and E. Townend.
Velocipedes, bearings of the wheels of—2841—J. Reeves.
Velocipedes, means of propelling—2779—R. Collis.
Warping or beaming machines—2876—C. Mather and W. Rossetter.
Washing machines—2908—W. H. Horsley.
Watches, &c.—2785—T. B. Daft, E. Axmann, and T. W. Willin.
Watches, &c.—2842—A. E. Fridlander.
Waterproof coats and leggings—2868—J. Reid.
Weighing machines—2773—J. Mackenzie.
Wool, machinery for combing—2885—W. Morris and J. Teal.
Wool, &c., machinery for cleaning—2895—W. Richardson.
Yeast or barm, preparing—2867—A. Heathorn.

Inventions with Complete Specifications Filed.

Guns, cartridges, and projectiles—2944—E. H. C. Monckton.
Land cultivators—2956—W. R. Lake.
Parlour or roller skates—2917—W. P. Gregg.
Pianofortes, &c., pedals and damping apparatus for—2923—W. R. Lake.
Railways—2943—E. H. C. Monckton.
Warp ends, machinery for joining—2948—J. H. W. Biggs.

Patents Sealed.

1184. E. T. Hughes.
1193. J. Horsley.
1199. A. V. Newton.
1202. L. Goetz.
1205. N. Wilson.
1210. K. S. Mackenzie.
1216. W. F. Reynolds and J. A. Mays.
1238. G. White.
1272. A. Jack.
1377. D. Adamson.
1521. F. Walton.
2343. G. W. Murray and G. M. Garrard.
2366. A. B. Ibbotson.

From Commissioners of Patents' Journal, October 19.

Patents Sealed.

1219. P. R. Hodge.
1220. E. O. Catrin.
1222. J. W. McCarter.
1227. C. D. Abel.
1228. C. M. Barker.
1234. J. Holding.
1242. G. G. Tandy.
1247. W. Palliser and T. English.
1250. W. A. Lyttle.
1254. J. Whittaker.
1258. E. Tatham.
1288. W. E. Newton.
1314. T. Bostock.
1327. R. Elsdon.
1328. W. Spence.
1344. W. B. Robins.
1402. R. Fennelly.
1407. F. Leonardt and H. Hewitt.
2544. B. Hunt.

Patents on which the Stamp Duty of £50 has been paid.

2638. D. Evans.
2658. F. Meyer, W. Wainwright, jun., and T. P. Pascoe.
2670. W. H. P. Gore.
2659. G. Lake, jun.
2744. J. Watts.
2714. O. L. Hopson and H. P. Brooks.
2672. J. Smith and J. J. Rowe.
2679. J. Brönner.
2686. C. A. Girard.
2710. E. B. Bigelow.

Patents on which the Stamp Duty of £100 has been Paid.

2756. C. Thomas.
2813. B. Lauth.
2789. E. A. Cowper.
2836. G. T. Bousfield

Journal of the Society of Arts.

FRIDAY, OCTOBER 29, 1869.

Announcements by the Council.

Notice to Members.

The One-Hundred-and-Sixteenth Session of the Society will commence on Wednesday, the 17th November, when the Opening Address will be delivered by Lord Henry G. Lennox, M.P., Chairman of the Council, and when the Prince Consort's Prize, awarded at the last Examinations to Mr. William John Wilson, will be presented.

The following are the dates of the Wednesday evening meetings, the chair being taken at 8 o'clock:—

1869.	November	—	—	17	24	
„	December	1	8	15	22	—
1870.	January	—	—	19	26	
„	February	2	9	16	23	
„	March	2	9	16	23	30
„	April	6	—	20	27	
„	May	4	11	18	25	
„	June	—	—	—	—	29*

For the Meetings previous to Christmas, the following arrangements have been made:—

November 17.—Opening Address by Lord Henry G. Lennox, M.P., Chairman of the Council.

November 24.—"On Silk Supply." By Thomas Dickins, Esq., Chairman of the Silk Supply Association.

December 1.—"On an Improved Means for Laying a Tunnel for the Transit of Passengers across the Channel." By Zerah Colburn, Esq., C.E.

December 8.—"On Prints and their Production." Being a sequel to a former paper, entitled "Engraving and other Reproductive Art Processes." By S. T. Davenport, Esq.

December 15.—"On India-rubber, its History, Commerce, and Supply." By J. Collins, Esq.

December 22.—"On the Recent Improvements in Small Arms, British and Foreign." By Capt. O'Hea.

A book of blank Tickets of Admission to the Meetings will be sent to each Member, who is privileged to introduce two friends to each Meeting on their presenting orders signed by him. Additional Tickets will be forwarded on application.

The first Course of Cantor Lectures for the ensuing Session will be "On the Spectroscope and its Applications," by J. Norman Lockyer, Esq., F.R.S., and will consist of three Lectures, to be delivered on Monday Evenings, the 6th, 13th, and 20th December, at Eight o'clock. Other courses will also be given during the Session, one, by A. W. Williamson, Esq., F.R.S., Professor of Chemistry in University College, London, "On Fermentation, especially in connexion with M. Pasteur's Researches," having been already arranged. These Lectures are open to Members, each of whom has the privilege of introducing two friends to each Lecture. Tickets for this purpose will be forwarded in due course.

Members are reminded that, should any of their friends wish to join the Society, the opening of the Session is a favourable opportunity for proposing them.

* The Annual General Meeting: the Chair will be taken at Four o'clock. No Visitors are admitted to this Meeting.

Improved Cabs.

The Council of the Society of Arts offer the following medals for improved hackney carriages specially suited to the metropolis:—

The Society's Gold Medal for the best and most convenient open hackney carriage for two persons.
The Society's Silver Medal for the second-best ditto.
The Society's Gold Medal for the best and most convenient closed hackney carriage for two persons.
The Society's Silver Medal for the second-best ditto.
The Society's Gold Medal for the best and most convenient hackney carriage for four persons, either open or closed, or both.
The Society's Silver Medal for the second-best ditto.

Lightness of construction, combined with adequate strength and durability, will be especially considered in making the awards.

The awards will be made after actual trials of the carriages extending over a certain period.

Communications describing the carriages must be sent to the Secretary of the Society of Arts before the 1st January, 1870, the carriages to be sent to a place hereafter to be appointed.

The Council also offer the Society's Silver Medal for the best instrument, to be affixed to a cab or other hackney carriage, for indicating the fare as between the passenger and the driver, whether by registering the distance travelled or otherwise, and which instrument shall also indicate, for the convenience of the cab-owner and of the driver, the total distance travelled during the day and the total amount earned. The instruments competing, with full descriptions of their construction, to be sent to the Society's House before the 1st January, 1870.

Competitors may, at their option, sign their communications, or may forward with them sealed letters containing the name and address of the writer.

The Council reserve to themselves the right of withholding all or any of the medals, in case none of the carriages or instruments possess, in their opinion, sufficient merit.

In the trials of the several carriages, the small amount of vibration and noise will be duly considered by the judges.

Subscriptions.

The Michaelmas subscriptions are due, and should be forwarded by cheque or Post-office

order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of Institutions.

City of London College.—The annual distribution of prizes and certificates took place on Tuesday evening, the 26th October, in the rooms of the College, Sussex Hall, Leadenhall-street. They consisted not only of prizes given by the college, but those awarded by the Society of Arts and the Government Department of Science and Art. The distribution took place under the presidency of the Lord Bishop of London.—The Rev. R. Whittington, the principal, thanked his lordship for attending on that occasion, and thus continuing to evince the deep interest he felt, when Bishop of Lincoln, in that institution, now that he was Bishop of London. The average number attending the college annually was 750, and of 56 candidates who went up from this college to the Society of Arts Examinations not one was plucked. Students of that college had obtained also the Prince Consort's prize three times out of seven, and 34 first-class certificates during the present year. He was also happy to inform the meeting that in almost every case where they went up for competitive examination, for offices in the civil service, they had succeeded; and it was his duty and pleasure to tell his lordship and the meeting that Mr. Alderman and Sheriff Cotton had given a prize of £5 for modern languages, and Mr. Alderman Finnis £5 annually, to increase the prizes already in existence.—His lordship then proceeded to distribute the prizes, and then addressed some observations to the meeting. He had, he said, learned during his lifetime that it was pleasanter to examine than to be examined, and could assure them that he felt great pleasure in distributing prizes among the successful candidates. He had long taken a deep interest in the success of institutions like the present. They all knew that civilisation generally travelled from the east to the west of London, and when the idea was first started of founding Metropolitan Young Men's Classes, it was upwards of two years before the movement, which commenced in Bishopsgate-street, reached Piccadilly. He had at the time four classes in his own parish of St. James's, Piccadilly, one of which was under his own immediate care, and he could assure them that the efforts then made were highly successful. The movement had only commenced at that time, and now, after so many years' absence from London, he found this City of London College flourishing beyond the hopes of its best friends. He saw it had its own buildings, its own professors and tutors, and was under Royal patronage. For that result he congratulated the Rev. Mr. Whittington and the members of his council.—Sir John Lubbock moved a vote of thanks to the Society of Arts for the number of prizes they had given; and, in reference to his proposed plan for improving the education of bankers' clerks, he begged to assure them that Mr. Whittington and the City of London College gave their kind co-operation in the matter, for which he expressed his cordial thanks.—The Rev. Wm. Rogers seconded the motion, and congratulated the meeting on the fact that, although the numbers were not increasing, the college was really popular, which he believed was principally owing to the education given, based as it was upon religion.—The motion was unanimously carried.—The Rev. Dr. H. Browne moved a vote of thanks to the examiners, who, by the sanction of their names and their exertions, had done so much good, which was also carried.—A vote of thanks was next passed to the professors and the other officers of the college, after which the Lord Bishop received a vote of thanks for his attendance, and the proceedings terminated.

EXAMINATION PAPERS, 1869.

(*Continued from page* 876.)

The following are the Examination Papers set in the various subjects at the Final Examination held in April last:—

THEORY OF MUSIC.

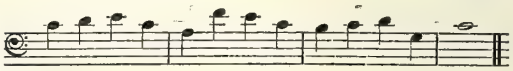
THREE HOURS ALLOWED.

RUDIMENTS OF MUSICAL GRAMMAR.

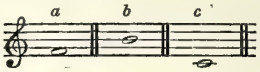
(*Nos.* 1 *to* 4 *to be answered on music paper.*)

1. Give an example (in musical notation) of every kind of time with which you are acquainted. Place the time signature at the head of each.

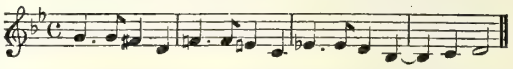
2. Write the following, at the same pitch, on the treble or any other stave:—



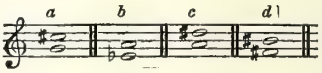
3. Add a perfect fourth to (above) *a*, a perfect fifth to *b*, and a minor seventh to *c*.



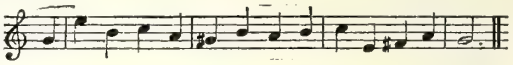
4. Transpose the following into *Si* (B) minor:—



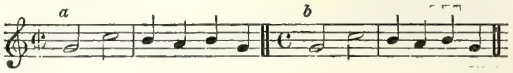
5. In what scales or keys (severally) are the following tritones?



6. Into what scales or keys does the following modulate:—



7. How many beats in a bar should be made to *a*? How many to *b*?

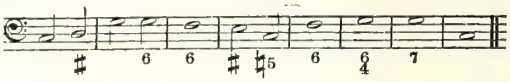


8. Give as many names of musical composers as you can, adding those of their native countries, with the centuries in which they flourished.

HARMONY.

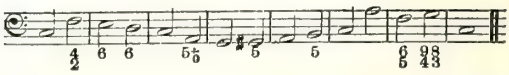
Nos. 1 *to* 7 *to be answered on music paper.*)

1. Add three parts to the following, introducing as many discords by suspension as can be properly prepared, sounded, and resolved:—

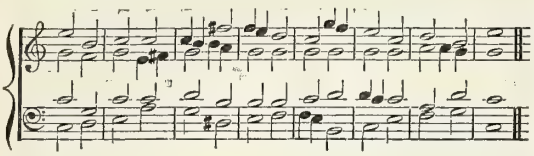


2. Write the perfect cadence (discord of the dominant seventh and its resolution) in the keys of *La* (A), *Si*♭ (B♭), *Do* (C), and *Re* (D).

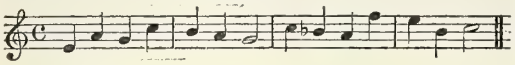
3. Add three parts to the following:—



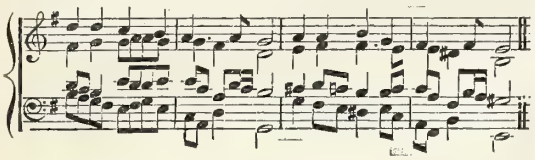
4. Figure the bass of the following:—



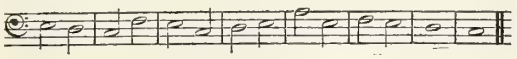
5. Harmonise the following:—



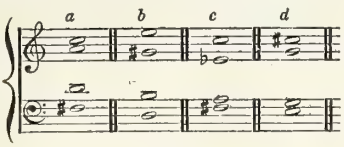
6. Put the following into score for treble, alto, tenor, and bass, using the proper clefs for each:—



7. Add a part, or parts, in any kind of counterpoint, to the following:—

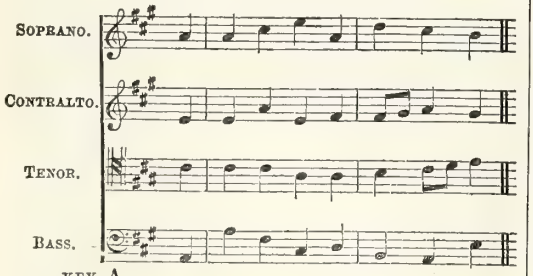


8. What are the roots of the following chords:—



ELEMENTARY MUSICAL COMPOSITION.

1. Continue the following, so as to make a common metre tune of eight bars (or measures). There is a close on the dominant (a SOH cadence) for the first line which is here given; let there be a modulation into the key of the sub-dominant (the first flat key) and full close (perfect DOH cadence) in this key for the second line; a return to the original key, and close on the submediant (cadence on LAH) for the third line, and a full close on the tonic (perfect DOH cadence) for the fourth line. The candidate has to compose six bars (measures) for the three last lines, so completing the eight bars (measures) of the whole. There must be no changes of key but those here specified. Those who write in the common notation are requested to write all the exercises in full vocal score as below, not two parts on one staff:—



KEY A.

:d	l	:m	s	:d	f	:m	r
:s,	s,	:d	s,	:l,	l,.t,	:d	t,
:m	m	:m	d	:d	r	:m.f	s
:d,	d	:l,	m,	:f,	r,	:d,	s,

2. Compose to either of the following verses of poetry an air for soprano, with an instrumental or vocal bass, properly accentuating the words, and generally expressing their sentiment:—

If I had thought thou couldst have died,
I might not weep for thee;
But I forgot, when by thy side,
That thou could'st mortal be;
It through my mind had never pass'd,
That time would e'er be o'er;
When I on thee should look my last,
And thou should'st smile no more.

Charles Wolfe, 1791—1823.

O come! for the lily
Is white on the lea;
O come! for the wood doves
Are paired on the tree;
The lark sings with dew
On her wings and her feet;
The thrush pours his ditty
Loud, varied and sweet.
So come, where the twin-hares
'Mid fragrance have been,
And with flow'rs I will weave thee
A crown like a queen.

Allan Cunningham, 1784—1842.

3. Compose a piece for four voices (SCTB) of from sixteen to twenty-four bars (measures), common or triple time (*i.e.*, in any kind of measure), to either of the following extracts:—

One by one the sands are flowing,
One by one the moments fall;
Some are coming, some are going;
Do not strive to grasp them all.
One by one thy duties wait thee,
Let thy whole strength go to each;
Let no future dreams elate thee,
Learn thou first what these can teach.

Adelaide Anne Procter.

Sing unto the Lord, for he hath done excellent things; this is known in all the earth.

Cry out and shout, thou inhabitant of Zion, for great is the Holy One of Israel in the midst of thee.

Isaiah, xii.

THE REPORTS OF THE "DÉLÉGATIONS OUVRIERES" ON THE PARIS EXHIBITION.

Some time after the Society of Arts had announced its intention of giving facilities to English workmen to proceed to the Paris Exhibition, to report thereon, the French government, following the Society's example, issued a decree which invited the various trades of France to elect delegates, to be sent to Paris to report, like the English artizans, upon the trades represented at the Exhibition.

Accordingly, a commission was formed, consisting of M.M. Victor Dillais, Baugrand, Arnould Desvernay, Arnaud Jeanti, Balsan Martin, Barbedienne, Barbezat, Bignon, Binder, Blaise (des Vosges), Butat Callou, Carlhian, Chevet, Christofle, Dentu, Dommartin, Dréolle, Durenne, Dusautoy, Ducuing, Fauler, Flaxland, Fourdinois, Froment Meurice (Emile), Germain, Gillou, Girardin (Emile de), Godillot, Gouin, Grellou, Groult, Haas, Halphen (Germain), Klein, Kœnigswarter, Jenty, Larsonnier, Latour, Laville, J. Lebaudy, Lebel, Lenoir, Lévy (Fr.), Louvet, Menier, Michau, Michel (Léon), Moréno-Henriques, Muron (Casimir), Mourceau, Normand, Payen (Alph.), Pereire (Henri), Picard, Plée (Léon), Ravaut, Renard, Rondelet, Roulhac, Rouvenat, Salmon, Sauvage, Servant, Teissonnière, Thibaut (Germain), Thiébaut, Varin, Vitu (Auguste), and presided over by M. F. Devinck, for the purpose of securing facilities to the delegates visiting and studying the Exhibition, and further to insure the publication of the reports which would be drawn up by the delegates.

Upwards of 150 of the Parisian trades and professions, &c., responded to the invitation, and the results of the labours of the delegates have now been published. The work consists of three large quarto portfolios containing the reports, which occupy altogether 1,400 pages.

The following is a translation, by Mr. A. S. Bury, of an extract from the report on Education in General by the Delegates of the National Society for the Extinction of Pauperism, on the 10th Group of the Paris Exhibition, 1867:—

Of all the obstacles that men devoted to the well-being of humanity, and disposed to act with a view to social progress, have to contend with, there is none more difficult to overcome than that which springs from ignorance. How many means of emancipation for the working-men have already failed for want of being understood! How many great conceptions have fallen to the ground, because the small number of privileged, educated persons have fancied they perceived in them a danger to their prerogatives! What catastrophes, what social evils, what offences, and even what crimes have been the result of the darkness maintained in the bosom of the multitude! In order to be convinced of the sad truth that ignorance often strengthens the arm that strikes unjustly, and is the principal cause of those culpable acts which the tribunals are continually called upon to suppress, it will suffice to glance at the report of the Minister of Justice, and in the chapter which relates to the Court of Assizes, it will be seen that, during the period from the year 1861 to 1865, out of 22,752 persons accused, 18,759 could neither read nor write; and that, out of 2,218 convicts imprisoned at Toulon, on the 1st January, 1865, more than half (1,330) could neither read nor write.

The application of universal suffrage, of which we are so proud in France—and, be it said at the same time, of which we make so bad a use—the application of universal suffrage is corrupted by reason of the ignorance which still clings to the inhabitants of certain localities, and even to some classes of the working-men in the city. But, with the latter, a kind of education takes the place of actual knowledge, and the evil is less to be feared than in the country. Read what M. Charles Robert* narrates to the persons in a state of convalescence at Vincennes:—"The scene took place in one of the western departments. At the close of the late municipal elections, in 1866, a mayor, not having been re-elected member of the municipal council, was replaced at the nomination of the prefet, who was desirous of conforming to the instruction of his government, namely, that a mayor should be chosen, if possible, from among the municipal councillors. The prefet had, therefore, appointed a successor, in the assurance that he had responded to the wishes of the electors. Some time after, a large deputation of the inhabitants of the parish waited on the prefet, and being admitted to his presence, the spokesman thus addressed him:—'Ah, Mr. Prefet, we are in great distress. We liked our former mayor very much, and we have just heard that he has been replaced.' 'But,' replied the prefet, 'if it be true that you really liked him, and were satisfied with his administration, why did you not re-elect him a municipal councillor? Why have you yourselves excluded him from that assembly?' The spokesman of the deputation seemed rather confused, but, after a little hesitation, at last replied, 'We thought we had re-elected him, but this is how it happened. The former mayor, whom we all liked (and we are the largest party), had an opponent in the parish, who was endeavouring by every means to attain to the councillorship. This person had some lists printed, which we distributed from door to door, bearing the names of the candidates, but that of our former mayor was omitted. We cannot read, and when we inquired of this person whether the late mayor's name was included in these lists, he replied, Yes. We accordingly went to vote with them, and were persuaded that our mayor would be elected by a large majority, and, when the result of the ballot was made known, we were astounded at finding that he had not a single vote.'"

We do not know what thoughts the narration of these fraudulent municipal elections may have suggested to you, but from it we infer that, if it could be admitted for a moment that the power which rules us was capable of forgetting its dignity, even for an instant, it would be easy for its agents, in a similar case, to act as the opponents of the mayor above-mentioned have acted, without fear of being disturbed; and this famous principle of universal suffrage, so often invoked when we complain of the want of liberty, would then be no more than a dreadful mockery.

Ignorance gives rise to mistrust, and thereby impedes progress in every sense. By referring to statistics, it will be seen that, in those parts where the people have received instruction, an extraordinary industrial improvement prevails. Dr. Melier, in a report to the Academy of Medicine, says:—"If good education is a source of wealth, it is also a source of health and physical well-being for the labourer."

We have before us a novel statistical map, by M. Manier, of the departments of France, classified according to the amount of education exhibited in each. To these maps, in which our eighty-nine departments are divided into five categories, each distinguished by a separate colour, is annexed a table, showing the number of conscripts per 100 who could neither read nor write, and the number of persons married in the year who could not sign the marriage certificate. The result shown is that, in 1867, the number of conscripts unable to read or write was at the rate of 23 per cent., and the number of persons unable to sign their marriage certificate was at the rate of 33·42 per cent.

The following are the two extremes:—Department of Meurthe, two per cent., and the department of Haut Rhin, fifty-six per cent., of conscripts unable to read or write. Department of Bas Rhin 1·44 per cent., and the department of Haute-Vienne 74·48 per cent. of persons unable to sign their marriage certificate.

At Paris, during the month of June, 1867, out of 3,024 bridegrooms, 200 were unable to sign their name. *(Statistical Report).*

M. Manier has not confined himself to a map of France, but has made one of a similar description of Europe generally, classifying the countries in four categories, with the following explanations, which we reproduce:—

First Category.—*Countries most advanced as regards Education.* *(See Map, p. 892).*

Saxony.

"For some time past, the inhabitants of the kingdom of Saxony have all been able to read and write, and are in possession of indispensable acquirements. Education is compulsory. It would not be possible to find throughout the kingdom a child that had never attended school. In 1863, the return of the number of children registered for attendance at the 1,741 village schools showed an average of 137 per school, and the average number of actual scholars was the same. Only two schools had one scholar less; most of them received more than the legal number. In the 275 town schools the result was analagous."

Switzerland.

"The inhabitants can all read and write, and possess other indispensable knowledge. Nearly all the children, from the age of 7 to 15, receive a sound education. In the canton of Zurich, the proportion of scholars is 1 in every 4 persons; in the canton of Thurgau 1 in 5; in the canton of Vaud, nineteen-twentieths of the children attend school. In the canton of Berne, the conscripts can read,

* M. Charles Robert, Councillor of State, and Secretary to the Minister of Public Education.

write, and cipher correctly; only 3 or 5 per 100 are unable to do so; there are 7,160 schools in Switzerland, containing 390,000 pupils. Switzerland expends 1f. 95c. (about 1s. 7d.) per head for education, which is compulsory."

Small States of North Germany.

"In all these states education is general and compulsory. It is seldom one meets with an an illiterate person. All the children attend school. The above specially refers to the Grand Duchy of Nassau, the Grand Duchy of Hesse, Hanover, and the Grand Duchy of Weimar-Eisenach. There are a great many schools, all well organised."

Denmark.

"The Danes, with very few exceptions, can all read, write, and cipher. The children attend school to the age of 14. Education is compulsory. There are 2,520 schools, containing 161,495 pupils."

Prussia.

"Three per cent. of the conscripts are illiterate. Nearly all the children, except in some of the eastern provinces, attend school regularly. In 1867, there were 126,197 schools in Prussia, containing 3,090,294 pupils. Education is compulsory."

Sweden.

"The proportion of the inhabitants of Sweden unable to read or write is 1 in 1,000; 1 in 5 attends school. Education is compulsory."

Baden.

"All the children receive education. By virtue of a law passed in 1864 by the two chambers, unanimously with the exception of two votes, the schools are under the direction of a commission elected by the heads of families, are self-supporting, and not dependent either on the State or Church."

Wurtemberg.

"There is not a peasant, or a girl in the poultry-yard, or in the tavern, that cannot read perfectly, and write and cipher. Every village of thirty houses is provided with a school. All the children attend school. Education is compulsory. In 1838, the proportion of scholars was 1 to 8 of the population."

Holland.

"Public relief is withdrawn from all poor families who neglect to send their children to school. The number of illiterate persons is said to be at the rate of three per cent. In 1838, the proportion of scholars was one to eight of the population."

Norway.

"Nearly all the Norwegians can read, write, and cypher tolerably. One in seven attends school. Education is compulsory."

Bavaria.

"On an average, seven per cent. of the conscripts have had little or no education. There are 8,469 schools, containing 611,451 pupils. Education is compulsory."

Second Category.—*Countries less advanced as regards Education*:—

France.

"Twenty-three conscripts out of a hundred can neither read nor write. In 1866, thirty-four brides and bridegrooms were unable to sign their marriage certificate. More than 200,000 children, from seven to thirteen years of age, do not receive any education. Of those who have been to school, about thirty-four per cent. leave it knowing nothing, or next to nothing. The parts where ignorance is most prevalent are—the peninsula of Brittany, the regions to the south of the Loire, in the centre and to the south of France, and the districts bordering on Spain and the Mediterranean. There are 74,340 primary and infant schools in France, receiving 4,984,108 children, and 32,383 evening classes, attended by 830,000 adults. The amount allowed by the state for education is 55 cents. (about 5d.) per head."

Belgium.

"In 1863, thirty militia-men out of 100 could neither read nor write. In 1865, out of 1,964 brides and bridegrooms, 1,032, or forty-nine per 100, were unable to sign their marriage certificate. There are 4,814 schools, and nearly 600,000 pupils."

England.

"Education is diffused throughout Scotland; it is mixed with ignorance in England, and little developed in Ireland. About half the inhabitants of Great Britain can neither read nor write. In 1858, out of 100 prisoners at Preston, forty were ignorant of the name of Jesus Christ, and sixty of the name of their Queen. The free associations are making every effort for the advancement of education. There are 59,065 schools, containing 2,535,462 pupils. The amount expended by Great Britain on education is at the rate of 1f. 19c. (about 11d.) per head.

Third Category.—*Countries in Arrear as regards Education.*

Italy.

"Education is tolerably diffused in the northern provinces and in Tuscany, but in the south and in Sicily the people are immersed in the depths of ignorance and superstition. Taking the various provinces together, the mean result is a general state of ignorance. In 1864, there were 31,803 schools, attended by 1,177,914 pupils. The amount expended by the State on public education is at the rate of 41c. (about 3½d.) per head."

Austria.

"In the German provinces the people are educated; they are very ignorant in Transylvania, Gallicia, Hungary, and the military frontier. Since 1774, education has been compulsory throughout the empire; but the rule is only observed in the German provinces. In the Tyrol, in Bohemia, and Moravia, 99 out of 100 of the children attend school. The peasants of Gallicia cannot read, nor do they send their children to school. It is right to add that, in conformity with the disposition of the people, no schools are established in the villages. It is only in the towns that the children go to school, and that voluntarily. In Hungary, more than half the children do not attend school. In Croatia, hardly 20 per 100 of the children go to school. A certificate of having acquired some religious instruction is necessary in order to obtain an apprenticeship, or to be married."

Greece.

"There is a great want of indispensable acquirements. Ignorance is general. The proportion of scholars is 1 to every 8 of the population."

Fourth Category.—*Countries very backward.*

Pontifical States.

"The inhabitants of the Pontifical States are very ignorant."

Spain.

"Education is very backward in Spain, although there are 24,353 schools, containing 1,251,653 pupils. In 1856, the proportion of scholars was 1 to 65 of the population. The people are superstitious and ignorant. The amount expended for education is at the rate of 40c. (about 3½d.) per head."

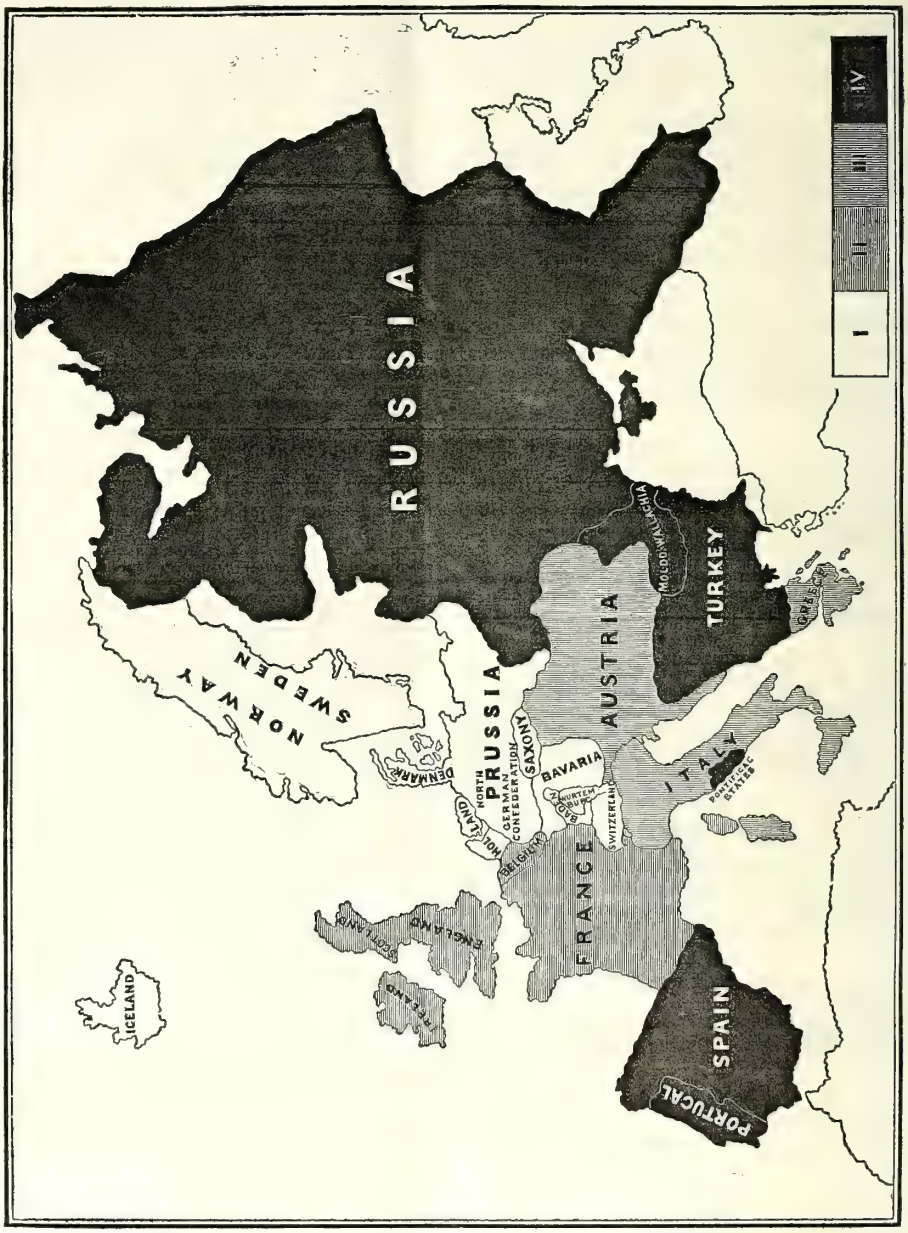
Portugal.

"The people are ignorant, the schools are few in number, and badly attended. The proportion of scholars is 1 to 81 of the inhabitants."

DIAGRAM SHOWING THE STATE OF INSTRUCTION IN EUROPE

PREPARED BY M. J. MANIER,

to accompany the Report on the 10th Group of the Paris Exhibition of 1867 by the Delegation of the National Society for the Extinction of Pauperism, extracted from the "French Artizans' Reports on the Paris Exhibition, 1867," published under the Presidency of M. F. Devinck, by Messrs. A. Morel, Paris.



I. (White.)—Well educated.
II. (Horizontal.)—Educated.
III. (Perpendicular.)—Partially educated.
IV. (Black.)—Ignorant.

MOLDO-WALLACHIA.

"Nearly the whole population is devoid of education."

RUSSIA.

"Few of the peasants can read or write. Out of a population of 82,000,000 comprised in this empire, only 3,500,000 (or 4 per 1,000) have received any education, and of this number a fourth part is included in Poland. The amount expended by Russia (in Europe) for public education is at the rate of 29c. (about 2½d.) per head."

TURKEY.

"Ignorance is universal, and there is not the least acquaintance with the most indispensable requirements."

From these tables, the fact may once more be asserted that the backward state of education in the several countries is in proportion to the influence of the clergy, whatever it may be, in public affairs. Switzerland, desirous of ranking foremost, as it is placed on the map, has perfectly understood this fact. The Grand Council of Berne has just decided, by 228 votes against 77, that experience has proved the incompatibility of the observance of the provisions of the law concerning education with the absolute obedience that members of religious orders owe to their superiors, and, therefore, no person belonging to these orders can hereafter be admitted to the office of teacher. Consequently, all clerical schoolmasters attached to public primary schools will be considered as under notice to quit.

Here is a small country giving the example of an important and frank resolution; it has not gone to work in any round-about manner; it simply said, "Here are people who supply bad intellectual seed; there is no hope that at some future period they will be able to provide any better; they must be radically swept away" —which has been done. In other countries they talk; discussions take place; disputes are carried on in the public press; speeches are made at meetings; and there it ends. At the expiration of a few days, things go on the same as before.

We have already said that to ignorance may be attributed the cause of many wicked actions. M. Cousin, one of our former ministers of education, was in Holland in 1836, and remarking that the schools were good and numerous in that happy country, and that there were few young persons to be found in the prisons, wrote as follows:—"I admire with sorrow the inconsistent zeal with which certain philanthropists, and even certain governments, occupy themselves with the subject of prisons, to the neglect of schools. In the absence of any training or education, they allow crime to be formed, and vile habits to take root during childhood; and, when crime is strong and deep-rooted, then they undertake to cope with it. They endeavour to put it down by fear and by punishment, or, in some sort, to overcome it with soft words or caresses. Thought and money are expended in vain, and the result is astonishment at all being useless, because it is simply contrary to reason. Without doubt correction is of importance, but prevention is still more important. The education of the people is the necessary foundation of good prison government. I approve as strongly as possible of the schools of correction, but I consider them destined to be of little service as long as they remain unsupported by public schools, universally established and compulsorily attended, and in which instruction would form but one of the means of education. The expense of these schools on the different towns would result in the committal of fewer offences and crimes, and consequently would reduce the expenses for police, and for repression and correction."*

You are indeed right, M. Cousin, for allowing that a doctor is able to cure a wound, the scar will still remain, the result of the remedies applied. Prevention is certainly better than cure.

We should not have recorded such opinions and facts, so conclusive in favour of public education, but that we persist the more in maintaining that it is a victory to be placed foremost of those that are indispensable to the success of moral and material reformation. We ask, then, that it may be developed far and wide over our country, and be made accessible to all citizens. Starting from that point, we maintain that primary education should not only be gratuitous, but compulsory; it is a measure of general interest, and no one can fail to admit its utility and efficacy, above all, in respect to the observance of those rights and duties that citizens owe towards one another. This question of gratuitous and compulsory primary education has often been treated, but never solved, We would say, in the words of a schoolmaster in the Department of Pas-de-Calais, whose opinion was asked relative to the compulsory system, "Why hesitate any longer? Necessity, sooner or later, will lead to compulsory education, and the opportunity of raising a whole people to welfare and order will have been lost." There is no reluctance to place restraint on liberty when material interests are at stake, but hesitation is shown when the chief interests of society are concerned. "The danger of a confusion of classes is also spoken of. But can the classification of a whole nation become confused because it is called upon to be educated. It is an absurd inference." But it is also said to be a revolutionary idea. "What does that matter," replies a schoolmaster of the north, "if it be a good one. A law framed for the prevention of moral infanticide would be neither less useful, nor more unjust, than that which punishes abortion, or useless cruelty towards animals."

As we have commenced, we will continue to quote the opinions of several schoolmasters, who have declared themselves in favour of compulsory and free education:—

"We do not ask for the severities of the Convention; and yet, if the designs of that revolutionary government had been executed, France would have been two centuries further advanced in civilisation."—(*Nord.*)

"We ought not to be allowed to escape from going to school any more than we are allowed to escape from the conscription. The security of the country depends as much on the good education of the people as on an armed force."—(*Nord.*)

"Has it not been found necessary to compel the adoption of vaccination and of the metric system? Few years would pass before the people, more enlightened as to their wants, would bless the legislator who introduced the system of compulsory education."—(*Oise.*)

"A law compelling attendance at primary schools, and accompanied by a wide extension of the gift of free admission, would be received with favour among the enlightened portion of the country people, without meeting with any strong opposition from the other portion. The nation is ripe for this great act."—(*Ardennes.*)

"Sad is the liberty that gives rise to ignorance and often to corruption. Society may justifiably make use of the remedy within its reach. Yes, it can, and it ought to do so."—(*Seine Inferieure.*)

"I think the only opposition would be on the part of the clergy."—(*Charente-Inferieure.*)

"With a government which is dependent on electoral power, education is due to everyone, as all have rights to exercise and duties to fulfil."—(*Lot et Garonne.*)

"In a country like France, whose institutions are based on universal suffrage, can it be said that the ignorance of so many in no way affects the nation as a whole? For liberty does not consist in doing all we wish, but only what does not injure others."—(*Aube.*)

"The State which is able to dispossess a proprietor of his land ought to be able to prevent a father from keeping his son in a state of ignorance. The means to accomplish this end are, I fear, severe, but its necessity is also extreme."—(*Haute-Soane.*)

In Germany and in Switzerland children are no longer compelled to attend school by force, or by means of punishment; they now go with pleasure, and have a liking for instruction, which diffuses itself imperceptibly throughout the family. Since the scholastic reformation in Switzerland, the people have become immensely changed; their manners have been softened down, they are more diligent, welfare is more general, and poverty, once so common, is no longer tolerated. In many parts where the prisons were formerly always occupied, they are now all the year round empty. Why should not public education be raised to the same level in France? Would it not be productive of like results?

"Free education would realise the most earnest desires of the rural population. The first and greatest obstacle to proper attendance at the country schools is undoubtedly the compulsory fees."—(*Pas-de-Calais.*)

"Children should be received at school on equal terms. The paying scholars invariably look down with scorn upon the poorer ones, admitted free."—(*Nord.*)

"The religious associations have, in some measure, accustomed the people to gratuitous education."—(*Nord.*)

"From close observations, I can testify to the school fees being a heavy burden on our peasants. I know that the actual poor are admitted free; but if to the free-list were added those who were in a position bordering on poverty, this list would then comprise two-thirds of the number of scholars. And I do not hesitate to

* On Public Education in Holland, 1837.

state, in spite of all I may read to the contrary, in writings more or less official, that free education would be a great boon, and received as such. The idea has, it is true, met with some opposition, but I have been struck with this fact, apparently inexplicable, that those most opposed to its realisation, either at deliberative assemblies or elsewhere, are they who sanction it, and even beg for it when it concerns schools belonging to different religious sects."—(*Loiret.*)

"With this system of gratuitous education, families in easy circumstances will undoubtedly bear the greatest burden; and it will be said, is it right that a family having no children at school should pay the same as those who have. I would reply that, in ten or fifteen years, this family might probably have become modified, and comprise several children."—(*Manche.*)

"The free list for the poor gives rise to odium and conflicts."—(*Cotes-du-Nord.*)

"In the poor parishes, payment for instruction and other expenses are insurmountable difficulties to attendance at the schools."—(*Pyrenees-Orientales.*)

"It matters little whether the rich send their children to the parish school or not. They are more interested than anyone that the interests of society should be protected."—(*Var.*)

"There is a great difference with respect to free education in towns and in the country. Due regard must be had to the situation of the peasants, who, being in narrow circumstances without being actually poor, are ashamed to ask for free admission. The required payment, with the necessary books, &c., amounts annually to about 40 francs (32s.); to this must be added the value of the child's labour, of which the father is thereby deprived, amounting also to about 40 francs. With the free gift of education, the schools would not be attended all the year round, but during the winter months, until the children had reached the age of 15 or 16."—(*Yonne.*)

"Here there are numerous objections to the proposed system. 'My child has his private tutor, and does not attend the parish school.' But, because you have a private keeper or guard, are you exempted from contributing to the salary of the rural constable? Because you keep within the boundary of your own grounds, are you exempt from taking the oath of allegiance? Because you have a well in your own yard, are you exempted from assisting in the maintainance of public springs of water? It must be borne in mind that the greatest safeguard to the fortunes of the rich is the education and the moral improvement of the people. To make them pay for education is to deprive them of it, or condemn them to a state of ignorance."—(*Doubs.*)

"In many important localities where there are assistant teachers, the school is divided into several sections, one of which, composed entirely of the very poor, is entrusted to the care of the least intelligent teacher. This is to be regretted."—(*Mayenne.*)

"Free admission is granted to persons comparatively wealthy, having an income of 1,000 francs (£40); and to the mayor's entire family."—(*Ardennes.*)

"There are often abuses of the system, to the prejudice of the master. Some of the municipal councillors enrol their children on the free list."—(*Doubs.*)

Several schoolmasters have explained how the school hours and the holidays could be arranged to fit in with work in the fields. The following are some of the remarks on the subject:—

"In summer, the school hours might be from six till eight in the morning."—(*Nord.*)

"From June to August, school might be held three times a day; from eight till half-past ten, for the young ones; from noon to two, for those employed at the harvest; and, again, from three to five, for the young ones. This arrangement would greatly please the country people."—(*Nord.*)

"They go to the fields with the cattle about eleven o'clock. Let school be held in the early morning during summer."—(*Loiret.*)

"Experience has proved that an amalgamation between tuition and husbandry is possible."—(*Haute-Vienne.*)

"Have only three hours tuition during the summer for those who are more than nine years of age."—(*Ariege.*)

"It has been found practicable and successful in Alsace to amalgamate school hours with field labour."—(*Bas-Rhin.*)

Let us continue to refer to the opinions of schoolmasters:—

"Some of the leading men of the village show a miserly disposition when the question of a tax for schools is mooted; some because they cannot comprehend the value of education; others because they have no wish to see education extended to the poor, saying that if all the world were able to read and write, there would be little or no distinction between those who were well-to-do and those who had nothing."—(*Nord.*)

"I know several excellent teachers who have been dismissed through the instrumentality of some influential persons, enemies to popular education."—(*Oise.*)

"The teachers are often dependent on persons opposed to education."—(*Finisterre.*)

"Some will remark that the parishioners are poor. I say they are penurious, badly disposed, and indifferent; the more so as they are influenced by some who look upon ignorance as an advantage. These truths may appear severe, but it is of the utmost importance that they should be exposed."—(*Haute-Vienne.*)

"In most of the parishes half the population is composed of petty farmers. If the latter, by means of privation and extra work, are enabled to send their children to school, the avarice and jealousy of the landlords are immediately roused, and the farmers, for fear of dismissal, are obliged to make their children work with them."—(*Dordogne.*)

"Generally, those charged with the supervision of the interests of the parish, as regards primary education, are they who are most opposed to its progress."—(*Gers.*)

"Some unconscientious persons have even said that the diffusion of primary education was the foundation of revolutions, and the principal cause of the neglected state of agriculture."—(*Basses-Pyrenées.*)

"The bad attendance of the schools may also be attributed to an opinion, false without doubt, but which has its influential supporters, and is promulgated and forced upon the public. I have often heard it said that the want of hands for agricultural purposes is caused by the extension of education, as those who have attended school show signs of ambition. I have no hesitation in replying that emigration, which is so justly complained of, is not the result of a diffusion of knowledge, but, on the contrary, of ignorance, and an ungovernable desire for wealth."—(*Gers.*)

"Many municipal councillors look upon education as a useless acquirement for poor girls."—(*Gers.*)

(*To be continued.*)

THE ORPHAN SCHOOLS, ASHLEY-DOWN, BRISTOL.

By George C. T. Bartley, Esq.

In considering means for the improvement or extension of any existing system, it is undoubtedly desirable to have as much evidence as possible of the working of that system. The education of the poorer classes of this country, as carried on at large institutions, must, therefore, at the present time be of considerable interest and importance.

Foremost among such establisments is the one at Ashley-down, near Bristol, which last year educated and provided for 1,600 children, and where, in a few

months, when the fifth house is furnished, no less than 2,050 children will be housed and entirely supported.

The history and remarkable manner in which these schools were commenced, and have hitherto been carried on, by Mr. George Müller, are so well known as to require but a passing notice. They were commenced about five-and-thirty years ago by this gentleman, in a small way, the means of support being entirely by voluntary contributions, Mr. Müller, as he says in his narrative, making it a point never to ask for money, but trusting entirely to Providence to supply the requisite means, in answer to prayer. The schools were first situated in Bristol, until, by degrees, they grew so much as to require regular school premises; a large building was accordingly erected at Ashley-down; to this, a second, of like proportions was soon added, then another and another, and now a fifth, at a total cost of one hundred and ten thousand pounds. The appearance of these fine premises is certainly imposing, built of excellent stone, and in every way calculated to stand for ages; they are, nevertheless, perfectly plain, and, both externally and internally, show that every penny has been most carefully laid out.

The ages and sexes of the children is as follows:—

Girls.		
Under eight years of age	280	
Over eight	822	
		1,102
Boys.		
Under eight years of age	208	
Over eight	290	
		498
Total		1,600

The income of the school, as already stated, is entirely derived from donations, and these are received from all parts of the world. Last year they amounted to £19,446 19s. 8d., including the amount realised by the sale of articles, such as jewellery, plate, &c., which were sent as donations. The cost per head of each child is given as £12 15s. 6d., including *every expense without exception*. The details of this important fact are not given in the report, and the institution being of a strictly private character, the accounts are published without many particulars which the outside world would be glad to know. True information on this item of cost would be the more desirable, as, even taking for granted that in the above annual cost no allowance is made for rent, it remains nearly sixpence per head per week cheaper than the great schools at Sutton and Liverpool.

The class of children who are thus clothed, maintained, and educated in this institution, which is probably the largest boarding school in the world, is very various. The appearance of the faces and shape of the heads indicate a superior class of child to that met with at the Hanwell District School, at Sutton, or at Norwood; though it is a fact that some of the children come from the parishes unions which these schools embrace; these are but few, however, and the majority are from healthier districts, and from superior parentage. The rules for admission to the school are very simple, and they are rigidly enforced by Mr. Müller. 1. No child is admitted unless lawfully begotten. 2. Nor unless he or she has lost both parents by death. 3. Nor unless he or she be in needy circumstances. No interest whatever is required to get a child into the school, nor is it expected that any money should be paid for admission; but a list is made in the order of application, and, according to this, the children, if fulfilling the above conditions, are eligible as vacancies arise. Strict investigation is made, and proper documents are required to prove that the three considerations are complied with.

The ages of the children vary from a few months to eighteen or nineteen, a large number being infants hardly able to walk. When once admitted to the school, children rarely leave it until a situation is found for them. Here, this institution has an immense advantage over the district schools, inasmuch as the whole time of each pupil, and of all the pupils collectively in the different classes, is entirely in the hands of the superintendent, without fear of interference on the part of pauper parents.

Many of the children come from unions in various parts of the country, and, as before stated, several from the London parishes. A large number are the children of parents in a superior class of life who have died and left their offspring destitute. It has been supposed that, as all the children have lost both parents prematurely, their constitutions are somewhat less hardy than the average. This may be so, more particularly when it is made known that, of all the children in the school, three-fourths have lost one or both parents from so fatal and hereditary a disease as consumption, but it seems probable that the regular habits, and excellent, though simple food which the orphans receive, more than compensate for this serious disadvantage, and in fact reduces the death-rate to much below that enjoyed by more favoured children, with whom the rules of diet, proper clothing, and attention are so often neglected, either through mistaken kindness, neglect, or ignorance.

During the year ending 26th May, 1869, only 10 deaths occurred in the school out of 1,600, or 6 in the 1,000. This makes the death-rate very low, though it must be borne in mind that there were not 1,600 children in the school during the whole year, but this number was made up on the completion of the buildings, the number at the commencement of the period being 1,149, and the dates at which the increase was made is not discoverable from the report. This somewhat increases the above rate.

The point next to be considered, having given this outline of the school itself, is the educational system pursued, and its success.

In the first place, the school is entirely on what may be called the whole-time system, in contradistinction to the half-time, that is to say, the children, from the time they get up to the time they go to bed, with the exception of play-time, are at *book-work*. The only exception to this is that the boys make their beds, clean their shoes, scrub their rooms, and work a little in the garden-ground round the orphan establishment, in the way of digging, planting, weeding, &c., and knit and mend their stockings; and the girls of course make their clothes and keep them in repair, and are taught all kinds of useful needle and household work.

The Boys' Schools.—All the five houses or schools are conducted on the same principle, and may, therefore, be considered as one. The subjects for study are reading, writing, arithmetic, English grammar, geography, English history, and a little universal history. The amount of knowledge of these subjects, imparted by the age of 14 or 15, when the boys have to be apprenticed, it is impossible to state, but, judging from the writing exercises of a large class approaching that age, there can be no doubt but that the Hanwell and Norwood children, in spite of their physical disadvantages, are much in advance of them. At these schools, it must be remembered, the half-time system is adopted, and but three hours a-day are given to book-work, the remainder to physical training. Again, in the general appearance of the boys, a stranger easily notices a want of smartness and deportment. There is a sort of awkwardness, no doubt accounted for by the absence of drill, which does not form part of the school work at all. The only attempt seems to be the marching, or rather slouching, round the school-room, in and out among the desks, at the same time singing a monotonous air. Such exercises as this can hardly have any good effect on the boys, either physically or morally. Drawing does not seem to be part of the curriculum, neither as a separate study, nor by being introduced into the writing lesson, a plan which has been tried with such good fruit at Hanwell. Again, another feature which is missing in this school, and which in other institutions is found to have so great an effect on all varieties of dispositions, is a

band. Among the boys at these schools there must be the material for an excellent band, and, to say nothing of the capital opening for young musicians, the effect on the whole school would be most beneficial, and, coupled with a systematic drill, would leave little to be desired, save the adoption of the half-time system.

As before stated, no part of the boys' time is devoted to industrial pursuits, their education up to the age of 14 or 15 when they are apprenticed, is entirely devoted to book-work in the subjects given above. From the experience of the half-time schools, there can be no doubt but that all that these orphans learn is imparted to the half-timers in the same number of years, besides the latter having the advantage of a thorough training in industrial pursuits. The writing at Hanwell and Norwood is certainly better, and in drawing, these schools have the advantage over the Clifton establishment, and in an open competition in arithmetic, geography, and in other book-work subjects, the pauper children would be found in no way behind the orphans, in spite of the supposed advantages which the latter enjoy from continued study and the double amount of instruction. This institution affords an excellent example of judging the advantages of the half-time over the whole-time system.

The boys, almost all of them, are apprenticed to some trade. Each has a free choice as to what trade he would wish to follow, but when he has once chosen and been apprenticed he is not allowed to change his mind. The trades selected are very numerous—carpenters, joiners, basket-makers, shoemakers, tailors, plumbers, painters, &c., in fact, almost every known description of work. On leaving the school thus to commence work, each boy has an outfit provided for him.

The various repairs, such as painting, limewhiting, plumbing, &c., and the articles of clothing—boots and tailors' clothes—which at such institutions as Hanwell, Norwood, Sutton, &c., are attended to and made by the boys on the premises, superintended by industrial teachers, are, of course, at the orphan establishment, performed by outside labour. This is to be regretted, as the occupation of the children in this way, though, perhaps, it does not effect any actual saving in expense, is certainly useful in making them hardier in after-life, besides forming a change to the monotony of book-work.

The Girls' Schools.—The course of study here is similar to that of the boys, and the remarks made on the latter might apply, to a great extent, to the former. Drill is, of course, not attempted, though as much required, and it might do as great an amount of good as at Hanwell. In the household duties the elder girls assist, though not as much as might be desirable. In the washing department, for instance, everything is done on a gigantic scale; large washing-machines are employed, worked, by-the-bye, not by the elder girls but by washer-women; centrifugal drying-machines take the place of drying yards, and every contrivance which modern science has invented for lessening labour may be seen in daily use. This is very advantageous, no doubt, for the wants of the institution, but it is not a good training for a young woman who is to go out as a servant. She would probably have to wash in a small family, and might hardly understand how to set about hanging clothes out to dry, as she would have been accustomed to put them into a box, to turn a handle, and in a few minutes find them ready dried for the next process. In the Clifton parish workhouse school the whole of the washing is done by the elder girls, and in the old-fashioned cottage manner; and though, no doubt, this is not so expeditious or modern, it forms undoubtedly a better and more useful system of training for the class of persons engaged.

Again in cooking, in the same way; the patent stoves, which in some mysterious manner can cook an incredible number of joints almost as it were by machinery, are very useful, but they require an experienced person to look after them; and all the girls can do, if they do as much, is to put the joints, potatoes, soups, &c., in to cook, and take them out again when they are told that they are ready. This does not teach them how to manage the stoves, or to do such common cooking as they are certain to meet with in the situations for which they are supposed to be training.

During the year ending May last, seventy-eight girls were sent out for service; and from the careful records kept of the subsequent history of both boys and girls who have obtained situations, it is a fact that not nearly 5 per cent. go wrong afterwards. It must be remembered that very bad children are not kept here. Last year three were sent away, as it was thought they would have a bad effect on the rest, so that probably the results are about equal to the large district schools, and, in fact, nothing better can be expected or hardly wished for.

The opinion of all who visit this remarkable institution is wonder at the systematic arrangement and order throughout. Nothing, indeed, shows more clearly the business habits and excellent management of the founder than the careful attention to all points of detail. It is somewhat a pity, however, that the schools have so much the air of a show. The daily visitors, by hundreds, are sent through the rooms as mechanically as if the whole were clock-work. The children are discovered doing certain exercises; all the books in the teachers' sitting and bedrooms are as carefully placed as if set by a straight-edge; the clothes are folded with too great a nicety; the kitchen things are in such perfect order as was never seen in a real kitchen—two drawers are left open to show the knives, forks, and spoons arranged like trinkets in a casket. All this gives the visitor an impression of unreality, and he is tempted to look into the other dresser-drawers, which indeed he does not find so perfect, though it must be owned, a great deal more like nature. While fully appreciating the value of neatness, this mechanical perfection in every detail with children, even if always kept to, is certainly not natural nor in keeping with the temperament of many, and when the youthful mind sees such little show arrangements as the dresser-drawers above-mentioned, it is apt to instil into its mind, almost unconsciously, a spirit of hypocrisy, which may never again be eradicated.

In concluding these remarks on this school, in many ways unique in the country, if not in the world, it must be said that the plan of education requires to be somewhat modified and enlarged, and the half-time system introduced. In the hours daily thus gained a complete course of drill should be adopted, both for the boys and girls, and also a system of industrial training arranged, more particularly for the boys. Were this done, or, in other words, were the school placed somewhat on the footing of the one at Norwood, it might be made, without doubt, the best school for poor children in the country, owing to the superior class of children, and the remarkable ability and goodness of the founder and manager.

Fine Arts.

Acquisitions of the Louvre.—M. Louis Lacaze, a well-known collector, just deceased, has bequeathed a magnificent gallery of old pictures, principally French, of the 18th century, to the Louvre. The collection is estimated to be worth £50,000 to £60,000. The French pictures include two important works by Boucher; two portraits, by P. de Champagne; ten works by Chardin, M. Lacaze's favourite painter, including some of his best pieces; five by Fragonard; four fine portraits and heads, by Greuze; two well-known works by Lancret; a number of historical portraits, by Largillière, J. M. Nattier, Tocque, and Vanloo; examples of Coypel, F. Lemoine, Lenain, Monnoyer, Oudry, and Raoux; three of Pater's best works; and four capital pictures by Watteau. The collection contains also a fine Rubens,

"Mary de Medicis, as France;" three Rembrandts; two works by Ribeira; a child, by Velasquez; a Tintoretto, two Titians, a Salvator Rosa; a number of works by Teniers, Ostade, Snyders, Cuyp, Jordaens, and others. M. Lacaze was son of an ancient peer of France, and in possession of a large income; he was Doctor in Medicine, and although he did not practice, never ceased to keep up with the progress of science. In 1849, during the visitation of the cholera, he converted his house into a temporary hospital, and for three weeks gave himself up night and day to the care of his unfortunate patients. His gallery was freely open to all the world, and nearly all his pictures have been copied by various artists. This collection is to be kept together, and to bear the name of the donor; rooms are now being prepared for it in the old portion of the Louvre, now occupied by the antiquities of the Campana collection. The Lacaze gallery is expected to be opened about the end of the present year.

Manufactures.

Mineral Statistics of Italy.—A correspondent from Italy writes:—"In the article on the 'Mineral Statistics of Italy,' vol. xvii., p. 854, I notice one or two errors which require correction. In the first place, the statistics are for 1865, and not 1867; at all events, the figures correspond exactly with those given in the 'Statistica del Regno d'Italia Industria Mineraria,' anno 1865,' published at Milan and Florence in 1868. Secondly, I must call attention to an error in connection with the gold ore. The quantity of gold ore is put at 103,800 kils,, or, roughly speaking, 100 tons, a quantity which is evidently far too small; but as the official document above-mentioned contains the same figures, the writer of the article is not to blame. In speaking of the produce of the gold ores worked near Macugnaga, it is stated that 'they do not contain ten or eleven grains of gold in a hundred-weight,' or 8 dwts. or 9 dwts. per ton. The mines referred to are evidently the Pestarena mines, of which it is said in Phillips' 'Mining and Metallurgy of Gold and Silver,' p. 521: 'The Pestarena ore has yielded 2½ oz. of gold per ton.' Again, in the *Mining Journal* of 9th October, 1869, p. 751, I find that 326 tons of ore from Pestarena yielded 490 oz. of gold, which is at the rate of about 1½ oz. of gold to the ton, or taking the entire produce of all the mines belonging to the Pestarena Company, some of which are many miles from Macugnaga, we have 883 tons of ore yielding 768 oz. of gold, which corresponds to more than 17 dwts. per ton, a produce twice as large as that mentioned in the article in question."

Commerce.

Electric Light on Board Ship.—The General Transatlantic Company of France, after a series of successful experiments, has decided on the adoption of the electric light on board its vessels, and has entered into an engagement with M. Berlioz, director of the Alliance Company, of Paris, for the establishment of the necessary apparatus for that purpose. It is believed that the use of electricity will tend greatly to facilitate navigation, and to add to the security of the vessels.

Colonies.

State of Queensland.—The *Brisbane Courier* observes that there never was a time in the history of Queensland when her prospects looked so bright. Sugar is an assured success; cotton is the same, and will improve in price as its manipulation is improved. There is an unlimited extent of unoccupied land, which the two nearest colonies have not. The mines are apparently in their infancy, the cattle trade is flourishing, and the Suez Canal is nearly complete. Let the reader take a map of New Holland, and observe what an enormous indentation occurs in the north of the island. How admirably it is adapted for a tramway at the foot of the Gulf, opposite such a harbour as Port Denison, thus in time sending the produce of the whole country by another route than the long and dreary one of Cape Horn; and then there are three rivers—perennial ones—from which the railway could earn immense sums by irrigation as it travelled, a source of revenue overlooked before; and then, again, there is now Polynesian labour, protected from the inroads of slavers.

Publications Issued.

Link-Motion and Expansion-Gear Practically Considered; by N. P. Burgh, engineer. (*E. and F. N. Spon*, 48, *Charing-cross.*)—This will be completed in about ten parts, of which the first is now ready. Excepting in the work "Modern Marine Engineering," there is no literature that contains practical description and illustration of the link-motion and expansion-gear. Mr. Burgh has, therefore, put himself in communication with the principal mechanical engineering firms of England and Scotland, for the purpose of making this work the standard reference on the above subjects. The following firms have already contributed drawings and articles for this work:—Messrs. Penn, Maudslay, Watt, Rennie, Humphrys, Ravenhill, Napier, Spencer, Dudgeon, Harvey, Hawthorn, Douglas, Wood, Shelmerdine, Hurdley, Jaffery; and other firms are preparing drawings, &c., so that the entire subject will be fully digested, as it should be for practical use.

Notes.

Extract of Vegetables.—A method of preparing a liquid containing the extracted matter of vegetables and condiments, for culinary purposes, has been invented by M.M. Villepoix and Bonaterre. In a copper still or other vessel, tinned inside, and having a double bottom, are placed 75 litres of water, 2 kilogrammes of common salt, 18 kils. of turnips, 8 kils. of leeks, ¾ kil. of onions, 3 kils. of celery, ½ kil. of parsley, 200 cloves, and 8 cloves of garlic; distil with a gentle fire, and draw off 30 litres. The aromatic liquor should be distilled into a receiver containing 12 kils. of salt and 8 kils. of sugar. These last-mentioned substances fix the aroma of the liquor, and prevent fermentation. The object of the salt in the vessel itself is to augment the boiling point of the water, and to allow of the distillation of the essential oils or aromas of the plants.

Correspondence.

The Channel Passage.—Sir,—Will you kindly advise me what I should do under the following circumstances:—I have been much interested lately in the papers published in the *Journal of the Society of Arts* with reference to the Channel passage; and, while passing a few weeks here, I have been trying to overcome one great obstacle, or rather difficulty, that many passengers encounter. Captain Morgan, the superintendent of the mail-packets, and the captain of *La France*, have kindly helped me to carry out my experiments. The weather has not been quite rough enough lately to continue them;

but one day, when I crossed twice, there was a capital opportunity, and a heavy cross sea. I had a cot made on a principle that may, with many persons, prevent sea-sickness; it was rigged in the fore-cabin, where there was most motion. While I remained in the cot, I kept well; but when I left it, I was as ill as any of the rest; when I returned I was well again; though I daresay there is still room for improvement. As space is needed, it would only answer in state-rooms or special cabins, and would be more suitable for steamers or vessels much larger than the present mail boats. However, special cabins might be supplied and paid for accordingly. The point I desired to attain was, to have a berth that would keep horizontal under any circumstances. The difficulty to overcome was the independent motion, that is, either twisting or getting too much way on, after the pitch or roll of the vessel. The first, the twisting, is quite overcome by hanging the cot from two or four hooks, four being preferable, six or seven inches apart. The second, or independent swing, cannot quite be overcome, but it must not be stopped abruptly; therefore, below the berth, in the exact centre, directly perpendicular from the hooks by which it is hung, I placed vulcanised india-rubber springs, "accumulators," such as serve to keep doors shut. They "give," but yet always tend to bring the berth back steadily to the exactly horizontal position. They must not be too strong, nor too pliant. Further experiments would show how strong or how many might be best used. I think four medium-sized would suffice, but they should meet in the centre of the bottom of the berth, though it would be an advantage to have the other ends spread over the deck floor, so that all the power might not be caught at once. I only had two; one weak, one strong, first in line, then fastened together alongside, but even then they were not strong enough to overcome the swing in one direction, though a touch of the hand sufficed to steady the cot. As the eye would be affected by the motion of the ship, though the cot kept still, either curtains must be used or the eyes must be kept closed. I have therefore added curtains; they need not be quite opaque. An ordinary hammock hangs from both ends stretched out, not compressed, so that in one way the full motion of the vessel is experienced; by contracting into six inches the motion that would be given to six feet, or 2½ feet length or breadth, a very nearly horizontal position can be maintained. In addition to the spring-band, a slack-rope might be fastened below, to keep the cot within the extreme limit of the cabin; but if the rope has no spring, or is made too tight, the effect, of course, is a sharp stop; this the spring prevents. It will be for further experience to show how best to adapt the spring. I have carried the experiment so far that we can see reason to believe a great boon may be thus provided for many who suffer at sea; in fact there is no doubt but that small cabins as well as cots might be fitted on this plan, with more or less success. I have ventured to lay the particulars before you, trusting that you will excuse the trouble, if they do not interest you; but you will be able to tell me, I believe, what is the best plan to adopt; to prevent the idea being patented by some one who might make it a dear monopoly, at least the patentee might prevent others trying to improve upon it, so that the benefit might be restricted instead of extended. I fear that if I put myself in communication with any one who would carry out further experiments, he might wish to monopolise any good in it, or expect me to meet the expense of experiments and patent. I seek no profit, and want no loss. I estimate that it would require a cabin 11ft. by 5ft. 6in. to give the berth full swing. At first, I made a working model, which answered well, but the practical test has been satisfactory with a full-sized cot. Yet frequent experiments in crowded steamers, full of sick pasengers, test more than my philanthropy and the invention.—I am, &c., John Scarth.

Dover, Oct 4, 1869.

MEETINGS FOR THE ENSUING WEEK.

Mon.....Entomological, 7.
British Architects, 8.
Society of Engineers, 7½. Discussion on paper read by Mr. P. F. Nursey, "On English and Continental Intercommunication;" and (time permitting) Mr. C. J. Light, "On the Need for further Experiments on Strength of Materials."

Tues ...Anthropological, 8.

Thur ...Linnæan, 8. 1. M. J. Correa de Méllo, "On some Brazilian Plants from the Neighbourhood of Campinas." 2. Mr. N. Dalzell, "Note on two Indian Plants." 3. Mr. R. Trimen, "On the occurrence of a Luminous Insect near Buenos Ayres."

Patents.

From Commissioners of Patents' Journal, October 22.

Grants of Provisional Protection.

Bricks, &c., ornamenting—2938—B. Baugh and B. Walters.
Cements, manufacturing—2940—H. Reid.
Door knobs, fixing—2924—T. Rice.
Envelopes used in extracting oil from oleaginous seeds, &c.—2706—C. Eskrett and H. Searle.
Liquid meters—2932—C. E. Brooman.
Looms—2914—J. C. Ramsden.
Match-box candlesticks—2394—F. Mazet.
Mineral oils, treating—2950—A. C. Kirk.
Motive-power—1994—H. A. Bonneville.
Nails, &c., manufacturing—2952—J. and J. A. Huggett.
Paper-hangings, manufacturing—2954—A. V. Newton.
Printing inks, &c.—2946—W. C. May.
Railway chairs, securing rails in—2912—J. McKenzie.
Railway fish-plates and chairs, constructing and fastening—2918—R. Chapman.
Railway wheels, &c.—2936—W. Kelsey.
Ships, &c., wheels for propelling—2916—W. E. Newton.
Socket and flanged pipes, casting—2920—J. Hilton.
Steam boilers—2922—G. W. Hawksley and M. Wild.
Water, apparatus for distilling and producing fresh potable—292 —H. Wainwright.

Inventions with Complete Specifications Filed.

Chain cable stoppers—3006—W. R. Lake.
Clocks—3028—J. M. A. Stroh.
Counterpanes, &c., weaving—3042—J. and J. Kippax.
Fire-arms, breech-loading—3003—J. Mackie.
Iron and steel—3025—J. Player.
Needles, &c., cases for—2998—W. Avery and A. Fenton.
Railway carriage wheels—2997—N. Washburn.

Patents Sealed.

1265. R. Foster.
1270. P. Jensen.
1274. J. Cudbird.
1280. G. White.
1286. J. Smith.
1290. S. Oakman.
1296. R. Flower & M. M. Crowly.
1298. J. H. Sams.
1324. O. Rose.
1332. F. Bujeaud.
1337. R. Craig.
1458. P. W. Flower, H. Nash, and R. Heathfield.
1493. L. A. V. Dubourg.
1563. M. Jarvis and E. Millward.
1883. S. Holmes.
2259. T. Winter.
2263. E. Attenborough.
2507. T. Whitehead.

From Commissioners of Patents' Journal, October 26.

Patents Sealed.

921. J. Macintosh.
1293. W. R. Lake.
1304. O. Moseley.
1308. G. Heyes and E. Barlow.
1313. E. Cooper.
1318. D. Greig, R. Burton, J. Gozney, & T. Atkinson.
1322. M. Wilkin and J. Clark.
1336. H. J. Seels.
1371. A. and E. Fau.
1472. C. Ferguson.
1500. R. Wilson.
1564. T. Herbert & J. C. Fowler.
1674. C. E. Brooman.
1678. W. E. Newton.
1944. J. Lomax.
1970. W. E. Gedge.
1997. S. Brooke.
2106. J. Piret.
2303. F. Jackson.
2333. F. C. Colney.
2397. H. Bessemer
2425. J. Lewis.
2457. R. F. Fairlie.
2527. T. Coley.
2536. H. Yates.
2570. H. E. Newton.

Patents on which the Stamp Duty of £50 has been paid.

2410. G. and E. Ashworth.
2726. A. V. Newton.
2740. G. Haseltine.
2754. B. J. B. Mills.
2767. G. F. L. Meakin.
2763. J. Storer.
2796. P. Adie.
2856. J. Chubb and W. H. Chalk.
3022. T. W. Webley.

Patents on which the Stamp Duty of £100 has been Paid.

2824. J. B. Payne.
2821. J. Clark.
2842. J. Spence.
2853. A. Chaplin and G. Russell.
2891. J. J. Ridge.
2877. W. Clark.

Journal of the Society of Arts.

FRIDAY, NOVEMBER 5, 1869.

Announcements by the Council.

Notice to Members.

The One-Hundred-and-Sixteenth Session of the Society will commence on Wednesday, the 17th November, when the Opening Address will be delivered by Lord Henry G. Lennox, M.P., Chairman of the Council, and when the Prince Consort's Prize, awarded at the last Examinations to Mr. William John Wilson, will be presented.

The following are the dates of the Wednesday evening meetings, the chair being taken at 8 o'clock:—

1869.	November	—	—	17	24	
„	December	1	8	15	22	—
1870.	January	—	—	19	26	
„	February	2	9	16	23	
„	March.....	2	9	16	23	30
„	April	6	—	20	27	
„	May	4	11	18	25	
„	June	—	—	—	—	29*

For the Meetings previous to Christmas, the following arrangements have been made:—

November 17.—Opening Address by Lord Henry G. Lennox, M.P., Chairman of the Council.

November 24.—"On Silk Supply." By Thomas Dickins, Esq., Chairman of the Silk Supply Association.

December 1.—"On an Improved Means for Laying a Tunnel for the Transit of Passengers across the Channel." By Zerah Colburn, Esq., C.E.

December 8.—"On Prints and their Production." Being a sequel to a former paper, entitled "Engraving and other Reproductive Art Processes." By S. T. Davenport, Esq.

December 15.—"On India-rubber, its History, Commerce, and Supply." By J. Collins, Esq.

December 22.—"On the Recent Improvements in Small Arms, British and Foreign." By Capt. O'Hea.

A book of blank Tickets of Admission to the Meetings will be sent to each Member, who is privileged to introduce two friends to each Meeting on their presenting orders signed by him. Additional Tickets will be forwarded on application.

The first Course of Cantor Lectures for the ensuing Session will be "On the Spectroscope and its Applications," by J. Norman Lockyer, Esq., F.R.S., and will consist of three Lectures, to be delivered on Monday Evenings, the 6th, 13th, and 20th December, at Eight o'clock. Other courses will also be given during the Session, one, by A. W. Williamson, Esq., F.R.S., Professor of Chemistry in University College, London, "On Fermentation, especially in connexion with M. Pasteur's Researches," having been already arranged. These Lectures are open to Members, each of whom has the privilege of introducing two friends to each Lecture. Tickets for this purpose will be forwarded in due course.

Members are reminded that, should any of their friends wish to join the Society, the opening of the Session is a favourable opportunity for proposing them.

* The Annual General Meeting: the Chair will be taken at Four o clock. No Visitors are admitted to this Meeting.

National Education Union.

The Council met on Monday last, the 15th inst., and resolved that a donation of twenty guineas be given to the National Education Union, which meets at Manchester during the present week, and that a deputation from the Council, with the Secretary, be requested to attend the meeting. The following letter has been addressed to the Secretary of the Union:—

Society for the Encouragement of Arts, Manufactures, and Commerce, 2nd November, 1869.

Sir,—I am directed by the Council of this Society to hand you a cheque for £21, as a donation to the National Education Union, and to attend the Manchester meeting with a deputation. Mr. Edwin Chadwick, C.B., and myself will form the deputation. The Council instruct me to point out that, in taking this action, they maintain that strict neutrality in regard to the programme of the Union which they carefully reserved in making a donation, and sending a deputation, to the National Education League. I enclose a copy of my letter to the League.* The Council recognise in the two bodies an earnest desire to promote the great object which the Society of Arts has at heart—an extended and improved education for the people at large.

I have the honour to be, Sir,
Your obedient servant,
P. Le Neve Foster, Secretary.

The Rev. William Stanyer, M.A.

Deputation to the President of the Poor Law Board.

The Council have decided that a deputation shall wait on the Right Honourable James Goschen, M.P., President of the Poor-law Board, to protest against any extension of the system of child-farming, which is reported to have been introduced at Warwick, such system tending, in the opinion of the Council, to counteract the great exertions now being made to improve the system of general national education. The deputation is to consist of Sir Wm. Bodkin (Assistant Judge), Major-General Eardley-Wilmot, R.A., F.R.S., Mr. Edwin Chadwick, C.B., Mr. Hyde Clarke, D.C.L., and Mr. S. Redgrave.

Subscriptions.

The Michaelmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

* See *Journal*, October 15th, p. 863.

Proceedings of Institutions.

UNION OF LANCASHIRE AND CHESHIRE INSTITUTES.

The annual meeting of the Union of Lancashire and Cheshire Institutes was held on Tuesday afternoon, in the news-room of the Manchester Mechanics' Institute. The chair was taken by Mr. Alderman Rumney.

Dr. Pankhurst read the report of the council, which stated that the soundness of their policy in administering the affairs of the Union was abundantly tested by the conspicuous success of many students of the several Institutes, and by the general state of vigour of all departments of the organisation. The number of Institutes now in union is 132, of which six have been admitted during the past year. The elementary examinations have been very generally used by the Institutes. About 2,300 examination papers were applied for by the several secretaries. About 1,600 candidates submitted themselves for examination. The non-success of the candidates who failed arose principally in respect of one or other of the subjects required to be taken in addition to arithmetic, viz., Gospel history, geography, English history, grammar, or dictation. It is a matter suggestive of serious reflection to observe that, out of 1,600 candidates belonging, by presumption at least, to the better and more aspiring members of the evening classes, 796, or less than 50 per cent., have succeeded in obtaining certificates. The elementary examination was held in March last. The following is a classified statement of the results:—The number of certificates gained was, in 1864, 72; 1865, 151; 1866, 339; 1867, 473; 1868, 583; and, in 1869, 796, of which 141 belonged to the higher grade, and 655 to the lower. The council are glad to be able to report a large increase of successful candidates at the final examination of the Society of Arts, which was held in April last. Candidates were sent in by 46 Institutes, of which 36 are in direct connection with the Society of Arts. The results of 1869 show an increase of 129 as compared with last year, as appears from the following statement. The totals of these certificates of the Society of Arts' Examinations were:—1864, 247; 1865, 281; 1866, 272; 1867, 397; 1868, 422; and in 1869, 551, of which 81 were in the first, 171 in the second, and 299 in the third class. In the examinations of the Science and Art Department, 2,897 students entered, of whom 1,905 obtained certificates. The Council record, with the greatest possible pleasure, the valuable educational effects which have arisen from the munificence of their chairman (Mr. Alderman Rumney). The Council have awarded the Rumney Science and Art Exhibition to W. H. Greenwood, of the Manchester Mechanics' Institute. Mr. Greenwood, however, having elected to hold the Royal School of Mines Exhibition, had resigned the Rumney Exhibition. The Council of the Union, therefore, with the sanction and approval of the donor, have decided to allow the exhibition to be held by Mr. J. A. Bennion, whose position in the examinations approached very nearly to that attained by Mr. Greenwood. The general results of the establishment of a special prize scheme had been highly satisfactory. The council have inaugurated a further and very important movement with regard to science-teaching. In August last, a conference of day-school teachers, secretaries of day-schools, and members of the council, was held in Manchester, when particulars of the organisation of the Manchester and District Pupil Teachers' Science Classes were arranged, and sectional classes instituted for instruction in geometrical and mechanical drawing, building construction, mathematics, theoretical and practical mechanics, inorganic chemistry, and animal physiology. The classes under this scheme were opened early in September, and 119 students are now under instruction. It is proposed next year to establish similar classes in some of the large towns of Lancashire and Cheshire. The Department of Science and Art has this year awarded twenty-two medals to Lancashire students, viz., six gold, three silver, and thirteen bronze. Two exhibitions of the School of Mines have this year been awarded to Lancashire students, viz., one to W. H. Greenwood, of the Manchester Mechanics' Institute, and one to W. J. Walley, of the Preston Institute. These scholarships are of the value of £50, tenable for three years. The statement of receipts and expenditure of the Union for the year ending August 31st, 1869, showed an expenditure of £439 16s. 8d., leaving a balance due to the treasurer of £24 18s. 11d. The estimated liabilities are about £30; the subscriptions not yet paid—general, £8 8s.; institutes, £4. The council heartily acknowledge the extent to which the friends of education in the district have sustained the action of the union by their contributions and subscriptions. The council would further express their sincere satisfaction at the circumstance that though, throughout the area of the Union, the adverse influences of the depressed state of trade have been keenly felt, yet the financial position of the organisation has been prejudicially affected only in a very limited degree. The council would add that had it not been for the serious loss which arose in respect of the evening meeting of last year, the annual income of the Union would have been fully equal to the expenditure.

Mr. Lawton, the visiting agent, read his report, which gave minute particulars of the formation and progress of classes in various districts.

The Chairman said that the reports which had just been read would afford great food for thought. There was much to rejoice at in their position. They had made considerable progress, and they occupied—though he ought not, perhaps, to say so—that proud and foremost position which they had occupied for some time. They stood first, and they had laboured, as he could testify, for many years in the direction of technical education, and in the direction of promoting science classes in Mechanics' Institutes. All this bore witness to the fact that the institutions were most prosperous where the most attention was given to these subjects. They had the gratification in the record they had heard read that their efforts had not been made in vain, but put them in advance of any other district in the country.

Mr. W. Romaine Callender, jun., moved the adoption of the report. He said that he could not help contrasting the present condition of this Union with its position some few years ago, when it appeared to be stationary, and it had not that influence which it was destined to exercise, and which had since been so powerfully developed.

Dr. Pankhurst, in response to a vote of thanks to the officers of the past year, said that in no period in their history were they more justified in feeling confidence in their position than at present. The area and success of their work was greater than at any other period. There were men who owed all their training to the educational influences which were administered in Mechanics' Institutions, which showed that they were doing the right work, and doing it in the right way. Mechanics' Institutions were never in a more efficient state, and never at any time were higher expectations more justly formed of their influence than to-day. It might be said that the books they possessed were not read. But they were doing an arduous work. They were beginning at the beginning, and doing it on the right method, and, more than that, they were pursuing that right method perseveringly, for a sufficient length of time, over a sufficient number of subjects.

Dr. Watts moved, and Mr. Traice seconded the following resolution, which was unanimously passed:—"That this meeting is highly gratified with the result of the several examinations of the past year, and strongly urges the importance of every institution having an efficient system of classes for primary and scientific instruction."

The following resolution, moved by Mr. Clarke (Macclesfield), seconded by Mr. Smith (Staleybridge), was

passed, with four dissentients:—"That this meeting, composed of delegates of the Lancashire and Cheshire Associated Institutes, 132 in number, is of opinion that the present time is an opportune one for introducing an Education Bill, which shall make the attendance of scholars compulsory."

In the evening, the special prizes of the Union were distributed in the Town-hall, Manchester, by Hugh Birley, Esq., M.P. After the prizes were distributed, he said that of late years public attention had been particularly directed to the subject of education. There was on all sides a universal desire to see that every individual in the country should receive a good primary education—that was to say, a good simple education, to fit him or her for the condition in life which he or she had to fulfil. There might be, and there were differences of opinion as to the mode in which this was best to be obtained; but, as to the result, there was substantially no difference whatever. After some remarks upon the advantages of study and reading, Mr. Birley regretted the indifference, almost amounting to reluctance, on the part of some of the working-classes to the education of their children.

Mr. Alderman Rumney proposed "That this meeting desires to express its sense of the necessity of the early establishment of a national system of primary education." He said that at the lowest computation there were 1,250,000 children who ought to be at school, and the question was now forced upon the attention of everybody, and so seized upon the public mind that a solution of it was inevitable. He pointed out that it was more economical to the country to have an educated than an uneducated working-class.

Mr. W. T. Charley, M.P., supported the resolution. He said that the party with which he was connected had advocated compulsory education in connection with factories, and they had no reason to regret the course taken, and he trusted that the factory system would be extended much more widely, and the Print-works Act, which permitted 16 hours' continuous labour, and the Bleach-works Act, sanctioning labour without intermission after hours, might be repealed. With these laws, it was impossible for young men to take full advantage of Mechanics' Institutions.

SOUTH STAFFORDSHIRE EXHIBITION.

The South Staffordshire Exhibition of Industry and the Fine Arts, which was opened six months ago at Wolverhampton, by Earl Granville, was closed last month. There were present on the occasion Lords Dartmouth and Wrottesley, Mr. Weguelin, M.P.; Mr. Henry Cole, C.B.,; the Mayors of Worcester and Kidderminster, and the Corporation of the borough of Wolverhampton. The official report states that a quarter of a million of people have visited the Exhibition, the largest number of visitors on one day, September 27, being 5,529. The receipts amounted to £8,541, and the expenditure to £7,183. A net balance, £1,200 was expected to accrue. Lord Wrottesley, as chairman of the Executive Committee, showed that the Exhibition was designed to benefit pecuniarily the South Staffordshire Institution for the Promotion of Adult Education and Night-schools, and the Wolverhampton School of Art. He spoke of the great gratification the promoters felt at the pecuniary success which had attended the Exhibition. When Earl Granville opened it, his playful allusion to such a satisfactory issue as a surplus was received with a merriment which clearly indicated the concurrence of the audience in the view of the speaker that such a result was extremely problematical. Mr. Cole received the fact of a surplus as the most conclusive testimony to the success of the Exhibition. The Committee had not made the show an *omnium gatherum*, but had confined themselves to works of art and industry, supplemented by an ample and beautifully-arranged garden, to which he chiefly attributed their success. He wished that they were going to keep it. He was sure there must be some one in the exhibition now unable to carry into the next world the great wealth he possessed, who could afford to contribute the funds necessary for the purchase of the garden and the adjoining meadows for the use of the people of Wolverhampton as a public park, in which there should be a museum of natural history. There had been many suggestions as to the disposal of the surplus; his was that they should not fritter it away, but, determining to have another exhibition ten years hence, resolve to employ it in promoting the knowledge of science and art during that decade through their School of Art, which they should place in such a position as to give them a claim to the £1,000 to which he should be glad to be able to tell Lord de Grey that they had become entitled. Mr. Rupert Kettle, as chairman of the general committee, asked the Earl of Dartmouth to close the exhibition. He remarked that the fine art works in the exhibition which had created the greatest admiration were produced by David Cox, the son of a Birmingham blacksmith, and that the exhibition had tended to raise the character of the manufactures of the district in the estimation of the commercial world. Lord Dartmouth then declared the Exhibition closed. His Lordship had acted as chairman of the sub-committee for the fine arts, and he tendered the thanks of the promoters to those who had, by the loan of their pictures and otherwise, contributed so greatly to the success over which they all rejoiced.

THE REPORTS OF THE "DELÉGATIONS OUVRIERES" ON THE PARIS EXHIBITION.

(*Continued from page* 894.)

As will be seen from what follows, many schoolmasters have expressed themselves as being opposed to the system of mixed schools, and have also dwelt upon the insufficiency and bad management of education for girls. Some have suggested that they should be brought up by a more practical method, with a view to domestic usefulness; others that their instruction should be confined to sewing, knitting, mending, cooking, a knowledge of hygiene and rural economy; and, lastly, the suppression of the diploma (*lettre d'obédience*), which takes the place of the certificate of competency with religious schoolmistresses:—

"I abhor mixed schools."—(*Nord.*)

"Mixed schools are anti-social."—(*Pas-de-Calais.*)

"They are irrevocably condemned."—(*Ardennes.*)

"It is not a question of improving, but of establishing an education for girls in France."—(*Ardennes.*)

"The existence of mixed schools is the greatest drawback to primary education in the rural districts."—(*Eure-et-Loire.*)

"Needlework is rarely taught in mixed schools."—(*Seine-Inferieure.*)

"Article 51 of the law of 1850, compelling every village of 800 souls to support a school for girls, suspended, only for a time, the system of mixed schools. The vicar applied to the religious sisters to undertake the direction of the new school for girls. The schoolmaster was ruined by the opposition thus established. The boys' school was done away with, and a mixed school was organised under the direction of the sisters."—(*Indre-et-Loire.*)

"I shudder when I think of the schools for girls; and yet the education of girls is more important than that of boys."—(*Basses-Alpes.*)

"We should apply ourselves to bring up good housekeepers and good farmers'-wives."—(*Bas-Rhin*).

"The clerical schoolmasters should be placed on the same footing as the laics. The schools on the term system (*école de stage*), and the religious diplomas (*lettres d'obedience*) should be suppressed."—(*Nord.*)

"Let the same legal conditions be imposed upon the clergy as upon the laics."—(*Nord.*)

"Religious bodies should be included in the common

law, Article 13, of the decree of the 23rd June, 1836, allowing sisters of charity, possessing the mere religious diplomas, to teach, should be suppressed. They should be required to obtain the certificate of competency after an examination."—(*Somme.*)

"I have a great aversion to the religious diplomas."—(*Oise.*)

"Why should the clergy be exempted from obtaining the certificate of competency? These religious diplomas, so easily obtained, will be the means of overthrowing the normal schools with the lay-mistresses."—(*Eure-et-Loir.*)

"All persons desirous of holding a school should be compelled to furnish a certificate of competency. The law of the 15th March, 1850, authorising the certificate of having kept the term (*certificat de stage*) and the religious diplomas, has resulted in favour of the religious bodies, who alone have profited by it."—(*Eure.*)

"I wish that the clergy were subjected to the common law, and that the fact of being clad in clerical costume were not sufficient to obtain the right of directing a school."—(*Cotes-du-Nord.*)

"Far from being any proof of competency, the religious diplomas do not even establish the identity of the holder."—(*Loire.*)

"Could it have been borne in mind that all citizens are all equally subject to the law, when the clergy were allowed to occupy the most important posts on the presentation of a mere religious diploma."—(*Nievre.*)

"The power given to religious bodies of substituting the diploma, or the letter of term (*lettre de stage*) for the certificate of competency, is a privilege that reminds us of those of the ancient monarchy."—(*Yonne.*)

During our inquiry into the subject, whence the above quotations have been obtained, and from arguments raised by certain schoolmasters opposed to free education, we have repeatedly heard the following remark:—"We are opposed to compulsory and free education, because unmarried people will thereby be forced to pay for those who have children." We would fain ask these egotists to whom belong the children "de la Rue d'Enfer" (Foundling Hospital)?

We recommend to the perusal of those opposed to education a work by M. Charles Robert, entitled, "On the Necessity of rendering Primary Education Compulsory in France," from which some useful lessons may be obtained.

As we have now quoted the opinions of some of the officers and subalterns of M. Duruy's force, we crave permission to express our own, as regards the method of organisation to be adopted for the object in view.

We would wish that primary schools should be divided into two distinct categories. The first to comprise children of both sexes under the age of ten; and we desire that more attention should be paid to their moral and physical training than to the learning of lessons acquired like parrots. It is difficult to educate a child until he be ten years of age.

From the nature of their dwellings, and from the exigencies of the work required of them in large centres, parents are not able to discharge the necessary duties towards maintaining the health and education of their children. A part of this task should fall on the schoolmaster or schoolmistress, even were it necessary, in order to raise the standard of their salaries in proportion to the new duties devolved on them, to suppress certain sinecures, and to change the method of rewarding those services which some are supposed to render to the nation.

A medical man should be engaged to visit the school once or twice a-week, for the sake of ascertaining whether due attention was being paid, in a scientific point of view, to the laws of hygiene; he should also examine the pupils one by one, and point out the nature of exercise suited to each for the maintenance of good health. And these learned doctors would not certainly be found wanting in humanity and patriotism.

The medical men would consider it a pleasure, as well as a duty, to co-operate in the regeneration of the Gallic race, of which they are also descendants.

The expense of some gymnastic apparatus, such as was exhibited in class 91, would not be very great for a school; besides, there are so many exercises which require no other auxiliary than good-will. Even the natural games of childhood, properly regulated, would replace many expensive appliances.

From our own experience, we assert that a child under the age of ten has not sufficient powers of conception to derive much benefit from the lessons of the master, especially when the latter confines his explanations to book-work; we are further convinced that a child ten years old, who can only read, write, and cipher, will know as much at the age of fourteen as if he had commenced to work seriously some years sooner. Those who are able to pursue their studies beyond the age of fourteen would not feel the same repugnance for work as many of those who have had their brains tormented, from the age of six or seven, with the rules of arithmetic, and those appertaining to the participle, of which they in reality understood nothing.

The second category of primary schools should comprise pupils above the age of ten, whose studies would be of a more serious nature. We would in no way suppress the gymnastic exercises, but should wish that, as in Germany, a time were set apart for them after the morning and afternoon school, with a view of strengthening the mind which is being developed and trained in a sound and well-formed body.

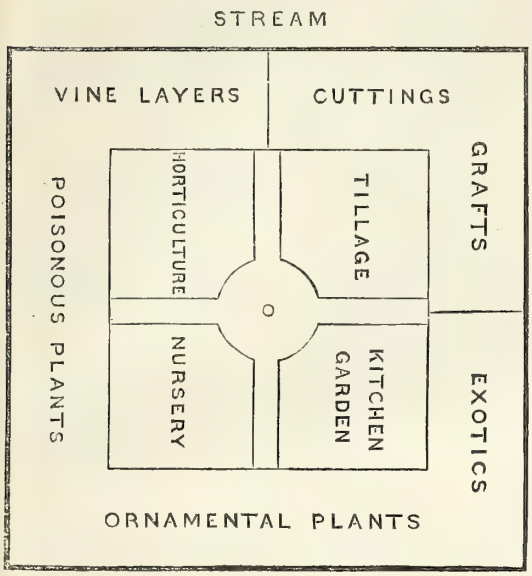
One of our committee had the opportunity of seeing a small practical illustration of our proposed system, during his travels last summer, in a small parish of one of our central departments, where the school-room was spacious and airy. The following plan is pursued by the schoolmaster:—School begins in the morning at 9 o'clock. At half-past ten, the pupils stop working, and go to play. During this interval the room is freely aired. If it be fine, they play out of doors; if, on the contrary, the weather be bad, the benches and tables are scaled, and taken by assault on all sides, and the little ones play about at their ease, and after their own fashion. We have no doubt of the healthy influence imparted to the children by this method, as being fixed to one place is the greatest torture a child can undergo. At ten minutes to eleven silence is again restored, and work continues until noon. During afternoon school the same plan is adopted.

This system cannot fail to produce good results in a sanitary point of view, and the minds of the children become more developed, because they have no aversion for pursuing studies when pleasure and work are combined.

We are not aware whether this measure, to which we attach so much importance, originated with the schoolmaster, or whether the idea was given to him by some higher authority; be it as it may, we do not congratulate him the less for having practically applied it, and we urge his colleagues, especially in the great centres, while waiting for something better, to imitate his plan as much as possible.*

While looking over the drawings of school buildings, of which we have already spoken, we have come across a plan for an agricultural garden, which it is desirable that all country parishes should maintain. This plan, of which a small sketch is given, was attached to that of the school at Bourback-le-Bas, in the canton of Taun:—

* In the sy tem of mutual instruction (Lancasterian system) this rule was strictly observed, for the pupils pursued their studies alternately sitting and standing in class. The changes were made in processional order, during which the children sang. Why has this hygienic system been cast aside?



We are of opinion that the construction of such a garden in all parishes where agriculture is the chief occupation of the inhabitants, would tend to produce a great reform in cultivation and rural economy. It would be the means of compelling some of the farmers to throw aside certain old customs of their forefathers, which many are unwilling to abandon. We in no way blame them for respecting old traditions, nevertheless, if it were explained to them that a change for the better were possible, we should be at a loss to comprehend their hesitation to replace an old system by a new one, the result of careful study under their own eyes and with their assistance.

Those who have lived in the country will have noticed that the lands of the petty farmers are generally the worst cultivated. The cause of this may be attributed to ignorance, which we have before condemned, and to the execrable principles of individualism. The idea of association or partnership, which is beginning to develop itself among the industrial classes as being the only means of saving labour from the oppressive power of capital, does not strike the agriculturist favourably, and the words association and communism are often confounded. There is, however, this difference; whereas citizens, in entering into partnership for the purpose of improving and increasing their productions, are free to live and dispose of their share of the profits as they choose, in communism their powers are restricted, and the principle is an absolute one. This error of the country people is, however, easy to be understood; darkness still reigns over them all-powerfully.

We very much regret that the direction of parish schools should ever be entrusted to celibates, that is, persons voluntarily and absolutely opposed to social principles. Let it not be said that it is with a view of devoting themselves more completely to the cause of humanity that they are unmarried; it is untrue. It is from pure egotism; it is from fear of being burdened with the charges and duties involved by a family. Question discreetly those of your fellow-workmen who boast of the charms of celibacy, and you will be convinced that we are in the right. We do not consider that men or women who have renounced the idea of a family are suited, or possess the qualifications necessary to train the heart and mind of children whom nature has destined, in their turn, to become, one of these days, fathers and mothers. Common sense prevents us from entertaining the idea that one can teach principles contrary to those one professes without running the risk, in wandering, of leading those astray whom one has undertaken to educate.

We desire the suppression of work-rooms entrusted to the administration of women who, having as we have before said, willingly rejected the sweets of maternity, employ the children of others. We know families who have withdrawn their daughters from such places because they were becoming hump-backed, from the quantity of needlework imposed upon them. One, amongst others, at the age of eight, had acquired in one of these dens the grade of work-mistress; it seems incredible, but it is, nevertheless, the truth. The young girl, now mother of a family, could testify to the fact, as well as her relations who withdrew her from the hands of those speculators who, in the name of Christian charity, would have rendered their pupil a deformity.

As to the nature of the punishment inflicted on those who have not behaved well, or rather who have not finished the amount of work imposed upon them, it is sufficient to question some of the children on the subject, to be convinced of the productive imagination of these hardened hearts, in discovering a number of little refinements of cruelty, which remind us of the gentle chastisements inflicted by the "Holy Inquisition."

As the labour costs them almost nothing, establishments of this kind do a great deal of injury to house-wives and young work-women, who have no other resources by which to gain their livelihood than by the work of their hands. We do not desire that a professional school for girls should be organised after this method.

If we deprecate institutions directed by religious bodies, it is not because those entrusted to laymen are faultless; on the contrary, there are many that are not managed as they should be. We would wish that a committee of the heads of families, renewable every six months, should be charged with the frequent inspection, in all quarters, of the free and parochial institutions, with full power of bringing moral pressure upon those directors who, for any reason, may have incurred censure.

We owe a special tribute of praise to the efforts that are being made daily for the education of the deaf, dumb, and blind. Several methods for facilitating their intercourse with the world will contribute to the possibility of their receiving employment. We must also refer to the singing schools, which were largely and worthily represented in Class 89. We cannot but approve of this excellent plan of bringing men together, even for amusement. Citizens invariably derive some benefit from being brought together, whatever the motive. The formation of a district or parochial choral society is, in fact, an association, the success of which augurs well for those devoted to other objects. The taste for music, however, must not supersede that for study. There are some young men who devote too much of their time to singing, and not sufficient to their books.

Evening classes, established for the benefit of apprentices and adults, and due in the first instance to private initiative, have received special attention from the present Minister of Education, and, thanks to the appeal made by him to devoted and intellectual men, the adult classes, which, on the 1st January, 1864, only numbered 5,623, had increased, on the 1st April, 1867, to 32,383, diffusing beneficial knowledge to 829,555 pupils.*

* In referring to the statistical tables on public education, we find the following information: — 33,383 classes for adults, under the direction of 39,466 teachers (men and women) and assistant teachers, are attended by 829,555 persons, of which 747,002 are men, and 82,553 women. Out of 110,503 persons who could neither read nor write on joining the classes in October, 1866, 87,211 could at least read on the 1st April, 1867. Of the teachers, 12,632 have given their services gratuitously to these adult classes, which they opened in October, 1866, and 8,981 have even contributed the expenses attending lighting, heating, &c., amounting to 234,620 fr. 29 c. We heartily join with those persons who have established rewards to be distributed to the teachers, and we only regret that there are not as many rewards as there are devoted teachers.

These classes ought to be better attended, for the number 829,555, represents but a small portion of the ignorant. We should be glad to see those who are concerned take advantage of the distribution of this moral and intellectual food which is daily held out to them, but, alas, the state of poverty of a great number of workmen renders them insensible to anything that they consider would not better their daily existence. Deprived of some of the actual necessaries of life, the word "foresight" is, to them, a term void of reason or common sense.

Good-will is not wanting with any of them; on the contrary they all desire fervently to receive instruction, but they are unable to do so, because by eight o'clock in the evening, when the classes open, they have had fourteen or fifteen hours of hard manual labour. They go to their homes worn out with fatigue, and after having hurried through a meagre supper, are only too thankful to seek in repose and sleep, renewed vigour and forgetfulness of the toils of the day.

We do not hesitate to say to moralists that they exhaust themselves with vain speeches, when they say that the best method of improving the manners of a people lies in the improvement of their condition. Let the workman find his material wants and those of his family satisfied, in exchange for his fatigues and the plenty that is procured to society by his labour, and his manners will soon become softened, he will not so often frequent the tavern, encouraged by government, because, on returning home after the day's work, he will be rejoiced to find his family in want of nothing. Evil thoughts would not take possession of his heart, and he would then be happy and proud to be able to acquire, during a couple of hours of an evening, such knowledge of the useful sciences as others may be pleased to teach him. But as long as a workman, from the present state of organisation of labour and division of taxes, is condemned to support a family as if it were a plague, instead of regarding it as a benefit, it will require a good deal of ill-will not to comprehend that, at every instant, revolutionary thoughts will enter his brain against a state of things that reduces him to so miserable a position.

We do not approve of the reasons, although we understand them, that keep ignorant workmen away from these evening classes; on the contrary, we would endeavour to convince them of the happy influence that education exercises on our future destinies. We agree with the Minister of Education, who, when at Lyons, on the 23rd June, 1867, said:—"I do not for a moment imagine that, in the twenty-six letters of the alphabet there lies hidden a magic virtue by which all who possess it are transformed; but, I am persuaded that, with the majority of men, there is a necessary connection between the enlightened mind and the purified heart. The schoolmaster places in the hands of his pupils a key, which to some is a key of lead, and, being pliable, is easily bent, and becomes useless, or even dangerous; while to others it is a key of gold, capable of opening the doors that lead to everything, and, first, to the knowledge of right and honesty. Let us, therefore, educate children in primary schools, which must be increased in number; adults, in evening classes, which we must maintain and extend; young girls, in professional schools, which we must establish; and those girls who are not in want of situations, in more advanced classes, which we must open. In fact, both for women and children, we must increase the hours of study, and lessen those of labour."

In a word, evening classes are a successful institution, which, if education become compulsory, will enable young men to complete their studies in those branches of which they had received but a faint notion, in their days of childhood, from the schoolmaster.

Next to the evening classes, we notice represented the system of education of a secondary and more special nature, on which is founded the institution of technical schools, which we desire to see established on a larger scale, and made more accessible to workmen.

We have before us a work, which may be seen at the office of our association, 50, Rue Turenne, and for which we are indebted to the Secretary-General of Public Education, entitled "An Inquiry into the System of Technical Education," in which we find, with much useful information, the views expressed by a number of our eminent authorities on the subject.

From this work we deduce the following opinion, and with the greater satisfaction as, not being able to express ourselves in the language of these learned men, we find our views have coincided with theirs, namely, that the development of advanced schools of arts and trades would not be impeded by the extension of primary education, or by the reduction of the working hours of apprentices at the workshops, with a view to giving facilities to the children to attend a theoretical course of instruction, organised by private initiative, and maintained, not by the State, but by the different municipalities.

M. Montjean, director of the Chaptal Municipal College at Paris, when asked his opinion on the establishment of a special system of education for apprentices, remarked, "I think that in all cases, with the exception of agriculture, a system of special education would not be productive of the results that might be expected. The best, most efficient and practical school for apprentices is the workshop for the artisan, and the counting-house for the merchant."

The establishment of working men's associations is, in our opinion, of great importance towards the organisation of special courses of instruction in each trade. The men whom we are about to select to compose these associations will take the initiative, which we must make every effort to support, of promoting the industry of France, so that it may acquire fresh victories at any future pacific and international contests.

While sharing in the opinion of M. Montjean, we would add that a school for apprentices would not possess the proper elements for the formation of good and clever workmen. In the workshops, one meets with excellent, practical workmen, who for various reasons would not be admitted as teachers in a technical school, and yet they make clever and ingenious artisans of the apprentices entrusted to their training. It would therefore only be requisite, in order to complete their industrial scientific knowledge, to make them acquainted with the nature and source of the materials they use. This they would acquire at the night classes, as well as the various processes which a workman only learns from continually changing from one workshop to another.

It is said that the schools of "Arts et Metiers" (Arts and Trades), and the agricultural schools would not produce the results that we have a right to expect. The unanimous opinion of artisans is, that no pupils should be received in the former until they had passed two years in a workshop, because the time allotted to practical instruction during the three years they remain at the school, is not sufficient to ensure them manual dexterity. As regards the latter, we consider any failure is due to the fact that not even an elementary knowledge of the subject is at present taught in any of the preliminary schools. Agriculture, in one respect, does not differ from other sciences; in that a preliminary knowledge must be acquired in order to comprehend the utility of a further investigation.

Government has undertaken the mission of sending men, specially qualified, to initiate agriculturists in any new methods of cultivation, or in any great discoveries relating to the theory of agriculture. We would wish to see the extension of these missions to all the rural districts, in the form of conferences. This system would be of greater benefit to the farmers.

Should not the large rural estates be, as it were, so many model-farms, the management of which would offer to those who possessed them as many attractive pleasures as the more or less repeated visits to the cafés on the boulevards of the capital, or the nights spent in gambling.

Why is not the same value attached to being the winner at an agricultural contest, as at a race-course? And yet it seems to us that, in gaining the laurels of an agricultural meeting, there should be a two-fold satisfaction; first, the glory of being distinguished from one's fellow-citizens; and, secondly, the fact of having bestowed on, or performed some good for, the country in general.

While touching on the subject of model-farms, we cannot too highly commend to the attention of men desirous of assisting in the diminution of poverty, the scheme for an agricultural reformatory-farm, by M. Nicholas, of Lyons. In a small pamphlet, sold for the benefit of the undertaking, the author explains, as a man determined to act for a good cause, how it might be arranged:—1st. To retain the inhabitants of the rural districts for agricultural purposes; 2nd, to keep the destitute children of large towns from a sojourn in prison; 3rd, to offer to agriculturists the advantage of sending their children to pursue a course of theoretical and practical study in agriculture, arboriculture, and horticulture.

Everyone is more or less acquainted with the system of organisation and administration pursued in primary schools, but few are aware of the efforts and struggles that are made against the old routine and prejudices by some eminent men who have devoted their time to the practical introduction of simple and ingenious systems. Among those devoted to the cause of humanity may be mentioned M. Youanne, director of the Maison Rurale d'Enfants, at Pry (Seine Inferieure), the system of which is founded on the free expansion of the natural faculties of the child.

As we have again spoken of children, we will take the opportunity of expressing our approval of the views expressed by M. Marsilly, President of the Industrial Society of Amiens:—"Our laws sanction the employment of children under 12 years of age in all industrial establishments, but it is required that they should also attend school; this is found difficult to arrange. In Germany, on the contrary, children are not allowed to be employed in manufactories under 14 years of age, until which time they are excluded from the workshop, and are compelled to go to school. They are further required to be able to read and write before entering any manufactory. I consider it would be of great advantage if the French law would also raise the standard of age for the employment of children in manufactories."

M. de Marsilly has not, however, stated at what age he would propose that the children should be admitted. We desire that the example set by our neighbours should be followed, viz., that no child should be received at any industrial establishment under 14 years of age.

We also desire to see our fellow-workmen follow our example, in subscribing weekly the small sum of 10 or 15 centimes (1d. and 1½d.) for the purpose of establishing social libraries, which would afford them amusement, and give them the advantage of being able to read works, the price of which is beyond their reach.

And this would not be the only benefit derived. The establishment of social libraries, like that of singing classes, would offer the advantage of bringing men together for an amusing and, at the same time, useful purpose.

To the reading-room might be annexed a debating room, in which the various members could in turn discuss topics which are of interest to the whole world. Newspapers might also be received, and thus enable the members to acquaint themselves with the passing events of the day, and to keep abreast of everything that bears the name of "progress."

The prevailing fault among workmen is indifference; and this indifference arises from ignorance, caused by a system of isolation. Hence the sad habit of expecting everything from the State, which they consider should provide even for their smallest wants. If they were to examine themselves, however, they would understand that there are in society certain private interests at stake which it would be imprudent to leave to the defence of others.

We should like to see social libraries* successfully competing with the wine dealers and coffee-house keepers. If in the populous districts the workmen were really willing, it would not be difficult for them to effect this transformation in their habits, now so disastrous to their families.

In the common interest of society, it is the duty of al persons well-disposed, and who take the lead, to diffuse the idea, and urge the formation of similar institutions; they would be sure of assistance.

In bringing to a close that portion of our report relative to education, we cannot refrain from expressing our gratitude to the government that first seriously considered the question of the education of the people, and that government was the Constituent Assembly—the terrible Convention which contended against the whole world, and against France itself. This assembly, in spite of the dangers with which it was beset, was sufficiently powerful to lay down the first principles of popular education. It was amidst that tempestuous season, when each moment threatened some new danger, that the government examined the different systems brought under its notice. One of the members exclaimed, while listening to the rumbling of the revolutionary storm, "If we are able to establish a system of education, we shall have fulfilled our mission." And true it was; and he who made the remark was a prophet; for that single decree of August sufficed to immortalise the assembly; and we, children of the people, are rejoiced at being able to express our gratitude to those who, in the midst of perils, have laid in the sand a foundation of stone on which to build a monument of social education.

If education is not diffused throughout the empire, no blame can be attached to the famous Jesuitical law of 1850, which, in spite of all that has been said to the contrary, was prepared with great power, and to the people's benefit. The greatest censure should fall on the State which is so mean in regard to education, and so liberal towards the maintenance of an army, or the prosecution of a war. They haggle over two sous for a school, and expend two millions on barracks, convents, and churches.

The following table is also taken from the map by M. Manier, and shows the proportionate amount expended by some of the European States for military and educational purposes respectively:—

NAME OF COUNTRY.	Proportional Part of the State Budget allotted to	
	Military Purposes.	Public Education.
France	0·295†	0·011
Austria	0·270	0·019
Prussia	0·276	0·014
Bavaria	0·219	0·022
Wurtemburg	0·218	0·047
Saxony	0·214	0·037
Grand Duchy of Baden	0·181	0·033
Kingdom of Hanover	0·128	0·013

* If we persist in recommending the establishment of social libraries, it is because the works they contain are chosen by the members themselves, which is not the case in those libraries supported by government for the promotion of popular education.

† That is to say, that out of 1,000 francs expended by the State, 295 francs are allotted to the requirements of the War Department, and 11 francs for Educational purposes.

PUBLIC WORKS IN THE METROPOLIS.

Considering the labour which a Committee of the Society took, in the last session of Parliament, to preserve the Thames Embankment, it is right that the following letter from Lord Elcho to the *Times* should be inserted in the *Journal*:—

"Sir,—I could hardly believe my eyes when I read of the transfer of Mr. Layard to Madrid, and of Mr. Ayrton to the Board of Works. A more successful putting of square men into round holes has never been effected, and I think it would be well for all who are interested in the metropolis and its future now to consider the way in which the office of First Commissioner of Works is dealt with by successive governments.

"If the First Commissioner is to be viewed simply as the head of a department, charged to administer it on narrow, utilitarian, and economical principles, in the application of which he is to exercise a rigid parsimony, worrying and snubbing all with whom he has to deal until he makes his office too hot to hold him, then, perhaps, it matters not, as regards the embellishment of the metropolis, who may, for the time being, be in power in Whitehall. But if, on the contrary, it is acknowledged, as is professedly done, that the government of a great nation, calling itself civilised and cultivating the arts, should, in the erection of public buildings and monuments, seek the embellishment of the metropolis and the improvement of public taste, then the office of First Commissioner must be considered as being of first-rate importance; and so long as it remains a political appointment it is the duty of the government to seek out the fittest man they can find in the whole army of their followers, and, having done so, to give him the authority and support necessary for the proper administration of his department. Is this done? Has it ever been done? Look back at the appointments for the last thirty years, and say how many of those who have held the office recently filled by Mr. Layard have been appointed through special fitness for it, on account of their known and acknowledged taste in architecture and art. I can name one—one man only in thirty years, whom any of us would in private life have consulted as to the building of a house, the erection of a statue, or the purchase of a picture, or, indeed, on any other matter into which art entered. That man is Mr. Layard. He, having, as he told the House last session, when that most ungenerous and unfounded party attack was made upon him, devoted his life to art, entered upon his office with high hopes and aspirations, knowing what a field was open to him, conscious of the will and power to work, and hopeful of setting his stamp upon our great city. Within a year he leaves his office, hopelessly discouraged, having met with opposition where he had a right to expect support, and, finding himself powerless for good, he is naturally unwilling to be held responsible for acts, or for the neglect of opportunities for which he is not to blame. One of his first acts on coming into office was the appointment of the well-known architect, Mr. Fergusson, as one of the permanent Secretaries of the Board. He, also, I hear, is about to resign, which, while it grieves, does not, under the circumstances, surprise me.

"Of Mr. Layard's successor I say nothing, save that no name would have less readily occurred to any one who has given a thought to these subjects, and that there never was a time in the whole history of this office when the person chosen to fill it should have been more carefully selected on account of special fitness. The completion of the Thames Embankment, and a combination of circumstances, now offer the opportunity of making London one of the grandest cities in the world, and not only the government of the day, but we all in our generation, will have a heavy reckoning with posterity if the opportunity thus offered is allowed irretrievably to slip.

"Pray, then, use your influence to raise the office of First Commissioner into a Ministry of Works, and into that Cabinet importance which is essential to the proper unhampered discharge of its functions. Above all, endeavour to prevent these appointments being thus made to meet the necessities of the Prime Minister of the day, and not the wants of the office itself.

"I remain, your obedient servant,

"Elcho.

"St. James's-place, October 29th."

Colonies.

Statistics of New South Wales.—At the time of the separation from Queensland, in 1859, there were in this colony 177 grinding-mills, which have now increased to 181, and there were 549 manufactories, works, &c., which have increased to 3,564. In 1859, there were 247,000 acres of cultivated land; there are now 434,873 acres. Of these, in 1859, 94,000 acres were under wheat; in 1869, 104,000. The increase in the produce has been 321,000 bushels. In 1859, 577 acres were cultivated as vineyards, against 1,917 acres in 1869, and the quantity of wine produced increased by 316,000 gallons. The increase in the number of horses, since 1859, is 68,000; increase of sheep, 10,000,000; increase of pigs, 57,000. There is a decrease of 369,000 head of horned cattle. There is an increase in the total value of the imports, since 1859, of £1,454,000, and in the exports of £2,024,000. The population of the whole colony, in 1859, was 114,386, and last year it was 466,739.

The Colony of Victoria.—In less than twenty years the population has swelled from 70,000 to 700,000. The straggling hamlet beside the Yarra is now the largest city and the busiest seaport in the southern world, and the country, which then shipped a few bales of wool and casks of tallow, has become the richest and most commercial member of England's colonies. The gold discovery, which immediately succeeded local independence, wrought the change; but gold discoveries have inaugurated no such extraordinary changes in other colonies. Here progress was sustained even when the yield fell off, and Victorian prosperity has now many props besides the particular pursuit which so suddenly created it.

Notes.

Lectures on Natural Science.—Professor Huxley will give his introductory lecture, on Tuesday, November 9th, at 11 a.m., at the South Kensington Museum, for which tickets may be obtained at half-a-crown. The course is intended especially for women, and the charge will be £2 2s. for thirty lectures; but governesses and teachers of schools are admitted upon lower terms, and even men will not be excluded if there be room.

The Indian Government and the Civil Engineers.—The Indian Government having made a public notification in *The Gazette of India*, wherein it is assumed to be a "recognised practice" in England "for civil engineers employed by public companies and otherwise, to receive, in addition to the salaries paid them by their employers, commission on contracts given out, or on stores and materials ordered or inspected by them, and other like pecuniary considerations for services done, or intended to be done, which are considered legitimate sources of emolument," the Institution of Civil Engineers at once took the matter up, and passed resolutions, repudiating in the strongest terms that such was the case; and a deputation, headed by the president, Mr. C. Hutton Gregory, have brought the matter before his Grace the Duke of Argyll, who has promised to communicate with the Governor-General of India, and ascertain the circumstances under which the notification in question was issued.

International Standard Measures.—The metrical

system and the standard measures of France have occupied the attention of the Academy of Sciences of Paris more than once of late. M. Chevreul, the eminent chemist, took an opportunity to protest scientifically against the adoption, for the purposes of a standard measure of length, of a measurement of a portion of a meridian of the earth, which had not at the time, and has not yet, been positively determined, but for practical reasons arrived, as Puissant and a commission of the Academy had already done, at the conclusion that the standard mètre of the year VIII, preserved in the archives of France, should be maintained, and proposed that an international commission should undertake the task of multiplying copies of such mètre and other standard measures, calling to its aid for such purpose all the scientific means in existence. A note was read before the Academy, showing that the Academy of St. Petersburg, adopting the same ideas as M. Chevreul, had expressed the desire that its members should, in future, use none other than the French metrical system in their publications; that it had constantly recommended its adoption by the various branches of the Russian administration, the universities, and scientific corporations; and stating that next year the meteorological observations in Russia will be published in the metrical system. At a subsequent meeting of the Academy, it was announced that the Berlin Academy of Sciences had adopted the decision of the St. Petersburg Academy respecting the metrical system, and accepted the existing mètre and kilogramme as absolute standards of measure, and joined in the recommendation of an international commission for the production of prototypes. The assent of the Royal Society of Great Britain to these propositions is hoped for as all that is needed for the adoption of a general international metrical system.

Scientific Prizes.—Dr. Lacaze, who has left his fine collection of pictures to the Louvre, has bequeathed twelve thousand pounds to the Academy of Sciences of Paris, to found three biennial prizes, of four hundred pounds each, for the most important works on physiology, natural philosophy, and chemistry. The conditions of the bequest are that the prizes shall not be divisible, and that they shall be open to competition by foreigners as well as Frenchmen. Should they be won by scientific men of other nations, says the testator, the honour will still remain to France, that the prizes resulted from a French donation, and were awarded by a French Academy.

Postal Arrangements.—It has been arranged between the postal authorities of England and France that the charge for a single letter shall be reduced from fourpence to threepence, and its weight raised from a quarter to a third of an ounce (ten grammes). This measure has been postponed for years on account of the difficulty which would attend the division of an ounce into three parts. A special weight, equal to 5⅓ drachms, will, we presume, have to be employed, but this is not quite equivalent to 9½ grammes. It is unfortunate that, in a matter of so much importance for both countries, the initial weight of half-an-ounce, which is that of all England, and also of Paris, could not have been conceded. The change will not come into operation until the arrangement has been sanctioned by the Corps Legislatif, and will probably commence with the coming year. The Austrian government has introduced a novelty in postage, which might be introduced with great benefit in all countries. The object is to enable persons to send off, with the least possible trouble, messages of small importance, without the trouble of obtaining paper, pens, and envelopes. Cards of a fixed size are sold at all the post-offices for two kreutzers, one side being for the address and the other for the note, which may be written either with ink or with any kind of pencil. It is thrown into the box, and delivered without envelopes. A halfpenny post of this kind would certainly be very convenient, especially in large towns, and a man of business, carrying a few such cards in his pocket-book, would find them very useful. There is an additional advantage attaching to the card, namely that of having the address and post-mark inseparably fixed to the note.

Correspondence.

The Channel Passage.—Sir,—As Mr. Scarth, in the last number of the *Journal of the Society of Arts*, requested your advice as to the best course for him to pursue in bringing to perfection and introducing into general use his plan for reducing or annihilating the effect of pitching and rolling of a ship on a suspended cot, and so relieving landsfolk of that scourge of comfort in voyages—sea-sickness; allow me to suggest to you, as one thing to which it may be desirable to direct his attention, a perusal of my communication to the Society on the same subject, entitled, "A Swing Cot for Sea Voyages," printed in the *Journal of the Society of Arts* for Jan. 4, 1861. At the time my plan was devised (in 1833), which, as there stated, proved completely successful, and a source of unspeakable comfort during a long voyage, often in a very agitated sea, the use of Mr. Brockedon's india-rubber ties had not become common. It is very likely that Mr. Scarth's proposal for their use may prove available (though, in case of fracture, on a long voyage, they are not so easily replaced as cord or pack-thread); and, in the event of their adoption, I would suggest the use of four such, radiating upwards from a ring in the cabin floor, vertically below the centre of the cot (to attach to its four corners), rather than downwards from the cot centre to four rings in the floor, as proposed by Mr. Scarth. Being on the subject of elastic bands, allow me to refer to a suggestion which I took occasion to make some time ago, relative to the proposed transfer of a very delicate astronomical instrument over a long and rude land journey, viz., its suspension by a set of such bands, radiating from it in all directionss—upwards, downwards, and sideways in the interior of an iron cage, free of all contact (Mahomet's coffin-like), the whole to be packed in a wooden case, for mule, camel, or coolie transport. For the cot, however, I hold to the cord and pack-thread system, not only as the cheapest and most readily replaced, but as being easily adjustable by trial to the exigencies of the case, by tightening or loosening, as circumstances may require, which the india-rubber bands in ordinary use are not. They require, too, no rings in the floor, which, in the day-time, when the cot is removed, and the cabin used as a sitting-room (as is very desirable in long voyages), would be much in the way.—I am, &c., J. F. W. Herschel.

Collingwood, October 30th, 1869.

MEETINGS FOR THE ENSUING WEEK.

Mon.....R. Geographical, 8½.

Tues ...Ethnological, 8. Mr. C. T. Gardner, "On the Chinese Race; their Language, Government, Social Institutions, and Religion."

Civil Engineers, 8. 1. Mr. John Ellacott, "Description of the Low Water Basin at Birkenhead." 2. M. Jules Gaudard, "On the Present State of Knowledge as to the Strength and Resistance of Materials."

Wed ...Geological, 8. 1. Mr. Charles Moore, "On Australian Mesozoic Geology and Palæontology." 2. Mr. Charles Moore, "On Plant and Insect Beds in New South Wales." 3. Professor Huxley, "Further Evidences of the Affinity between *Dinosauria* and Birds." 4. Professor Huxley, "On a new genus of *Dinosauria (Hypselophodon)*."

Thur ...Zoological, 8½. Prof. Flower, "On the Anatomy of the Aard-Wolf (*Proteles cristatus*)."

Patents.

From Commissioners of Patents' Journal, October 29.

Grants of Provisional Protection.

Alarums—2721—A. Lacanau.

Alcoholic drinks, aërated—2589—A. M. Davis.

Alcoholic liquors, distilling—2930—J. Wallace.
Alimentary substances, closing and securing vessels containing—2989—L. A. Lesage.
Animal and vegetable matters, desiccating—2981—R. J. Ellis.
Animal and vegetable substances, preserving—3061—W. E. Newton.
Balls and mallets used in croquet, &c.—3026—W. Rogers and G. Tidcombe, jun.
Belts, fastening the joints of—2969—W. Lincolne.
Billiards, &c., apparatus for registering—2930—J. Hartley.
Bird cages—2475—M. Wilson.
Boots and shoes—2955—T. Greenwood and J. Keats.
Bridges, constructing—3013—M. Henry.
Carding engines—3029—G. Collins.
Carriages—3056—W. Heywood and J. Bottomley.
Carriages, boats, &c., propelling—2966—E. Brown.
Cast-iron, producing wrought-iron and steel from—2953—E. A. Cowper.
Castors for furniture—3018—J. Horton.
Cattle trucks—2949—A. Welch.
Cattle trucks—3039—A. Welch.
Cisterns, &c., apparatus for drawing and preventing waste of water from—2933—J. Chandler.
Coal gas, purifying—3036—A. P. Price.
Cocks, taps, and valves—2959—E. A. Snuggs.
Concrete and cement buildings, &c.—2921—J. Duckworth, T. Hindle, and G. B. Serram.
Corkscrew and carriage key, combined—2994—E. L. Parker.
Cotton, &c., machinery for cleaning, &c.—2995—J. Taft and J. C. Edwards.
Cutlery, &c—3053—A. Munro and W. B. Adamson.
Dish covers, &c.—3013—J. Smith.
Draws applicable to waggons, &c.—2976—T. Parry and J. McHardy.
Drawings, &c., apparatus for facilitating the copying of—2986—F. M. Cotton and W. Field.
Fabrics, machinery for manufacturing—2999—E. Roe.
Fabrics used as a backing for bedsteads, &c.—3040—A. V. Newton.
Fans, pumps, and machinery for propelling air fluids, &c., by centrifugal force—2979—C. Brakell.
Fire-arms—2970—J. H. Selwyn.
Fire-arms, breech-loading—2965—E. Farrington.
Fluids, apparatus for measuring—3008—J. Walker.
Forks and spoons—2978—W. Challiner.
Furnace cisterns used in glass making—2831—W. Blunn and J. Wild.
Gas burners, &c., apparatus for lighting—2972—L. M. Casella.
Glass furnaces—3014—J. H. and W. Lyon.
Glass furnaces—3062—H. Percival.
Heating apparatus—3048—J. H. Johnson.
Horse shoes, elastic—3015—W. E. Gedge.
Hot-water boilers, constructing—2931—W. J. Jones.
Injectors for feeding steam boilers with water—2469—R. F. Fairlie.
Iron and steel, smelting—2988—C. W. Siemens.
Iron, &c., attaching cements to—3057—J. F. Crease.
Iron, &c., purifying—3058—A. Brady.
Kitchen ranges—2964—W. Bennett and J. Currall.
Latches and locks—2963—M. Andrew.
Latches or locks—2913—A. and W. Coleman.
Lifting apparatus—3011—E. T. Hughes
Liquid carbons, burning—3009—J. W. Robinson and T. Murray.
Liquid hydrocarbons, vaporising and burning—2962—J. B. Blythe.
Liquid soap, manufacturing—3054—J. Scharr.
Liquids, &c., obtaining and applying power by means of—2845—G. Hinton.
Locomotive engines, &c.—2761—W. Black and T. Hawthorn.
Looms—2937—D. Sowden, R. C. Stephenson, and J. Myers.
Looms—2960—R. L. Hattersley and J. Hill
Looms—3024—J. Raper, M. Pearson, and D. Mills.
Metal bars, machinery for heating and delivering—3022—A. Angell and J. J. Perry.
Metal rods, &c., rolling or reducing—2835—H. Hughes.
Metal surfaces for advertising purposes—3001—D. Brown.
Motive-power, &c., applying electricity to obtain—2935—R. L. Hickes.
Nail-making machines—2939—J. H. Johnson.
Needles, incasing packets of—2983—W. E. Gedge.
Needles, &c., cases for holding—3045—R. S. Bartleet.
Nuts for screw bolts—3041—W. R. Lake.
Packing-cases for bottles, &c.—2991—C. L. Page.
Packing for buckets, &c—3002—L. Byrne and W. Payne.
Paper, machinery used in the manufacture of—2781—W. I. Palmer.
Paper-making machinery—2992—J. and C. Hudson and J. Hudson, jun.
Paper pulp, reducing wood to a fibrous condition for the manufacture of—2958—A. B. Childs.
Photographs, producing in pigments—3049—F. R. Window.
Pipes and tubes, connecting—3045—A. Evans.
Potatoes, desiccating and preserving—2749—J. Windsor.
Presses used in pressing cotton, &c.—2987—S. Wilson.
Pumps—2975—R. Scholefield.
Pumps, &c—2951—G. A. Middlemiss.
Puddling furnaces, &c.—2971—J. Halford.
Puddling furnaces, &c., fire-place and grate of—2967—J. Morrison and J. Thomas.
Railway breaks—2984—J. H. Roberts and E. Simons.
Railway carriage door fastenings—3052—W. R. Thomson.
Railway crossings, opening and closing gates of—3050—J. Hudson.
Railway tickets, &c., apparatus for regulating the delivery of—3010—E. T. Hughes.
Railway trucks, apparatus for feeding and watering cattle in—2982—W. J. Bonser.
Railways—2957—W. R. Lake.
Railways—2990—E. Lane.
Railways and tramways—2521—W. J. Cockburn-Muir.
Reaping and mowing machines, knife bars and knives for—2977—S. Osborn.
Rocks, &c., machines for boring—3004—W. R. Lake.
Sanitary composition for building and ornamenting purposes—2974—J. Kennedy.
Sewing machines—2927—N. Wilson and W. Campion.
Sewing machines—3005—W. R. Lake.
Sewing machines—3047—A. Clegg.
Sewing machines, holders for supplying thread to—3021—J. J. Nancy.
Sheep shears, &c., manufacturing—3017—H. M. Marsden.
Ships' logs, instruments for timing—2973—J. Smith.
Signalling apparatus—2915—H. Schildberg.
Signalling by means of electricity—3038—C. E. Spagnoletti.
Stage lights, arranging—2996—W. Barbour.
Steam boilers—3060—J. Howard and E. T. Bousfield.
Steam boilers, high and low water level indicators for—2945—A. M. Clark.
Stone, machinery for cutting, &c.—3051—D. Jackson, J. Riley, and G. R. Ray.
Syringes, &c—3046—W. B. Robins.
Tobacco, machinery for twisting—2961—T. Cope, J. Hignett, and G. Lander.
Traction carriage wheels—3059—W. Firth.
Velocipedes—2947—C. Wyndham.
Velocipedes, &c., seats of—3044—A. Forder.
Venetian blinds, &c.—3023—W. H. H. McNeight.
Warps, preparing for the loom—2778—W. Strang.
Water colour printing—2993—W. Kloen.
Water, hydraulic apparatus for raising and forcing—3012—W. B. Leachman and J. Holroyd.
Water tuyeres for forges, &c.—2929—J. Frearson.
Wheels for vehicles, &c.—2926—O. C. Evans.
Window curtains, hanging and drawing—3037—M. Ker.
Wines, &c., apparatus for heating—2735—W. A. Gilbee.
Wool-combing machinery—3034—C. & W. Bradley & E. Thackray.
Woollen fabrics, &c., machinery for milling—3031—J. and W. Bottomley.
Woollen fabrics, &c., machinery for washing and scouring—3032—J. and W. Bottomley.
Yarns, &c., bleaching—2941—W. N. Hartley.

Invention with Complete Specification Filed.

Brushes, machinery for manufacturing—3106—J. Sheldon.

Patents Sealed.

1346. J. P. Balm and R. Newton.	1465. J. Timmins and J. Gayton.
1349. W. Broughton & T. Steven.	1475. W. Cadogan.
1350. J. Conway.	1536. W. R. Lake.
1357. J. B. Nimmo.	1630. A. Edlmann.
1382. A. Cocke.	1801. W. A. Lyttle.
1386. J. E. Phillips.	1953. M. Kennedy.
1395. W. Galloway.	2276. T. Parsons.
1396. W. Galloway.	2379. A. Turner.
1441. C. D. Abel.	2434. S. Smith.

From Commissioners of Patents' Journal, November 2.

Patents Sealed.

1353. P. Barry.	1425. R. F. Hoppe.
1354. J. Shackleton.	1436. J. Hall.
1355. S. H. Hodges.	1446. L. Wray.
1359. D. P. Wright & C. Butler.	1498. F. Kohn.
1364. C. Topham.	1527. F. Johnson and W. Hatchman.
1366. T. Cockcroft.	1530. J. H. Johnson.
1372. J. Tall and A. Williams.	1541. P. McGregor.
1384. C. Moore.	1559. G. Perkin.
1392. J. Tolson.	1595. W. A. Gilbee.
1399. J. M. Hart.	1714. W. R. Lake.
1403. D. and A. Posener.	1858. B. Hunt.
1405. J. Ramsbottom and T. M. Pearce.	2279. W. R. Lake.
1410. W. Henderson.	2636. R. E. Hodges.
1415. E. S. Copeman.	2674. S. Fox.

Patents on which the Stamp Duty of £50 has been paid.

2756. H. Phillips.	2827. J. J. Holden and S. J. Best.
2758. D. McDermid.	2814. W. Robertson.
2766. C. E. Brooman.	2832. E. Tavernier and H. W. Whitehead.
2793. E. Alexandre.	2838. J. Deas and R. C. Rapier.
2808. H. M. Nicholls.	2878. T. Hunt.
2785. M. and A. D. Hopkins.	3038. J. L. Clark.
2853. E. P. North.	
2815. J. Dodd.	

Patents on which the Stamp Duty of £100 has been Paid.

2910. A. Krupp.	2985. J. Shirt and C. Briggs.
2971. D. Scattergood.	2927. F. Gregory.

Journal of the Society of Arts.

FRIDAY, NOVEMBER 12, 1869.

Announcements by the Council.

Notice to Members.

The One-Hundred-and-Sixteenth Session of the Society will commence on Wednesday, the 17th November, when the Opening Address will be delivered by Lord Henry G. Lennox, M.P., Chairman of the Council, and when the Prince Consort's Prize, awarded at the last Examinations to Mr. William John Wilson, will be presented.

The following are the dates of the Wednesday evening meetings, the chair being taken at 8 o'clock:—

1869.	November	—	—	17	24	
„	December	1	8	15	22	—
1870.	January	—	—	19	26	
„	February	2	9	16	23	
„	March	2	9	16	23	30
„	April	6	—	20	27	
„	May	4	11	18	25	
„	June	—	—	—	—	29*

For the Meetings previous to Christmas, the following arrangements have been made:—

November 17.—Opening Address by Lord Henry G. Lennox, M.P., Chairman of the Council.

November 24.—"On Silk Supply." By Thomas Dickins, Esq., Chairman of the Silk Supply Association.

December 1.—"On an Improved Means for Laying a Tunnel for the Transit of Passengers across the Channel." By Zerah Colburn, Esq., C.E.

December 8.—"On Prints and their Production." Being a sequel to a former paper, entitled "Engraving and other Reproductive Art Processes." By S. T. Davenport, Esq.

December 15.—"On India-rubber, its History, Commerce, and Supply." By J. Collins, Esq.

December 22.—"On the Recent Improvements in Small Arms, British and Foreign." By Capt. O'Hea.

A book of blank Tickets of Admission to the Meetings will be sent to each Member, who is privileged to introduce two friends to each Meeting on their presenting orders signed by him. Additional Tickets will be forwarded on application.

The first Course of Cantor Lectures for the ensuing Session will be "On the Spectroscope and its Applications," by J. Norman Lockyer, Esq., F.R.S., and will consist of three Lectures, to be delivered on Monday Evenings, the 6th, 13th, and 20th December, at Eight o'clock. Other courses will also be given during the Session, one, by A. W. Williamson, Esq., F.R.S., Professor of Chemistry in University College, London, "On Fermentation, especially in connexion with M. Pasteur's Researches," having been already arranged. These Lectures are open to Members, each of whom has the privilege of introducing two friends to each Lecture. Tickets for this purpose will be forwarded in due course.

Members are reminded that, should any of their friends wish to join the Society, the opening of the Session is a favourable opportunity for proposing them.

Improved Cabs.

The Council of the Society of Arts offer the following medals for improved hackney carriages specially suited to the metropolis:—

The Society's Gold Medal for the best and most convenient open hackney carriage for two persons.
The Society's Silver Medal for the second-best ditto.
The Society's Gold Medal for the best and most convenient closed hackney carriage for two persons.
The Society's Silver Medal for the second-best ditto.
The Society's Gold Medal for the best and most convenient hackney carriage for four persons, either open or closed, or both.
The Society's Silver Medal for the second-best ditto.

Lightness of construction, combined with adequate strength and durability, will be especially considered in making the awards.

The awards will be made after actual trials of the carriages extending over a certain period.

Communications describing the carriages must be sent to the Secretary of the Society of Arts before the 1st January, 1870, the carriages to be sent to a place hereafter to be appointed.

The Council also offer the Society's Silver Medal for the best instrument, to be affixed to a cab or other hackney carriage, for indicating the fare as between the passenger and the driver, whether by registering the distance travelled or otherwise, and which instrument shall also indicate, for the convenience of the cab-owner and of the driver, the total distance travelled during the day and the total amount earned. The instruments competing, with full descriptions of their construction, to be sent to the Society's House before the 1st January, 1870.

Competitors may, at their option, sign their communications, or may forward with them sealed letters containing the name and address of the writer.

The Council reserve to themselves the right of withholding all or any of the medals, in case none of the carriages or instruments possess, in their opinion, sufficient merit.

In the trials of the several carriages, the small amount of vibration and noise will be duly considered by the judges.

Subscriptions.

The Michaelmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

* The Annual General Meeting: the Chair will be taken at Four o clock. No Visitors are admitted to this Meeting.

NATIONAL EDUCATION UNION.

On Tuesday morning, the 2nd instant, a congress was opened at the Town-hall, Manchester, under the auspices of the National Union, "for securing the primary education of every child by judiciously supplementing the present denominational system of national education." A considerable proportion of the audience, as well as speakers, were clergymen and ministers. The Earl of Harrowby presided; and there were on the platform Lord Robert Montagu, Lord Edward Howard, Mr. W. R. Callender, jun., and the Rev. Canon Hornby. A deputation from the Society of Arts, consisting of Mr. Edwin Chadwick, C.B., member of the Council, and Mr. Le Neve Foster, secretary, attended, and the letter from the Council (see last *Journal*, p. 899) was read.

The following is the programme of the Union.—

"A complete system of national education to harmonise with the existing framework must embrace the following requirements:—1. The primary instruction of all children, without exception, in reading, writing, and arithmetic. 2. The inculcation of religious and moral truth; whilst care be taken that denominational teaching be not imposed upon children without the assent of the parents. 3. The cardinal principle of parental responsibility must be preserved; the parents to have the choice of schools, whether liable partially or wholly for the cost of schooling. 4. When the parents are unable to pay for the children's schooling, and come under the class of paupers, indoor or outdoor, then the cost of instruction to come out of the poor-rates. Vagrant children in boroughs, found wandering about the streets, to be liable to be sent, by police, to industrial schools; the schools to be maintained out of the borough rate. 5. The education of children of the working classes should combine industrial training with attendance at school, as under the provisions of the half-time system; that is half-time attendance at school, and half-time at work. 6. No child or young person to be allowed to work full time without having passed a satisfactory examination in reading, writing, and arithmetic; and, having received a certificate of these qualifications, such certificate to be a passport to full-time. The period of half-time to be prolonged beyond the present age of 13 until such child or young person shall have satisfactorily passed such examination. Discretion allowed to examiners to pass those naturally incapable. 7. All schoolmasters in schools aided by government to be properly qualified for their work, and their qualifications to be tested by a certificate of efficiency, to be granted by competent examiners. 8. In denominational schools receiving government aid, a conscience clause to be insisted on, to prevent denominational teaching of children whose parents object thereto. 9. Special grants for technical or scientific instruction should form an essential feature in all schools aided by government.

"Existing legislation requires to be supplemented as follows:—1. The provisions for the education of children of the working-class to be extended to the agricultural district by a compulsory attendance at school on alternate days, or weeks, or for a given number of days in the year; a certificate of attendance to be a condition for work under 13 years of age. 2. Grants to be made to infants' and mixed schools, for the training of children under the age at which they are allowed to work. 3. No children at or above 13 to be allowed to work full-time without a certificate of the qualifications before referred to. 4. More liberal grants to be made to evening schools under teachers of ascertained competency for young persons who work full-time, so as to continue their education after the age of 13. 5. The Act to provide for the education and maintenance of pauper children in certain schools and institutions, passed 17th July, 1862, and the Industrial Schools Act, to be rendered compulsory."

The Earl of Harrowby, on taking the chair, said he had been called upon to preside under the following circumstances:—A considerable movement had occurred at Birmingham upon the subject of national education—one of the highest, and most important, and most vital interests of the country. A number of those who were interested within the town itself, and in its neighbourhood, in this important question, said that the grounds upon which that movement rested were not safe to the country. They organised themselves in consequence, to show that even Birmingham itself was at least not unanimous in that movement, and these persons did him the honour to ask him to preside over them; and as president of that meeting, which was the first to take a step in this direction, he had been asked to preside at this congress, which had the same objects in view. The question was, Are you to have the education of the country without religion? In the first place, those who were present differed a little from those of the National League, who had taken the lead upon this question,—first, as to the extent of the evils existing; and, second, as to the nature of the evils; and, third, and most strongly, as to the remedies proposed. The promoters of the National League had proceeded upon the principle that every poor man and poor man's child in this country should be, from nine to twelve years, at school. Was that compatible with the existence of labour at all, or with the proper training of the labourer's children to assist in the maintenance of their families, and their ultimate maintenance of themselves? An evil did indeed exist, but where did it most exist as to quantity? It existed in some very small parishes. The investigations lately entered into by the National League proved that it was limited in regard to country parishes to very few, in which the population was very small, and where it was difficult to provide and maintain a school. The evil existed also in a number of the large towns. That was the evil they had to remedy as to quantity. Now, to meet this evil they were requested to supersede practically that which had nearly covered the whole of the country with schools. Those who proposed the new scheme contended for free schools, no payments exacted from the parents, the schools maintained by rates, and schools conducted on what they called unsectarian principles. Of course these were just other words for the exclusion of religion. Now, the Union objected to all these grounds. They said that free schools were not valued by the parents nor by the children. They appealed to the evidence of America in their favour on that point. There they held that it was not fair to charge upon the rates of particular localities those burdens which ought to be borne by the Imperial funds. They held it was not fair to impose this burden merely upon realised property, instead of upon that much larger extent of property which existed in personalty. They held further—and this was the greatest of all objections—that under the plausible name of unsectarianism, it was practically proposed that no religion should be taught in public schools. His lordship went on to show that the Catholics would not consent to part with the denominational system already existing, and (quoting from the inspector's reports) that the religious difficulty was not practically appreciable, the principle of the conscience clause operating to prevent it. The present system should, therefore, be extended, and the State should give larger aid. Imperial funds ought to be liberally contributed to what was really an Imperial matter.

Lord R. Montagu, M.P., read a paper entitled, "What is Education? Comparison between Secular and Denominational Education." He argued that there must be religion taught in schools, in order to insure that development of the nobler qualities of mankind, and the subordination of the animal nature, which was required for the making of good husbands and fathers, respectful and obedient children, unselfish friends, benevolent landlords, and loyal citizens. Lord Russell had said last year, that the present system had failed because there

was still a large portion of the population without education, and from this premise he drew the deduction that the niggard sums which, in 1862, had been devoted to education ought to be cut down, and the whole system changed essentially. The premise, however, was denied. The statistics of the matter showed that the system had not failed. Educational destitution was of three kinds —the want of school buildings, the want of masters, and the deficient attendance of children. With regard to the first, Lord Palmerston's government, when Mr. Lowe was Vice-President, had taken a course which it was desirable to remedy by contrary legislation. The second species of educational destitution was the dearth of masters, and it must be provided for by a more liberal treatment of training colleges. With regard to the third, the insufficient attendance, the rule of the Revised Code of 1862, for ascertaining the average attendance, was extremely misleading. It was mere education-mongering for raising a phantasm of educational destitution where none existed. The only way of meeting the difficulty of the deficient attendance of poor children, and competing with the labour claims, would be by teaching industrial occupations at school, so as to make it the interest of parents to send their children to school. He maintained that the system in America showed decidedly that it could not remedy the evils complained of. We ought not to abolish our own present system because of a small educational destitution which was yearly decreasing, and adopt another system under which all the species of destitution were greater, and were annually increasing.

Lord Edward Howard held that this representative meeting of gentlemen of all creeds and politics, was an answer to those who thought the friends of religious education were in favour of education being narrowed. He maintained that religion must be acknowledged in education. He did not say that the friends of secular education meant to deny a child its chance of learning what the better life hereafter was to be, but that would be the result of their system. If, then, we must have religious education, any man would be mad, in a country like this, who said, "Do not let that teaching be denominational." It had been said that secular knowledge was not necessarily opposed to religion, but merely distinct. It merely ignored religion as mathematics ignored chemistry, neither denying nor affirming it. That was what he objected to; it put religion on one side, to be treated as a casual thing, and he believed the inevitable results would be, if religion was put out of the regular school course, it would be disregarded altogether.

A paper, by the Rev. Dr. Barry, Principal of King's College, "On Religious Liberty in Education," was read in his absence by the Rev. Canon Hornby. In the course of the paper it was observed that the government had recognised two systems of education—the one based upon the teaching of distinct creeds, the other unsectarian, though acknowledging the authority of Scripture. The desire of the nation was shown by the fact, that of the government-aided schools six-sevenths or seven-eighths adopted the denominational system. The operation of the Conscience Clause secured entire religious liberty in these schools. But, under a secular system, religious liberty would not be secured, for, with secular schools, there would be no means of gratifying the preference either of those who desired the first class of schools (the denominational) or those who preferred the second class that he had named.

The Rev. F. Meyrick, late her Majesty's Inspector of Schools, said the real ground for the attack upon the denominational system was not its failure, but its success, threatening to cover the whole ground, and leave no opening for the secularists. By a rate-supported system we should lose the advantage of religious zeal in voluntaryism, and the present system would be destroyed, for people would not pay rates and also pay again in voluntary subscriptions.

The advocacy of the denominational system was continued on Wednesday, in a paper by Mr. W. R. Callender, jun. Notwithstanding the exception that had been taken by the Chairman (Lord Harrowby) to the published statistics of the Educational Aid Society, showing that 40 per cent. of the children who ought to be at school or at work were neither one nor the other, Mr. Callender believed in the value of those statements, but dissented from the inferences which had been drawn from them. He thought there were two things wanted in order to improve the present educational system. These were—first, the provision of an educational test before a child is permitted to work, and the prolongation and extension of the term, during which short-time working and education were combined; and, secondly, the adoption of the principle of the old Manchester Poor-house Act, in 1784, which was that every child found wandering and begging, and which appeared to stand in need of protection, or to be deserted by its parents, and every child of poor parents leading idle and dissolute lives, and setting an example of vice and idleness, which should be under a certain age, should be educated, employed, and brought up in habits of religion and industry.

Mr. T. W. Allies, secretary of the Roman Catholic Poor Schools, said the highest and happiest conceivable system of national education was only possible where the Established Church of a nation was the one Church of God, and comprised the whole people. In that case, the idea of dividing education into secular and denominational could never occur. The next best method, with which we must be content in this country, was to take into confidence and co-operation the large religious communities, make grants to each on some general terms, and leave them to combine secular and religious instruction.

The Rev. W. J. Kennedy, inspector of schools, read a paper, entitled "A plea for Denominational Education." He complained that the advocates of the denominational system had not been quite fairly treated by Mr. Dixon, M.P., who took a very prominent part in the proceedings of the National Education League, at Birmingham. They certainly did not deserve to be charged, as they had been by Mr. Dixon, with wishing to extend a system based upon the principle that the working-classes should begin life as the recipients of charity. These words sounded very spiteful. But surely rather those who preferred free schools, and who proposed to maintain these schools as paupers were maintained in workhouses —viz., by rates—were more open to the charge of making the working-classes begin life as the recipients of charity. But it was said that the denominationalists had not done their work completely, because there was a residuum of 40 per cent. of children who did not attend schools. He thought that per-centage was accounted for by such reasons as the indifference and obstructiveness of parents, the wretched homes and social habits of the poor, the employment of juvenile labour, and the pressing wants of the poor. If the denominationalists could have been helped, as those who opposed them proposed to help themselves, freely, and without limit, from the public purse, the work would long before now have been satisfactorily accomplished. In describing the programme of the anti-denominationalists, Mr. Dixon used the word unsectarian. He (the speaker) complained strongly of the use of that word. The League was divided into two sections—those who would restrict the work of schools for the poor to secular subjects only, and those whose views were represented by Mr. Miall, who would permit the use of the Bible as a class-book, the use of prayers, and would allow the teacher to give explanations of the Bible lessons. The latter party adopted very nearly the system which was known as the Irish system, which had been tried in Ireland under favourable circumstances, but had not held its ground. There was a tendency manifest in Ireland to work round to denominational schools, and the same feeling was beginning to be pretty

strongly shown in America. He saw no reason why the compulsory system should not be applied in a modified form to denominational schools, and while, as a previous speaker had contended, there would be a great hardship in compelling a poor man's child to attend a purely secular school, there would not be the same hardship in compelling it to attend a denominational school, even where the parent did not like the particular denomination by which the school was conducted, because parent and child would be alike protected by the Conscience Clause. Let them have wise compulsion by all means. He claimed superiority for denominational schools in four important respects. 1st. They could accomplish what might be required more speedily than any other body. 2nd. They could beat their enemies hollow in point of economy. 3rd. They could beat them hollow in respect of school management. And, 4th. They could provide teachers such as could not be provided by the secularists.

The Congress was also addressed in support of the denominational system by the Rev. Canon Cromwell, the Rev. Dr. Rigg, Principal of the Wesleyan Training College, and Mr. Birley, M.P., who, during the latter part of the day, took the chair. Papers on the Conscience Clause were read by the Rev. J. P. Norris, Canon of Bristol, the Very Rev. Canon Toole (Catholic), and Archdeacon Allen.

Mr. Charles Buxton, M.P., was not at all sorry that there were at the present time two rival, and to a certain extent, antagonistic bodies, endeavouring to take the lead in this great question. It would immensely stimulate public action upon it, and excite far more interest, and perhaps elicit the true policy that ought to be pursued more certainly than if there was but one movement. He trusted, therefore, they would disclaim any feeling of jealously or illwill against the Birmingham League. In many respects they were in perfect agreement. The broad question was this — Should they say that the present system was a failure, and cut it down as a mere cumberer of the ground, or should they own that hitherto it had come far short of the work that had to be done, but set to work to develop, to expand it, to make it far more powerful and effective than hitherto? The Birmingham League aimed at having in every district a free school, supported by rates, untrammelled by any denominational religious teaching, and, further, that it should be compulsory on parents to send their children to school. Probably the League would only advance towards this ideal state of things by slow degrees, but it was clear that the machinery they would set up would, in the course of time, annihilate that which now existed. Now the idea that actuated the Union was the improvement of the present system, which seemed to chime in with the feelings of the people, and which, whatever its shortcomings, was doing great things for the education of the people. They wanted the present system developed and made far more thorough than it now was. He thought that all they could do in the way of compulsion was, to give power to the local authorities to deal with the case of vagabond children in the streets, and to orbid the employment of any child below 13 or 14 without a certificate of education; but he would in no case apply compulsion to the parents.

The Right Hon. W. Cowper, M.P., asked if the existing system of primary education had no life and spontaneity as much as any institution existing in this country? The present system did not proceed from any scheme or any doctrinaire ideas; it was not founded by any man or party, but it had grown with the wants, feelings, circumstances, and necessities of the people; it had adapted itself to the circumstances of the country; it had obtained the concurrence and aid of the Government, and, generally speaking, it had satisfied the parents of the children. The system had cast its roots deep into the country, and it would not be easy to eradicate it.

The meeting was also addressed by the Bishop of Colombo, the Rev. C. Sewell, Inspector of Schools; the Rev. Canon Melville, and the Rev. G. Butler.

The Dean of Durham, while supporting the denominational system, thought they might take a leaf out of the Birmingham book, in boldly facing the problem how to make education universal. They must put their movement upon some popular basis, and he should, therefore, go in himself for a modification of the system of rating. They would never make education universal unless they devised some means by which the people generally would be obliged to support it, and thereby they would be made interested in what they supported. He heartily agreed with the principles of the Conference held in Manchester two years ago, and he did not think that those principles were necessarily opposed to those which were now advocated in the Union.

The congress resumed its sitting on Thursday morning.

The Hon. Algernon Egerton, M.P., presided. He said the object of any scheme for improvement should be threefold—first, to increase the efficiency of the present existing schools; secondly, to provide masters and mistresses in larger numbers; and thirdly, and perhaps most important of all, to sweep up the residuum, who never go to school at all. The inspectors' reports showed that the schools had rather deteriorated than improved since the introduction of the Revised Code. Referring to the scheme of the Union, he said his opinion now was, that the rating principle should be applied only to those who, from varied causes, were not able to give anything towards the education of their children.

Colonel Akroyd, M.P., read a paper, the title of which was "Practical Results of the Factory System of Education and its Extension as a Basis of National Education." He said it was upwards of 35 years since the passing of the Factory Act, which at first was simply inoperative, but it was now showing good results. He gave an account of the effects of the school system in operation at his own works, and, regarding the day schools, said that one cause of the success of the system he attributed to the fact that the education was not gratuitous. Parents contributed freely the weekly pence for the education of their children. The evening-classes had also been productive of great good, many of the students who studied there occupying good positions in life. Then the reports of the factory inspectors showed that the effects of factory education were not entirely dependent on individuals, but were grafted on the whole system. We now heard much of the higher grade of education reached by the operative-class in the United States, as contrasted with the United Kingdom, but an official return from the State Constable of Massachusetts, for 1868, revealed a state of things much at variance with our popular notions. Taking the certificates to marriage registers as a test, he found that in Massachusetts the proportion of those who could not sign was thirty per cent. of men, and forty-six per cent. of women; while in England the proportion was twenty-three per cent. of men, and thirty-two per cent. of women. On the question of the capabilities of the extension of the factory system, he said there were defects in the Workshops Regulation Act, which might be remedied by the Government Education Bill to be introduced next session. It might be enacted that no child, having reached the age of thirteen years, should be allowed to work full time without a certificate of education, and thus it would be clearly in the interest of the parents to send their children to school before the age of thirteen, as a passport to full work and full wages. Thereby a loophole would be closed, and the field of education be made co-extensive with the whole of the working population. The whole course of past legislation ran in the groove of the half-time system, and it remained to be seen whether the system should be abolished and an untried one substituted. There were special advantages in the factory system which deserved the careful consideration of all the friends of education; it combined industrial training in the school and the workshop with secular instruction; it enlisted the atten-

tion of employers, and almost compelled them, for their own sakes, to contribute to and take part in the management of the schools; it afforded scope for voluntary aid from individuals and denominations; it husbanded and economised the present school appliances, and it allowed clergymen of all denominations to take part in the task. The religious difficulty he believed to be exaggerated. In his own schools there were children of parents attached to every denomination, and no objection had been raised by parents to the religious teaching. Indeed, under the age of thirteen, children understood very little of sectarian or denominational teaching. Attempts to proselytise at that early age were futile.

Mr. F. S. Powell denied that there was anything in the payment of rates which would remove the existing deficiency. The question had been greatly cleared by the admission which had now been made that a system of permissive rates, such as exists in America, was not a sufficient remedy for the evils around us. He spoke strongly against a system of entirely free schools. He did not think that the struggling ratepayer would be willing, nor would it be just, to pay rates for the education of the children of the well-to-do artisans. The country was already overburdened with rates. But there ought to be some means whereby those who were unable to pay the cost of their own education should have school wages, according to the American phrase, paid for them, either by rates or by the action of benevolent men. He thought there was a stratum of our population which could not be reached by our ordinary schools, and expressed a fear that if it could the effect would be to turn some of the others out, and he deprecated any system which would have the effect of turning away some of those who were now the ornaments of our system.

Mr. Alexander Redgrave, Chief Inspector of Factories, in a paper upon "The Extension of the Half-time System," said that system was the groundwork for the superstructure upon which the work of the Union rested. In Lancashire and Yorkshire the system was well known, but in other parts of the country it was known only as a compulsory system of education. If we were now commencing a national system, we could not do better than follow the example of Prussia; but for upwards of 30 years we have been experimentalising, and we had now full proof that our system, when in full and fair operation, was an excellent one, and we had the experience of years to show how the excellence of such a system could be made universal. It must, however, be remembered that the half-time system was at the present time almost local; its *habitat* was Lancashire and Yorkshire. In 1830, the proportion of half-timers employed in factories was only 5·9, while, in 1868, the percentage was 9·5. This was a convincing proof that the system was appreciated and fostered by manufacturers. It appeared from the Registrar-General's returns, that there were in Blackburn 15,837 children between five and fifteen years of age, and of these 11,147 were attending schools of various kinds, so that 74 per cent. of the children were attending school. In Halifax, the proportion was 70 per cent. It was also found that, making every allowance for the larger number of half-timers than day scholars, the former passed a better examination, and showed how well the half-time system worked when in proper operation. A further inquiry was instituted some time since, as to the capacity of children to read and write, who were presented to the surgeons for the purpose of being certified for factory work. In Blackburn only 24 per cent. were unable to read; in Rochdale only 24, and Leeds 29. Then, in Newcastle, a town in which half-time had no existence, 54 per cent. of the persons examined could not read. The failure, therefore, was to be attributed to the employers, who ignored the half-time system. He confessed to grave disappointment at the educational results of the Factory Act of 1867, and he desired to give the fullest publicity to this, to show that the old factory half-time system must be renewed and invigorated to make it efficient and capable of overcoming the present educational deficiency in particular places. They must so enlarge the system as to make it more the interest of the employers than it now was to promote the education of the young. In addition to the proposal of the League, he thought there should be two conditions insisted upon—proof of previous attendance at school should be required of every child before working short time, and the short-time period should be extended to 14 years of age, instead of 13, as at present. In the abstract, he was not in favour of allowing children to be employed at all under 12 years, but they must inquire whether that was possible, and he must admit that at present it did not seem to be so. In the agricultural districts he was in favour of making school attendance compulsory only during certain months of the year.

The Rev. Canon Norris expressed his strong repugnance to the adoption of a general compulsory system, which he declared would be unfair and impracticable. He advocated the adoption of a system of indirect compulsion, which had been adopted under the Factory Education system, as sufficient to meet the wants of the country.

The Rev. Dr. Rigg, principal of the Wesleyan Training College, Westminster, read a paper upon the subject. He advocated the principle of compulsory education, but did not think it desirable that the system should be passed into law, because its operation could only be partial, and he believed in that form it would be impracticable.

Mr. C. R. Ford, secretary to the Reformatory and Refuge Union, read a paper on "The Industrial Schools Act." While bearing testimony to the general success of the industrial school system, he regretted that magistrates did not take larger advantage of the Act in the cases of children brought before them.

Mr. James Cropper advocated the more extensive adoption and application of Denison's Act, which gave authority to Boards of Guardians to undertake the education of children of outdoor paupers.

The Earl of Harrowby said that, on this point, he had learnt that, by the application of Denison's Act in Birmingham, 1,600 more of the poorest children would be received into the schools. When they recollected that this was the class of children most likely to furnish the criminal classes, and that the out-door paupers received from the guardians only enough to enable them to live, and not to educate their children, it was difficult to see why the Act should not be applied. He believed that if Denison's Act were extended in its application, and made compulsory, a great part of the difficulty which was generally felt would be solved.

The Rev. W. Morrison, vicar of St. James's, Halifax, read a paper on "The Weak Points in the Working of the Present System." The paper contained a number of suggestions for the improved management and administration of schools.

The Rev. Dr. Bell, vicar of Goole, and the Rev. J. P. Pitcairn, vicar of Eccles, afterwards spoke upon the same subject.

The congress completed its labours at the evening sitting on Thursday.

The Right Hon. W. F. Cowper, M.P., presided, and, in opening the meeting, said it seemed to him that the working classes had a right to demand that if the State should undertake the education of their children it should do so thoroughly, not put them off with the acquisition of mere mechanical methods of mental education, but treat them as immortal beings. He thought the religious difficulty had been much exaggerated; for, in his experience, he found that the children of Dissenters who went regularly to the Church schools during the week went as regularly to the Dissenting chapels on Sundays. In his opinion, the solution of the difficulty was to be found in rendering the schools unsectarian without becoming irreligious; or, in other words, rendering them religious without becoming sectarian.

The Rev. J. W. Oliver, secretary of the Wesleyan Education Committee, said the Methodists entertained no objection to the religious teaching in Church schools. But religious instruction in day schools was one thing, and Sunday liberty was quite another. He was glad to know that the National Society had withdrawn the rule which compelled attendance at Church Sunday-schools as the condition of their attendance on the week-day. But there were numbers of the clergy in the Established Church who, notwithstanding the withdrawal of that regulation, did most intolerantly compel attendance in the Sunday-school as the condition of instruction in the week-day schools, and of this the Methodists did complain. There was a necessity for a conscience clause upon the Sunday as well as on the week-day, and if that question should be dealt with in the spirit in which it had been dealt with by the speakers who had referred to it, he made bold to say that, so far as the Methodist Church was concerned, the difficulty was practically at an end. He must say, further, that it was a mistake to suppose that the establishment of the Birmingham League was raised in opposition to religious teaching, or was merely antagonistic to the spirit of religion. He declared it to be his deliberate conviction that that League was in many cases, and to a very large extent, the protest supposed to be necessary of the spirit of freedom, in opposition to a spirit of mere ecclesiasticism.

The Dean of Durham (Dr. Lake) thought a very great educational want throughout the country had not been quite sufficiently dwelt upon as a necessary basis for the operations of the Union. The educational deficiency did not consist simply in the number of children actually at school, but in the attendance of children at school. He quite admitted the high quality of education in this country, but at the same time it fell far short of Switzerland, Prussia, and Scotland. That should not be shirked, and if the Union was to continue they must be quite determined to go thoroughly into the subject, and show themselves as anxious as the Birmingham League to bring education home to the doors of every house in the country, and that, where it was necessary, they would force it upon the unwilling.

Colonel Akroyd, M.P., moved the following resolution:—"That this congress desires to record its general approval of the scheme of the National Education Union, and is of opinion that it ought to form the basis of further legislation for the comprehensive extension and completion of our national system of education."

Mr. S. R. Graves, M.P., seconded the resolution. He said that after listening for two days to the deliberations of the congress, and with a full sense of the responsibility of his official position, he was happy to be able to state that he gave in his entire adhesion to the general principles of the Union. He hoped the Union would not cease its labours until there should be appointed a separate Educational Board, and a Minister of Education sitting in Parliament and responsible to the people. There should also be a representative of that Minister placed residentially in every large town, with equal responsibility to direct school operations, and especially to carry out the extension of the Factory Acts and Industrial Schools Act.

The resolution was adopted.

The Ven. Archdeacon Durnford moved—"That this congress earnestly invites the friends of the existing system of national primary education to enrol themselves members of the Union—to meet together in their respective localities, and form themselves into auxiliaries for united action, and to sustain the central executive during the coming year by subscribing to the guarantee fund now so liberally opened, and to invite the clergy and ministers of religion to use their influence in this behalf."

Mr. T. W. Allies seconded the resolution, which was unanimously adopted.

Mr. F. S. Powell moved the appointment of the list of executive officers as drawn out by the congress committee.

The Dean of Durham seconded the motion, which was passed.

The Rev. Canon H. M. Birch moved the thanks of the congress to the Earl of Harrowby, Mr. Birley, M.P., the Hon. A. F. Egerton, M.P., and the Right Hon. W. F. Cowper, M.P., for their kindness in presiding, and to the readers and speakers at the respective sessions of congress.

The motion was seconded by Mr. John Marsden, and agreed to.

The Chairman briefly replied, and the congress broke up.

THE FAVERSHAM EDUCATIONAL SYSTEM.

By George C. T. Bartley.

The educational system in the ancient town of Faversham is so efficient as to form almost a pattern to other places of even greater size and importance. The town contains about 7,000 inhabitants; it has a charter of incorporation, and elects a mayor, four aldermen, and twelve councillors annually. The occupation of the inhabitants of the surrounding parishes is chiefly divided between dredging for oysters and farming.

Like many ancient towns, Faversham has large endowments, about £4,000 a-year being available for various purposes. The largest item amongst these funds is that bequeathed by Mr. Henry Wreight, in the year 1838, amounting to over £2,000 per annum. According to this gentleman's will, the money was to be spent in a variety of ways, though all for the relief of the poor, in some shape or other. Fortunately, the idea seems to have struck him that in so small a place it might be difficult at times to find proper means of employing so large a sum, and he inserted the following words towards the end of the conditions of trust, viz., "and [the money shall be applied] in any other way the trustees shall think proper, and conducive to charitable purposes in the said town."

As might be imagined, the trustees had at first considerable difficulty in expending the income, more particularly as the town at that period was smaller than at present; but, no sooner did it get known that so much money was going begging, than idlers and tramps began flocking to the town like birds of prey, in anticipation of plentiful doles of bread and money on Sundays. The effect of this was not long in making itself felt, and the trustees discovered that, in reality, the charity instead of being a blessing was quite the reverse, for the town was becoming rapidly pauperised, and this not only by the immigrants, but by the demoralising influences on the hitherto hard-working inhabitants.

Such being the case, a few gentlemen residing in the town determined to act on the spirit of the latter clause of the will, and accordingly applied to the Court of Chancery for the requisite authority. This was obtained, after some little opposition, in 1856, and a scheme for the proper use of the funds finally settled.

The outline of this was as follows:—

(*a.*) Almshouses, at a certain cost, were to be erected.

(*b.*) A recreation-ground was to be laid out in the town.

(*c.*) £1,000 was to be devoted to building residences for the mistresses of the national school.

(*d.*) A sum of £530 per annum was to be set aside, for the trustees to be at liberty to devote to the national school.

(*e.*) A commercial school was to be erected, at a cost of £3,200, for the middle-class.

(*f.*) A certain sum was placed at the trustees' disposal for exhibitions, to be given to boys in the national and commercial schools, to enable them to continue at the grammar school.

(*g.*) A certain sum might be used for scholarships from the grammar school to the universities.

Such was the scheme, and, with the grammar school founded by Dr. John Cole, in 1576, the income of which amounts to about £370, it forms the system of educa-

tion provided for the town. The working of each branch will now be briefly considered.

The National Schools.—These schools are all day schools, and are conducted on the whole-time system, there being no industrial training, and not even any drill. They are divided into the infant school for boys and girls under seven, the girls' school for girls over seven, and the boys' school for boys over that age.

A feature in the girls' school, which gives it a pleasant appearance to a visitor, is the habit of making each child wear a white pinafore while at work, which is left behind on quitting the schoolroom. The appearance of these white uniforms gives a clean and fresh aspect to the classes.

The course of instruction does not go beyond that usually pursued in national schools, viz., the three R's, with the addition of needlework for the girls, though, as a proof that the instruction is sound, it should be stated that, last year, the inspector, the Rev. G. R. Moncrieff, reported that "the results of the standard work was high, above 94 per cent. on the very large number presented."

In one respect there is a grand difference between the girls' and boys' schools. In the latter are found the children of artisans, small shop-keepers, and even fairly well-to-do men of business; in fact, it is the only place in the town where a sound instruction can be afforded, and parents do not mind their boys mixing with those who are rather below them in station. With the girls, however, this is not the case, many parents having an idea that it is more genteel to send their daughters to private schools, where, indeed, the education is often defective, though the fees are considerably higher. In consequence of this, the girls at the national schools are almost all of the artizan and labouring classes.

The sectarian difficulty at Faversham is completely got over by a liberal conscience clause. Religion is taught on the broad principles of Christianity, with the Church catechism; though any parent sending a written objection may have his child excluded from such instruction. The consequence is, that only some half-dozen have availed themselves of this privilege in the last dozen years, though more than half the school are not Church of England. This will be seen from the following table, giving the number of each denomination in May last:—

Church of England	480
Wesleyan	214
Baptist	63
Independent, &c.	212
Roman Catholics	1

The numbers of children in the schools, paying one penny a-week, during last year, were:—

Infants	375
Elder girls	245
Elder boys	350
Evening scholars, chiefly composed of those who have left the day-school for some employment	55
	1,025

The schools are managed by a committee of 20, four of whom consist of the chairman and three other members of the Trustees of Public Charities. This committee has the power to send up the best boys, to the number of eight, from this school to the national school, and also to pay their fees. By this means a promising lad gets the first step, if he shows any peculiar ability.

The Commercial School.—This school originated in the formation of an advanced class for the national school, which increased so rapidly as to render it advisable to make it into a distinct advanced school. For this purpose, as before stated, £3,200 of Wreight's fund was applied for and afterwards devoted to the erection of suitable premises. The school is entirely a day-school, though the head-master takes about 25 boarders; and the course of study is considerably in advance of that given at the national school. It is greatly to be regretted, however, that elementary science forms no part of the curriculum, not even for the elder boys.

The fees at this school are £3 per head per annum; the boys vary in age from 8 to 16, as will be seen below, taken in April, 1869:—

Between 8 and 9	4
„ 9 „ 10	9
„ 10 „ 11	21
„ 11 „ 12	13
„ 12 „ 13	28
„ 13 „ 14	21
„ 14 „ 15	9
„ 15 „ 16	5

Some of the children come from considerable distances to attend the classes.

The parents of 59 of the boys reside in Faversham; 16 within four miles; 14 at Whitstable; 2 in the Isle of Sheppey; 1 at Maidstone; 3 at Woolwich; 3 at Dover; 3 at Deal; 4 at Sittingbourne; 4 at Chatham; 1 in London. Many of these necessarily reside with the head master, but it is interesting to know that 96 reside, either with their parents or in lodgings, within one mile of the school; 3 reside within three miles of the school; 7 within four miles; 1 within five miles; and 3 within seven miles, going backwards and forwards daily.

The mixture both of grades of society and also of sects in this school is noteworthy, and makes it evident that these supposed difficulties are more imaginary than real. Of the 110 boys in the school, in May last, 14 were the sons of professional men; 15 the sons of farmers; 51 of tradesmen; 8 of ship-owners and merchants; 7 of clerks; 13 of artisans; and 2 of mariners; and, further, the parents of

60 of them belonged to the	Church of England
28 „ „ „	Wesleyan body
1 „ „ „	Baptists
20 „ „ „	Independents
1 „ „ „	Jewish community.

The Grammar School.—This is, unfortunately, at present, the part of the Faversham scheme which does not fulfil its proper duties. It might be expected to form the culminating-point of the educational arrangements of the town, and so undoubtedly it should, and probably will be made to do by the Endowed Schools Commission. The vital question as to who are the managers is somewhat disputed between the Trustees of Public Charities, the corporation, and the Warden of All Souls College, Oxford, so that any improvements are difficult to carry out. The present teacher is a gentlemen of over 80 years of age, and consequently too old to perform his duties, which have to be attended to by deputy.

The number of scholars is eight, and they pay a fee o £8 per annum; and, as the endowment is £370, the cost per student is as high as £54 per annum. For this they are merely taught by one master, and receive no board whatever, and there can be no doubt but that the education at the commercial school at £3 is as much better as it is cheaper. This state of things will, no doubt, be shortly changed, as the feeling in the town is strongly against it, and last summer a deputation waited on the Rt. Hon. W. E. Forster, on the subject.

The Trustees of Public Charities have power to give two exhibitions to Oxford and Cambridge, of the value of £60, to the best scholars in the school, but owing to the small attendance, in consequence of the inefficient state of the grammar school, this has never yet been done.

The Mutual Relation of the Schools one to another.—The peculiarity of the Faversham Schools is their connection one to another, and the means they afford to a promising boy of rising even from the lowest rank to the advantage of a good education, culminating even in a university diploma. This final step will be more satis-

factorily arranged when the grammar school has been remodelled.

The infant and national schools receive the children of the poorer classes, the payment being but one penny per week. A sound education is here given until the age of twelve; at this age they must leave, though the greater number unfortunately give up school long before that period. To those who show any promise a free admission is given by competition to the commercial school, and by this means a boy rises at least one step, and may have the advantage of an excellent advanced education until he is sixteen years of age.

So far, the promotion of a clever boy is secured, and the next step is an exhibition to the grammar school. The trustees have power to grant £50 a-year, in sums not exceeding £10 each, for this purpose. Were the grammar school what it shortly will be, this step would be an immense advantage, and be the means of bridging over the widest gap which at present separates the poor genius from the way to usefulness.

To the brightest stars of all a further opening would present itself after this, in the shape of a £60 scholarship to Oxford or Cambridge, the funds for this, as for every previous step, being obtained from Wreight's charity, thus, happily, snatched from being applied to the creation of pauperism, and applied to the only sound way of reducing poverty, namely, increasing education.

It is difficult to conceive a better system, or a more admirably drawn scheme for providing for the education of a town, than the one which has been thus sketched out as existing at Faversham, and, as far as it has gone, the results have been quite successful. The culminating point, in the grammar school, being at present in an unsatisfactory state, is to be regretted, though it cannot be looked upon as permanent. From the energy and ability displayed by the inhabitants in the national and commercial schools, it is not likely that they will remain much longer in getting the grammar school completely re-organised, and put on a proper footing.

It would seem probable that the office of head-master of the whole set of schools, including grammar, commercial, and national, might be entrusted to one officer, charged with general superintendence, and renumerated partly by a fixed salary, and partly by fees. The classes in the grammar schools should be as superior to those in the commercial as the commercial are at present to the national. None should be admitted to the grammar school unless they had passed through the other schools, or, at any rate, were sufficiently educated to benefit by the classes, which should be only of an advanced nature. At present considerable time is spent at the grammar school in giving elementary instruction in reading and writing. The resources of the schools, when combined, would supply sufficient funds to provide an ample staff of teachers of varying qualifications, including physical science, and there could be no doubt but that, with these advantages, coupled with the attractions of the exhibitions to the universities, which might be thrown open to all the inhabitants of Kent, the Faversham Union Schools would be second to few in the country.

General Conclusions.—Several points are worthy of note in the institutions under consideration. They show chiefly what may be done, even in a small place, by the proper use of endowments, and by organisation and combination. The schools are much more efficient than half-a-dozen small ones in different parts of the town would be. They also show that such combination is not only efficient but economical, both in teaching power and in absolute cost. The average cost in 1867-8 was £1 4s. 1d. per head per scholar. Comparing this with the average cost of each child in all the schools in England and Wales, inspected by the Committee of Council on Education, in the same year, it is less by 2s. 7½d. per head. It follows, therefore, that if all the children in the Education Department Schools had been managed as the Faversham children, a saving of no less than £140,000 a-year would be effected, and a superior education given at the same time. The religious sect difficulty is here practically got over, and, further, a step is made of inducing parents to allow their children to be educated together, though their stations in life may be somewhat different.

Finally, it may be remarked that Faversham in no way differs from many other towns. A large number of places have funds at their disposal, which are yearly wasted or spent in fostering idleness, under the cloak of charity. Were they all to take a lesson from Faversham, and adopt this system, by combining the small district and party schools into large and well organised institutions, the charity funds thus used would soon bear their own fruit, and more effectually relieve distress than any number of Sunday doles.

SCIENCE AND ART INSTRUCTION FOR WOMEN.

A movement was, last year, set on foot by a committee of ladies, who constituted themselves promoters of a scheme for the higher education of women. The term "higher" is perhaps rather ambiguous. The subject of the first course of lectures whereby the "higher education" was imparted, was "English History," minutely dealt with by Mr. Wiseman. Then followed discourses on "Size and Shape," a new science, invented by Mr. Clifford, apparently based upon the problems and theorems of Euclid; and this season has opened with lectures on Grecian History, by Mr. Kennedy. It will therefore be seen that the choice of subjects is somewhat erratic and unconnected.

With the desire of securing a consecutive course of "instruction in science and art for women," a distinct committee of ladies from the above-mentioned has been formed, having the Hon. and Rev. Mr. Byng for their treasurer; and certainly not in antagonism, but probably more as an auxiliary, to the "higher education of women" scheme, announcement has been made of a course of lectures on "Physical Science," to be delivered by Professors Huxley, Guthrie, and Oliver. Professor Huxley treats on "Physiography," *i.e.*, a rudimentary analysis and description of natural facts, more commonly considered as physical geography. Professor Guthrie will succeed, with an exposition, under their simplest aspects, of "Elementary Physics and Chemistry;" and Professor Oliver concludes this series of about thirty lectures with "Illustrations of Biology, or the Phenomena of Life, by means of Elementary Botany."

Professor Huxley delivered his first lecture on Tuesday last to an audience of upwards of 300 ladies. The points upon which Professor Huxley touched cannot be better described than in the words of his own "Notes of Lectures," supplied to each member of the audience before the commencement of the lecture. They are as follows:—

"1. The map of the Thames is an outline sketch of the river, as it would present itself to a person passing over it in a balloon.

"2. The Thames at London-bridge is a mass of fresh water, one-sixth of a mile wide. In its deepest parts it is sometimes as little as twelve, and sometimes as much as thirty feet deep.

"3. The water of the Thames at London-bridge runs down (ebbs) towards Margate for about seven hours, and then runs up (flows) towards Teddington-weir for about five hours every day. The river is shallowest at the end of the ebb; deepest at the flood tide.

"4. About 115,000,000 cubic feet more water runs down than runs up beneath London-bridge every day. The overplus goes beyond Margate into the sea.

"5. Above Teddington-weir the water always runs down towards London-bridge. A continuous stream of fresh water, running in this general direction, can be followed as far as Thames-head, in Wiltshire, which is

170 miles from London-bridge, and 370 feet above the water of the Thames at that bridge.

"6. The water which ebbs and flows under London-bridge all comes from the basin of the Thames, the area of which is 6,000 square miles.

"7. The basin of the Thames receives this water in the shape of rain, hail, snow, or dew. The quantity of water which it thus receives in the course of a year amounts to fully two and a-half cubic miles, or would fill a cistern a mile square at the base and two and a-half miles high.

"8. The rain, hail, snow, or dew, come out of the atmosphere. They result from the condensation of the watery vapour which always exists in the atmosphere.

"9. The watery vapour in the atmosphere is raised there by the heat of the sun, from all watery bodies, but chiefly by the sea.

"10. Thus the water of the Thames is constantly circulating, and the agent of the circulation is the sun. Only a part of the water which falls on the Thames basin reaches the sea by way of the river; the rest is evaporated into the atmosphere by the heat of the sun."

The lectures are to be delivered every Tuesday and Friday, at 11 a.m., and the first course ends on Friday, 17th December. Professor Guthrie will then commence his series. Should the present enterprise, which, be it remembered, is a private one, succeed, it is said that lectures on vocal music, by Mr. Arthur Sullivan, are to be delivered. The amount of support, however, given in the present instance will probably regulate any decisions the committee may arrive at on the subject generally.

Notes.

Shelter for Cabmen.—The *British Medical Journal* says:—"A most important movement has been commenced in Edinburgh, to afford shelter for cabmen. Through the exertions of Mr. A. B. Fleming, a neat wooden building, designed by Mr. Pilkington, and provided by subscriptions from inhabitants in the neighbourhood and the cabmen themselves, has been erected at the stand at Randolph-crescent. Large side-windows are provided in it, by which a full view of the road in each direction can be commanded; and it is entered by a door from the street-side immediately facing the stand. A gas-stove is to be provided for it, along with which there will be a small boiler for the supply of hot-water. The movement is, on the face of it, so admirable, that we think there would be little difficulty in raising the funds necessary to provide similar shelter in London and other large towns. The nature of their employment exposes the cabmen to all the influences of cold and wet, and, accordingly, they are great sufferers from consumption, and acute and chronic rheumatism, but more especially from bronchitis; and they are rendered the more liable to these from their intemperate habits, which are, under the circumstances, easily understood, as they find that stimulants 'keep out the cold' for the time. If shelter, such as has been provided in Edinburgh, were procured for the cabmen in every town, there would be less encouragement to intemperance, and their calling would be rendered in every respect a more healthy, profitable, and respectable one. If, in addition, these stands were each provided with a restaurant, where good food was provided, the movement would prove a still greater boon to poor cabby."

The St. Petersburg Exhibition in 1870.—This exhibition is confined to Russian produce and manufactures; it is national, and not international, as has been stated in some publications. It is to open on the 27th May, and close on the 27th of July.

International Coinage.—The Minister of Finance in France has recommended that a gold coin, of the value of twenty-five francs, corresponding with our English sovereign, should be issued by the French Mint, and the Emperor Napoleon has approved of the proposal.

Correspondence.

The Channel Passage.—Sir,—Since writing my letter of the 30th ult., on the subject of a suspension cot, an exceedingly simple solution of the problem has occurred to me, on considering the proposal for a nautical observing chair, suggested at the conclusion of my communication of January 1st, 1861, therein referred to, viz., to transfer the whole coercing power, operative in deadening the effects of oscillation, at once to the point of suspension, and so doing away with the necessity of attachment of any kind to the walls or floor of the cabin, whether by friction bands or by elastic straps. This it was proposed to accomplish in the case there considered, by suspending the chair by a piece of thick and very stiff cable, opposing so much resistance to flexure in every direction, as to afford the requisite coercive power, whether against rolling, pitching, or twisting. In a cabin, however, there is no height disposable for such a mode of suspension. But the same resistance to the prolongation of oscillation in every direction will be afforded by a stiff ball-and-socket suspension, from the ceiling of the cabin, of a cot, resting on a light but rigid iron frame-work (like a birdcage or a tent bedstead), the upper irons converging to, and uniting in a short, but strong vertical bar, terminated above by the ball. The socket should be fixed (orifice downwards) to the ceiling by strong screws. It should enclose no more of the ball than is requisite to give it a perfectly safe and secure grasp, with a view to allowing a great range of conical motion in every direction. It should be made, however, too large, and the interval between its inner surface and the ball occupied by a smooth, thick, very well compressed lining of felt or other friction-producing material. It should open, laterally or vertically, with a hinge, to admit the ball and allow of its withdrawal when required to strike the cot, the socket remaining permanently attached to the ceiling; and it should be furnished with powerful clamping or tightening screws, to increase or diminish the friction as found necessary. It is evident that by increasing the diameter of the ball, and the pinch of the clamping screws, any amount of pendulous motion might be destroyed, and the ball rendered immovable in its socket, so that it is a mere question of experiment what dimensions to give to the one, or what amount of pressure to lay on the other. It is needless to enter into further detail, as any ingenious ironmonger would easily devise a suspension frame-work capable of being readily dismounted and screwed together again when wanted, packing into a small compass for stowage in the day-time. In place of a ball-and-socket suspension, a solid and massive Hook's-joint, with clamps on each of the axes, might be used, the upper arm of the joint to work in a conical friction-socket screwed under the ceiling.—I am, &c., J. F. W. Herschel.

Collingwood, November 5th, 1869.

Diagram of the State of Instruction in Europe.—Sir,—The *Journal* for the 29th October contains a sensational map of the state of instruction in Europe, by Mons. Manier, on which I wish to make a few notes. To say nothing about the fallacy of comparisons as to the superficial area of Sweden and that of Switzerland, and the consideration of density of population, and leaving others to deal with Mons. Manier's remarks on these islands, I call attention to *Sweden* and *Norway*.—This includes Lapland; and I am as yet unaware that the Lapps are better taught than the Welsh or the Finns. Iceland is a much brighter spot than some would like to make it, after allowing for the intellectual activity of the small population. *Greece*.—Mons. Manier says, "Ignorance is general;" and next, "the proportion of scholars is one to every eight of the population. The former statement does no justice to the efforts of the Hellenes to promote education, nor to our own exertions while we held the Ionian Islands. The black line of

Turkey does not exist, so far as the neighbouring Greek population is concerned. *Turkey.*—Mons. Manier says, "Ignorance is universal, and there is not the least acquaintance with the most indispensable acquirements." According to this account, reading, writing, and arithmetic, are unknown in European Turkey, and there are no schools to teach them. This is simply unfounded. There is great ignorance among the Christian populations, from want of instruction in their vernacular dialect, which is now being supplied. The same backwardness applies to Bretons, Basques (in France and Spain), and the nationalities of Austria, &c.—I am, &c., Hyde Clarke.

MEETINGS FOR THE ENSUING WEEK.

Mon.....British Architects, 8.
Entomological, 7.
Society of Engineers, 7½. Mr. Charles J. Light, "On the Need for further Experiments on Strength of Materials."

Tues ...Statistical, 8. 1. Mr. Newmarch (President), Inaugural Address. 2. Mr. Samuel Brown, "Report on the International Statistical Congress of 1869."
Anthropological, 8.
Civil Engineers, 8. Discussion upon Mr. Gaudard's paper on "The Strength and Resistance of Materials;" and, time permitting, Mr. Edward Dobson, "Public Works in the Province of Canterbury, New Zealand."

Wed ...Society of Arts, 8. Opening Address by Lord Henry G. Lennox, M.P., Chairman of Council.
Meteorological, 7.

Thur ...Linnæan, 8. Mr. A. W. Bennett, "Review of the genus *Hydrolea*, with Descriptions of Three New Species."

Patents.

From Commissioners of Patents' Journal, November 5.

Grants of Provisional Protection.

Bleaching—3094—W. W. Ladelle.
Blood-albumen, purifying and decolouring—3033—P. Jacques.
Bottles, &c , metallic caps for—3064—H. Brooks.
Cards, &c., machine for bronzing, &c.—3100—J. S. Grierson and R. Phillips.
Carriage bolts and pins, &c.—3114—J. Wakefield.
Carriages, &c.—2925—A. Etienne.
Electric telegraphic cables, apparatus for coiling—3070—J. Buchanan.
Furnaces for calcining ores, &c.—3074—T. Gibb and C. Gelstharp.
Furnaces for obtaining lead from its ores—2471—G. Metcalf.
Furnaces, fuel-feeding and smoke-consuming apparatus for—3110—W. A. Martin and E. Wylam.
Hansom cabs—3068—G. Clark.
Horses, &c., apparatus for clipping—3076—J. R. Grayson.
Locomotive engines, &c.—3108—T. Dunn.
Looms—3112—J Holding and J. Eccles.
Meat, preserving—3086—T. Deichmann.
Metallic tiles or slates for roofing—3080—C. D. Abel.
Metals, forging or shaping—3104—J. Dodge.
Motive-power, obtaining and applying—3066—G. M. Ashforth and W. Hardy, jun.
Nut-crackers—3096—G. Ireland.
Painting, &c., preparing oils for—2934—J. More.
Pumps—2685—W. E. Newton.
Railway carriage doors, &c., hinges and hinge guards for—3072—A. M. Clark.
Railway engines, &c., couplings for—3098—J. Lockwood.
Railway rails, metallic keys for securing—3088—A. B. Ibbotson and T. S. Sarney.
Railway trains, signalling and communicating on—3082—F. Woodward.
Reaping machines—3078—J. Rignall.
Sewing machine needles—3092—W. R. Lake.
Sheet-iron—3118—W. R. Lake.
Stamping and cancelling presses—3055—B. Sulman and R. Willis.
Sulphate of soda, &c., producing—3084—R. Scott and W. McIvor.
Tube wells, &c., implements for constructing—3116—T. Clark.
Xyloidine, preparing and using solvents of—3102—D. Spill.

Inventions with Complete Specifications Filed.

Nickel, electro-deposition of—3125—W. Brookes.
Portraits, &c., box for enclosing—3117—H. A. Bonneville.
Shaft couplings—3133—M. Clemens.
Springs, coiled or volute—3137—W. R. Lake.

Patents Sealed.

1389. E N. Hudson.
1401. E. Seyd.
1406. A. J. Murray.
1414. R. and G. Cadbury and J. M. Rendall.
1417. W. N. Nicholson.
1421. C. Lauth.
1422. R. Blezard.
1424. M. S. Wolfgang.
1428. W. B. Smith.
1448. A. Henry.
1449. C. H. Merritt.
1464. E. V. Gardner and P. M. Crane.
1499. R., J. J., & L. R. Bodmer.
1555. A. L. McGavin.
1556. A. L. McGavin.
1677. J. Dockray.

From Commissioners of Patents' Journal, November 9.

Patents Sealed.

1438. C. Cross, A. Heywood, jun., and G. D. and T. B. Wilson.
1440. W. R. Lake.
1445. J. B. Payne.
1454. J. B. Handyside.
1457. J. L. Greatorex.
1470. I. and G. Battinson and T. Whitehead.
1483. G. F. Henry, I. A. F. Bang, F. R. C. Monestier, and J. P. A. Figuier.
1489. C. H. Gardner and J. Bickerton.
1523. W. Benson.
1529. W. Naylor.
1545. W. Mitchell.
1597. E. T. Hughes.
1618. J. D. Brunton.
1640. J. Wilson.
1641. J. Wilson.
1701. B. J. B. Mills.
1762. W. E. Newton.
1877. W. Topham, jun., and S. Wells, jun.
2346. B. J. B. Mills.
2599. H. Bridgewater.
2615. W. S. Clark.
2649. W. Baines.
2652. F. Forder and J. Traves.
2658. D. Colville.
2696. C. G. Hill.
2718. T. J. Denne and H. Billingsley.
2751. E. Hill.

Patents on which the Stamp Duty of £50 has been paid.

2983. T. S. Truss.
2850. R. J. Gay.
2923. W. E. Newton.
2924. W. E. Newton.
2874. J. H. Johnson.
2895. P. Kirk.
2911. R. J. Edwards.
2914. T. Horsley & G. Knighton.
2920. S. W. Woodroffe.
2886. W. Darlow and P. W. Seymour.
2941. R. Lakin and J. Wain.
2917. E. K. Heaps.

Patents on which the Stamp Duty of £100 has been Paid.

2978. J. McKean and T. Greenall.
2993. J. Petrie, jun., & J. Teal.
3021. E. Sonstadt.
3010. C. O. Heyl.

LIST OF PRESENTS.

The following Presents have been made to the Society during the past year. The thanks of the Society have been forwarded to the Donors :—

Presents.	Donors.
Specifications of Patents up to the present time, and Indices	Commissioners of Patents.
Abridgments of Patents	"
The Commissioners of Patents' Journal	"
United States Patent Office Reports, 1865 and 1866	United States Commissioners of Patents.
The American Conflict, by Horace Greeley	Author.
Forensic Medicine, by Dr. W. Augustus Guy	"
A Manual of Orthopraxy, by Heather Bigg	"
Mnemonic Geography (China), by Thomas Jenner	"
A Practical Treatise on the Manufacture of Worsted and Carded Yarns, translated from the French of C. Leroux	H. Carey Baird, Philadelphia.
Catalogue of Additions to the Manuscripts in the British Museum	Trustees of British Museum.
Rapports du Jury International et Catalogue Officiel; Exposition Maritime Internationale du Havre, 1868	Messrs. J. M. Johnson & Sons.
Greater Britain; a Record of Travel in English-speaking Countries, during 1866 and 1867, by Sir Chas. Wentworth Dilke, Bart., M.P	Author.
Materials for a History of Oil-Painting, by the late Sir C. L. Eastlake, R.A. Vol. II.	Messrs. Longmans and Co.
Painted Windows, a lecture delivered by the Rev. F. B. Harvey, M.A., in the Town Hall, Berkhamsted	"
Nature and Art; and other Poems, by Dr. Evanson	Author.
Minutes of Proceedings of the Institution of Civil Engineers, Vols. XXVII. and XXVIII., 1867-9.	Institution.
Report of the Meeting of the British Association for the Advancement of Science, held at Norwich, 1868	Association.
Memoirs of the Literary and Philosophical Society of Manchester, Vol. III. (3rd series)	Society.
Proceedings of ditto, 1865-8	"
Statistics of the Colony of Victoria for 1867	His Excellency the Governor.
Reform of the Patent Law, by M. A. Soul	Author.
Irrigation in India and in Spain, by Messrs. Wilson, Login, & Higgin	Authors.
Roads, Railways, and Canals in India, by T. Login	Author.
Orthographic and Isometrical Projection, by E. A. Davidson	"
Letters concerning the Country of the River Plate	Central Argentine Railway Co.
State Emigration, an Essay, by Edward Jenkins	Author.
The Charities of London, and some Errors of their Administration, by T. Hawksley, M.D.	"
A Second Series of Reports on the Preparation of Food and Economy in Fuel, "Captain Warren's System"	Captain Warren.
Recent Excavations in Rome made in 1868, by the British Archæological Society, a Lecture by John H. Parker, M.A.	Author.
British Archæological Society of Rome. Proceedings 1858-9	Society.
The Smoke Nuisance and its Remedy by Means of Water; with remarks on Liquid Fuel, by C. J. Richardson, architect	Author.
Assainissement, Embellissements de Paris. Edilité urbaine mise a la portée de tout le monde, par Hector Horeau	"
The Ruthven Hydraulic Propeller *versus* the Screw and Paddle	M. W. Ruthven.
The Thames Embankment and the New Law Courts, a Letter to the Right Hon. A. H. Layard, M.P., by A. Baillie Cochrane	Author.
The Land and Labour of India, by W. Nassau Lees, LL.D.	"
Public and Private Psalmody, by the Rev. S. Cowdy	"
Christianity Re-examined, Lectures by the Rev. Samuel Cowdy	"
Leaves from the Tree of Life, being Seven Sermons preached by the Rev. Samuel Cowdy	"
On the Application of Sulphurous Acid, Gaseous and Liquid, to the Prevention, Limitation, and Cure of Disease, by James Dewar, M.D.	"
How to Prevent Accidents in Coal Mines, by Matthias Dunn	"
Textile Manufactures of India, by Dr. Forbes Watson	Alfred Davis.
Tree and Serpent Worship of India, by James Fergusson	"
Opinions of the Press on the Fairlie Engine	R. Fairlie.

Presents.	Donors.
Observations on the Construction of Railway Carriages, together with a Paper on Railways and their Management, by R. F. Fairlie, C.E.	R. Fairlie.
The Potato Disease, its Cause and and Cure, by William Taylor ..	"
A Synopsis of the Patent Laws of Various Countries, by Alexander Tolhausen, Ph.D.	Author.
The Tramway Question, as applied to London and its Suburbs, by Herbert Bright, C.E.	"
On the Home Produce, Imports, and Consumption of Wheat, by Messrs. Lawes and Gilbert	"
The British Army in 1868, by Sir Charles E. Trevelyan, K.C.B. ..	Messrs. Longmans
Trades Unions: an Inquiry into their Rules and Working, by Robert Jobson	Author.
The Training and Equipment of the Teacher for his Profession, by Joseph Payne	"
Lecture on Perfumes, Flower Farming, and the Methods of obtaining the Odours of Plants, by Septimus Piesse, Ph.D.	"
On the Regenerative Gas Furnace, as Applied to the Manufacture of Cast-steel, by C. W. Siemens, F.R.S.	"
Della Istruzione Primaria e Industriale considerata nelle sue relazioni colla Pubblica Economia, nuovi studi comparativi di Dr. Dino Carina	"
Reports of the Inspectors of Factories for the year ending 31st October, 1868	"
A Problem for Trisecting an Angle Geometrically, also a Problem for Doubling the Cube Geometrically, by Sampson Sandys	A. Redgrave.
Miscellaneous Papers on Mechanical Subjects, by Joseph Whitworth, C.E., LL.D.	Author.
Report of an Inquiry into the Connection between Strong Winds and Barometrical Differences, by Robert H. Scott	"
Address on Technical Education, read before a meeting of the Royal Scottish Society of Arts in Edinburgh, by Professor Fleeming Jenkin	"
Report of the Commissioners of Agriculture and Arts of the Province of Ontario for the year 1868	Legislative Assembly.
Statistics of the Colony of New Zealand for 1867	His Excellency the Governor
Kurrachee Harbour Works, Correspondence 1856 to 1867	India Office.
Do. do. Report on State of, by W. Parkes, C.E.	"
Reale Instituto Lombardo. Rendiconti Classe di Lettere e Scienze Morali e Politiche, Vol. IV., 1867	Institute.
Do. do. Rendiconti, Serie II., 1868	"
Do. do. do. Classe di Scienze Matematiche e Naturali, Vol. IV., 1867	"
Memorie del Reale Instituto Lombardo. Classe di Scienze Matematiche e Naturali, Vol. X., Parts 4 and 5, 1867	"
Do. do. Classe di Lettere e Scienze Morali e Politiche, Vol. X., Parts 5 and 6, 1867	"
Tijdschrift uitgeven door de Nederlandsche Maatschappij ter bevordering Van Nijverheid	"
On the Measurement of the Luminous Intensity of Light, by W. Crookes, F.R.S.	Author.
The Paying and Non-paying Weights pulled by the Locomotive Engine in 1867, a Paper read before the Civil and Mechanical Engineers' Society by B. Haughton	"
Palestine Exploration Fund, Quarterly Statement, January to March, 1869	Fund.
Do. do. Treasurer's Reports, January to July, 1869	"
Transplantation, by Frederick Young	Author.
The Duties of a Royal Engineer Officer in Time of Peace, with a few Suggestions for the Organisation of the Staff of an Army, by Captain Webber, R.E.	"
National Education, some Proposals, a Prize Essay by A. B. Greenwood	"
Transactions of the American Philosophical Society, Vol. XIII., Part 3	Society.
Smithsonian Contributions to Knowledge, Vol. XV.	Smithsonian Institution.
Do. Miscellaneous Contributions, Vol. VI. and VII.	"
Do. Report, 1867	"
Transactions of the Wisconsin State Agricultural Society, 1861-8	"
United States Commission, Work and Purposes	Commission.
Do. do. Sketch of Purpose and Work	"
History of Brooklyn and Long Island Fair	"
A Record of the Metropolitan Fair in aid of the United States Sanitary Commission in April, 1864	Sanitary Commission.
Military Medical and Surgical Essays, prepared for the United States Sanitary Commission 1862-4	Commission.
Tenth Annual Statement of the Trade and Commerce of Chicago Board of Trade	Board of Trade.
Address by D. B. Reid, Wisconsin State Agricultural Society, 1861..	Legislature.
Statistics of the History, Climate, and Productions of Wisconsin ..	"
Report on the Agriculture and Arts of Ontario, 1868	"
Census of the State of New York, 1865	"
Twenty-second Annual Report of the Board of Trustees of the Public Schools of the City of Washington, 1867	Board of Trustees.
Report of the Council of the Literary and Historical Society of Quebec, 1867	Society.
Manuscripts relating to the Early History of Canada	Literary Society of Quebec.
Transactions of the Literary Society of Quebec, 1866-7	"

Presents.	Donors.
Report of the Board of Controllers of Public Schools of the first School District of Pennsylvania, for the year ending December 31st, 1867	Board of Controllers.
Eighteenth Annual Report of the Regents of the University of the State of New York, 1867	The University.
Fiftieth Annual Report of the Trustees of the New York State Library, 1868	The Trustees.
Fifty-first do. do.	"
Address to the Mathematical and Physical Section of the British Association at Exeter, 1869, by Professor Sylvester F.R.S.	Author.
Reports of H.M. Inspectors of Factories for the half-year ending 30th April, 1869	A. Redgrave.
Report to the Committee of the Meteorological Office on the use of Isobaric Curves, and a line of greatest Barometric Change in attempting to foretell Winds, &c., by Captain Henry Toynbee	Author.
Opinions of M. Cremieux, M. B. de Marsangy, Lord Campbell, and Lord Brougham, on Lord Brougham's application, in the year 1848, for French Letters of Naturalization: laid before the Association for the Promotion of Social Science, by M. Davenport Hill, Q,C.	"
Miscellaneous Papers on Mechanical subjects, "On the Penetration of Armour Plates with Long Shells of large capacity fired obliquely," a Paper read before the British Association at Exeter, by Sir Joseph Whitworth, Bart.	"
Law of Patents for Inventions, with Explanatory Notes on the Law as to the Protection of Designs and Trade Marks, by F. W. Campin	"
Catalogues of the Exhibitions of the Society of Artists of Great Britain, between the years 1760 and 1790	John Pye.
Catalogue of the Exhibitions of the Free Society of Artists held between 1761 and 1783	"
Minute Book of Meetings held by the Free Society of Artists between 1775 and 1780	"
Forty-five Copies of each of the following Works, by Sir George Ramsay, Bart., for the Institutions in Union:—	Author.
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Instinct and Reason.	
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Transactions of the Institution of Naval Architects, Vol. X.	Institution.

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Proceedings of the Royal Institution of Great Britain	"
Journal of the Royal Asiatic Society	Society.
Journal of the East India Association	Association.
The Canadian Journal of Science, Literature, and History	Canadian Institution.
The Public Policy of a Patent Law, by W. Spence	Author.
Proceedings of the Royal Geographical Society	Society.
Proceedings of the Royal Geological Society of Ireland	"
Journal of the Royal Agricultural Society of England	"
The American Journal of Science and Art	Messrs. Silliman and Daud.
Proceedings of the Royal Society	Society.
Philosophical Transactions of the Royal Society	"
Proceedings of the Zoological Society	"
Transactions of the Historic Society of Lancashire and Cheshire, 1867-8	"
Journal of the Royal Dublin Society	"
The German Working Man; his Institutions for Self-culture, and his Unions for Material Progress, by James Samuelson	Messrs. Longmans
L'Album de la Fabrique. Guide repertoire de l'acheteur en gros. Adresses, cartes, dessins et modèles, prix courants des principaux Fabricants. L. Berger and Cie., Paris	M. Cambon.
Seventeenth Annual Report to the Council of the City of Manchester on the Working of the Public Free Libraries, 1868-9	Council.
La Matière Médicale a l'Exposition de 1867, par J. Léon Soubeiran et Augustin Delondre	A. Delondre.
Variations des Animaux et des Vegetaux par la Domestication. Le Chien. par A. Delondre	"
Science et Nature. Essais de Philosophie et de Science Naturelle par Dr. Buchner, traduit de l'Allemand, par A. Delondre. (2 vols.)	"
Société Impériale d'Acclimatation. Production Animale et Végétale.	"
Produits Vegetaux du Portugal considéres au Point de Vue de l'alimentation et de la Matiére Médicale, par J. L. Soubeiran et A. Delondre	"
De la Bière, sa composition chimique, sa Fabrication, son emploi comme boisson, par G. L. Mulder, traduit du Hollandais par A. Delondre	"
De l'Introduction et de l'Acclimatation des Cinchonas dans les Indes Néerlandaises et dans les Indes Britanniques, par J. L. Soubeiran et A. Delondre	"

CONTRIBUTIONS TO THE READING-ROOM.

The Council beg to acknowledge, with thanks to the Proprietors, the regular receipt of the following Journals and Periodicals:—

WEEKLY.

Asiatic.
Architect.
Athenæum.
British Journal of Photography.
British and Foreign Mechanic.
Builder.
Building News.
Builders' Weekly Reporter.
Chamber of Agriculture Journal.
Chemical News.
Colliery Guardian.
Cosmos.
Engineer.
Engineering.
English Mechanic.
European Mail.
Farmer.
Gardeners' Chronicle.
Herapath's Railway and Commercial Journal.
Illustrated Photographer.
Land and Water.
Les Mondes.
Mechanics' Magazine.
Mining Journal.
North British Agriculturist.
Photographic News.
Scientific Opinion.
Sessional Proceedings of the Social Science Association.

FORTNIGHTLY.

Cotton Supply Reporter.

MONTHLY.

Artizan.
Bulletin de la Société d'Encouragement pour l'Industrie Nationale
Bulletin de la Société Imperiale Zoologique d'Acclimatation.
Bulletin du Musée de l'Industrie.
Canadian Naturalist and Quarterly Journal of Science.
Civil Engineer and Architects' Journal.
Educational Times
Engineers' Journal (Calcutta).
Journal of the Chemical Society.
Journal of the Board of Arts and Manufactures for Upper Canada.
Journal of the Franklin Institute.
Journal of the Horticultural Society.
Journal of the National Life Boat Institution.
Journal of the Pharmaceutical Society.
Journal of the Quekett Microscopical Club.
Photographic Journal.
London, Edinburgh, and Dublin Philosophical Magazine.
Practical Mechanics' Journal
Presse Scientifique des Deux Mondes.
Revue du Monde Colonial.
Symons' Meteorological Magazine
The Horological Journal.
The Institute and Lecturers' Gazette.
The Stationer.

QUARTERLY.

Journal of Mental Science.
Journal of the Geological Society.
Journal of the Linnæan Society.
Journal of the Royal United Service Institution.
Journal of the Statistical Society.
Journal of the Victoria Institute.
Popular Science Review.

INDEX TO VOL. XVII.

A.

"Academy," the, Mr. Murray's new publication, 860
Actualités scientifiques, 583
Adams, W. Bridges, on dried meats, 66; ventilation of drains, 517; patents and patent laws, 722; *chairman* (theory of boiling), 367
Address, chairman's (Lord H. G. Lennox) opening, 2
Adelaide, soap making in, 424
Agricultural invention in Russia, 151; prizes, 203
——————labourer, the, 200
Albert medal, award of to Liebig, 557, 641
Aleppo, trade of, 885
Alkali waste, recovery of sulphur from, B. H. Paul, 185
Allan, Mr., *disc.** (cotton in India), 662
Ammonia powder (explosive), 788
Amsterdam Exhibition, see "Exhibitions"
Anderson, John, Cantor lectures on applied mechanics, 711, 731, 746, 763
Anderson's University, Glasgow, professorship of practical chemistry, 827
Anerley district school, visits to, see "School"
Aniline colours, W. H. Perkin, Cantor lectures, 99, 109, 121
Anthropological museum in France, 788
Antidote to phosphorus, 355
Aquariums, 202
Architect, on the duties of the, by T. Roger Smith, 440; W. Botly, 472
Architects, naval, meeting of the, 309
Armour, Meyrick; see "Meyrick"
Army expenditure, economy in, address by E. Chadwick at the Hague congress, 855
——, effect of idleness, &c., with Captain Du Cane's report as to, 860
——, national, on the efficiency and economy of, H. Cole, 206, 225, 247; (letter by G. H. Whalley), 289
—— organisation, Mr. Cardwell's speech, 306
Art, international conference on instruction in, 859
—— copyright bill, 243; second reading moved by Lord Westbury, 469
Art, Society of the Friends of, at Lyons, 241
—— workmanship competition, list of works sent in, 137; report of judges and list of prizes, 244
——, distribution of works of, in France, 449
Artistic property, 147
Arts, fine, proposed minister of, 643; expenditure on, in France, 707
Ashe, Mr., *disc.* (ventilation), 239
Ashley Down orphan schools, G. C. T. Bartley, 894
Assam, trade with, &c., Col. Hopkinson, 561
Atherton, H., *disc.* (tea in India), 329
Atkin, Robert, transport of cattle, 31
Australia, exports to, 134
Australian tariffs, 202
Austria, agricultural education in, 202

B.

Bainbridge, H., *disc.* (tea in India), 297; (Indian fibres), 453
Baking powder, the Horsford-Liebig, 840
Balance-sheet, to May, 1869, 614
Bank, savings, in Paris, 671
Barham, Mr., milk conveyance, 49
Barry, Dr., *disc.* (tea in India), 299, 325; (trade in India), 569
Bartley, G. C. T., training and cultivation of pauper children, 188
——————, district schools for pauper children, 375, 398, 629, 669, 697, 819, 894
——————, tablet to Bunyan, 885
——————, Faversham educational system, 914
Barytes, tungstate of, 399
Bavaria, newspapers in, 184
Bazley, Thos., M.P., *chairman* (ventilation), 233; *disc.* (cotton in India), 658
Beads, manufacture of, at Venice, 270
Beaumont, Capt., *disc.* (national army), 231
Beauvais, exhibition at, 449
Beer, Mr., *disc.* (electric organ) 89
Beer, analysis of, see "Malt Liquors"
Belgian fine art exhibition, 354
Bell, J., on poisonous mushrooms, 63
Bergtheil, Mr., *disc.* (Natal) 42
Bessemer, H., on lighting coal mines, 759
Bibliotheque Imperiale, Paris, reading room, 203
Biella, manufactures at, 133
Bishop, Mr., *disc.* (duties of an architect), 447
Bismuth in South Australia, 860
Bodkin, Sir W., *chairman* (Spain), 389
Boiling, theory of, C. Tomlinson, 367; letter on, 401
Botanical library, 203
Botly, Mr., *disc.* (Society of Arts), 25; (artificial freezing), 74; (electric organ), 90; (waste products), 179; (national army), 252; (Japan), 305; (smoky chimnies), 472; (drains), 489; (colonies), 512
Bradford, W., on waste in glass manufacture, 221
Brady, Antonio, *chairman* (photography and the magic lantern for teaching history), 139; *disc.* (Society of Arts), 26
Brandy, production of, 354, 813
Brandreth, E. L., *disc.* (waste lands in India), 534
Brazil meat, 182
Bread-making, Liebig on, 181, 815, 840
Briggs, Mr., *disc.* (settlements in the colonies), 466, 491
British Association, Exeter, 1869, programme, 757; president's (Prof. Stokes') address, 773; list of papers read in the sections, 780
British Museum library, 815
Bryceson, H., electric organ, 81
Buckland, F., *disc.* (waste products), 179; (salmon laws), 387
Buenos Ayres, trade of, 77
Burgh, N. P. the indicator diagram, 61; paper on screw propellers, 274
Burn, Dr., *disc.* (cotton in India) 663
Byron, statue to, 147

C.

Cab question, deputation to the Home Secretary, 459; meeting of cab proprietors, &c., 574; additional suggestions, 626; Paris system, 628; prizes for improved cabs, 644; abstract of bill brought in by the Home Secretary, 742; taxes on locomotion, 330; shelter for cabmen, 917
Caird, James, *chairman* (oyster culture), 478
Caithness, Earl of, *chairman* (Natal), 32
California, coal in, 220; silk in, 378
Campbell, Dr. Archibald, *chairman* (tea in India), 291; *disc.* (hill settlements) 431; (Indian fibres), 454; (waste lands in India), 524, 529; (trade between Calcutta, Darjeeling, Bhootan, and Thibet), 558; (cotton in India), 662; (remarks before the Duke of Argyll), 674
Campbell, G., *disc.* (national army), 253; (tea in India), 298; (technical education), 353; (Indian silk), 365; (hill settlements), 409; *chairman* (Indian fibres), 452; (settlements in the colonies), 461; paper on waste lands in India, 520; *disc* (trade in India, &c.), 567; (cotton in India), 653
Campin, Mr., *disc.* (waste products), 180; (pauper children), 197; (trade marks), 420; (settlements in colonies), 468; (drains), 488
Cantor Lectures, on aniline and coal tar colours, W. H Perkin, 99, 109, 121
——————, applied mechanics, John Anderson, 711, 731, 746, 763
——————, painting, S. A. Hart, R.A., 70
Caoutchouc, mineral, in Australia, 555
Cape diamonds; see "Diamonds"
Cardwell, Mr., speech on army organisation, 306
Carnegie, Mr., *disc.* (artificial freezing), 74
Carpenter, Dr A., *disc.* (drains), 488
Cassell's Technical Manuals, 355; Popular Educator, 760
Cassels, Mr., *disc.* (cotton in India), 662
Cattle, transport of, 31
—— show at Paris, 203
Causeries scientifiques, 309
Cavendish, Lord F., *chairman* (scientific instruction), 261
Cement for polished steel, &c., 828
Cenis, Mont, railway on, 379
Chadwick, D., M.P., *disc.* (cotton in India), 655
Chadwick, Edwin, *chairman* (training and education of pauper children), 188, 285; *disc.* (national army), 225, 256; (India hill settlements), 411, 437; *chairman* (trade marks), 414; on grants for national education, 285; pensions to aged school teachers, 513; *disc.* (waste lands in India), 527; (annual conference), 633, 637; (limits to endowments), 686; (cottages), 720; (international economy in military expenditure), 855
Chadwick, Mr. (from the Ribble), *disc.* (salmon laws), 388
Channel steamers, prizes for designs for, 643
—— passage, Capt. Tyler's report as to proposed improvements in harbours, &c., 807
——————, J. Grantham on, 823
——————, proposed cot to avoid seasickness, J. Scarth, 897; Sir J. Herschel, 907, 917
Chartres, exhibition at, 219, 449
Cheetham, John, *chairman* (cotton in India), 651, 657
Childs, Mr., *disc.* (house paint), 56, 58
Churchill, Lord A. S., velocipedes, 203
Clarke, Hyde, *disc.* (Natal), 43; (electric organ), 108; (national army), 214; (tea), 325; (technical education), 351; (silk),

* *disc.*, discussion at a meeting.

364; (trade marks), 417; (duties of an architect), 447; (India hill settlements and sanitaria), 407, 430; (Indian fibres), 455; (settlements in the colonies), 465; (progress of colonies), 510; (waste lands in India), 529, 533; (trade in India, &c.), 565; (cotton in India), 660; remarks to the Duke of Argyll, 674; *disc.* (limits to endowments), 686, 693; on proposed examination in modern languages, 797; on public instruction in Turkey, 883; on the state of instruction in Europe, 917
Clarke, Major Gen., *disc.* (Indian tea), 325; (Indian silk), 366; (Indian fibres), 457; (waste lands in India), 525
Clarke, Chatfield, *disc.* (the duties of an architect), 446
Coal (in California), 220; (exports from Belgium), 355; (do. to France), 378
Cockram, John, cab question, 576
Coinage, international decimal, 555, 917
Cole, Henry, on the efficiency and economy of a national army, 206, 225, 247; *chairman*, meeting of cab proprietors, &c., 574; *disc.* (annual conference), 636
Collieries, safety of, H. W. Reveley, 63
Collyer, Col., *disc.* (Indian silk), 365
Colonies, industrial settlements in the, Col. Maude, 461
——— progress of, J. Robinson, 495
Commerce, Russia, 133; France, 148; Rio Janeiro, 400; Switzerland, 400
Commercial school of Paris chamber of commerce, 216
——— treaty between France and England, proposed revision of, 859
Concrete buildings in Southwark, 861
Conference, 18th annual, of representatives of institutions in union, &c., 616, 633
Connolly, T., *disc.* (national army), 227
Conservatoire (Paris) des arts et métiers, 844
Conversazione, 651
Cook, E. R., *disc* (drains), 489
Cooke, Ch., on porpoise oil, 271, 356; on velocipedes, 788
Cooke, M. C., on edible fungi, 47
Cooper, Abraham, obituary, 118
Cooper, W., *disc.* (electric organ), 89; (ventilation), 240
Copper in Australia, 827
Copyright convention, 399
———, art, see "Art"
Corsica, statues in, 133
Cottages, cheap agricultural, 555
———, sanitary improvements in, E. Chadwick, 720
Cotton cultivation and supply in India, discussion on, 651; M. Turnbull, 789; letter as to, 825; the *Times of India* on, 872
——— in New South Wales, 106; in Siam, 117; in Queensland, 61
——— supply, 309, 554, 631
——— question, an American view of the, 849
——— waste as manure, 148
Council, list of, for 1869-70, 645
Cruikshank, G., *disc.* (national army), 253
Cuba, population of, 184

D.

Davenport, S. T., past and present of the Society of Arts, &c., 10, 127, 143, 160
Davidson, E. A., *disc.* (scientific instruction), 268; paper on technical education of females, 345
Davison, R., on desiccation as a preventive process, 65; *disc.* (Japan), 305
Davison, W., trade and commerce of Japan, 301
Day, T. N., *disc.* (scientific instruction), 269
Dean, W., paper on xylography, 154; letters on, 185, 203
Decimal coinage, international, 555
Delamotte's drawing-book, 698
Délégations ouvrières, reports of, Paris Exhibition, 889, 901
Denison, Sir. W., *disc.* (national army), 215, 226, 256; (Indian silk), 363
Desiccation, 65
Diamonds at the Cape, 199; letters, H. Emanuel, 46, 517; E. Muskett, 379
Dickins, T., *disc.* (Indian silk), 363
Dilke, Sir C. W., obituary, 516
Distilleries in Holland, 491
D'Orsey, Rev. A. J. D., *disc.* (technical education), 351
Documents, means of ascertaining the age of, 816
Drains, ventilation of, J. Lovegrove, 485; W. B. Adams, 517; W. Glass, 517; F. W. C., 555
Dried meats, 66
Drill in schools, see "Schools"
Ducie, Earl, *chairman* (ventilation of drains), 485
Duff, Grant, on education, &c., in India, 741
Dutch independence, monument of, 181; herring fishery, 287

E.

Eckhold's omnimeter, 705
Ecole pratique des hautes etudes Paris, 198
Education, agricultural, in Austria, 202,
——— in Prussia, 514; in Holland, 776; in South Australia, 788
———, administration of funds, T. P. Allen's table, 667
———, national elementary, E. Chadwick, 285
———, national elementary, and training, see "Schools"
———, scientific, Professor Huxley on, 785
———, technical, see "Technical"
——— of the agricultural poor, 815
——— league, national, letter from the council to, 863; report of, 876
——— union, national, letter from the council to, 899; report of, 910
——— and recreation, discussion as to, 870
———, public, in Turkey, Hyde Clarke, 883
———, reports by the "délégations ouvrières," Paris Exhibition, 889, 901
———, &c., in India, 741
——— in Europe, map illustrating the state of, 891; Hyde Clarke on, 917
——— in France, 78, 183
——— in Turin, 62
Egypt, proposed address to the Viceroy of, 558
Elcho, Lord, on Mr. Layard's ceasing to be First Commissioner of Works, 906
Electric organ, H. Bryceson, 81
Electricity, proposal to illuminate beacons, &c., by, 815; do. railways, 816; do. ships, 897
Electrotype ornaments, 106
Ellis, Dr., *disc.* (Society of Arts), 26; (waste products), 180; (pauper children), 196
Emanuel, Harry, *disc.* (Natal), 41
——— letters, diamonds at the Capé, 46, 517
Emigration from Italy, 62; statistics, 134; in 1868, 220; from Europe, 1867, 271; from Liverpool, 424
Enamelling of iron vessels, 77
Endowments, limits of, see "Posthumous"
Engineers, civil, and Indian Government, 906
Estor, Dr., preserving meat, 29
Ewart, Lieut.-Col., *disc.* (national army), 253
Edward, Wm., obituary, 183
Examinations, final, 1869; list of candidates who gained prizes and certificates, 588
——— examiners' remarks, 621
——— tables of results, 622, 647
——— papers set, 704, 719, 756, 772, 779, 805, 818, 831, 842, 861, 865, 875, 888
——— 1870, programme of, 791; prizes, 798; list of local boards, 800
———, elementary, 803
Examination, civil service in France, 631
Exhibitions:—
Amsterdam, 106, 332, 491, 776, 820; list of recompenses, 834, 861, 885
Annual international of selected works, announcement for 1871, 742
Beauvais, 448
Bordeaux, 106, 491
Brussels, international art, 354, 554
Chartres, 219, 449
France, provincial, 116, 200
Hamburgh, international, 95
Metz, art, 167
Munich, art, 378
Naples, maritime, 220
Paris, agricultural, 552
——— salon, 553, 630, 649
———, of applied art, 777
——— art, 399
Prizes, Beckwith on the use of, at, 76
Rheims, art, 872
Rouen, art, 181
St. Petersburg, 649, 917
Utrecht, see "Amsterdam"
Vienna, 119
Eyre, Sir V., *chairman*, (Japan), 301; *disc.* (hill settlements, 411)

F

Faversham educational system, G. C. T. Bartley, 914
Ferrey, B., *disc.* (on the duties of an architect), 445
Fibres, Indian, Leonard Wray, 452
Field, Edwin, *disc.* (Thames embankment), 319, 342
Fielder, C. H., tea cultivation in India, 291, 325; *disc.* (hill settlements), 435
Financial statement to 31st May, 1869, 614
Fish, supply and transport of, J. Mitchell, 381; see also "Piscicultural committee"
Fisheries in France, 151, 182
Fishing tackle factory, 867
Fitch, J. G. *disc.* (limits to endowments) 684
Fitzgerald, Vesey, *disc.* (waste lands in India), 533
Fitzwilliam, W. S., *chairman* (waste lands in India), 520
Flax in New Zealand, 671
Florence technical education in, 202
Flower, Mr., *disc.* (artificial freezing), 75; letters on, 95, 119
Food Committee:—Dr. Estor on meat preservation, 29; W. Shand on do., 97; Mr. Hardwicke (Gamgee), do., 170; A. Morris, do., 476; transport of cattle (Atkin), 31; G. Barham, milk, 49; R. Davison, desiccation, 65; Bridges Adams, dried meats, 66; Mr. Mitchell, supply and transport of fish, 381; committee's report to the council, 642
Food Journal, 424
——— supply (letter, G. E. Tyndal), 185
Fordred, Mr., *disc.*, house-paint, 57; artificial freezing), 75
Forster, *disc.* (electric organ), 89
Foster, P. Le Neve, *chairman* (screw propellers), 374
France, agricultural education in, 78; commerce of, 184; fisheries, 151, 182; newspapers, 184; art exhibitions, 116, 200; school for shepherds, 221; agricultural show, 289; coal in, 378; railways, 401; distribution of works of art, 449; commerce in, 671; annual statement of the position of in 1868, 837; hospitals and asylums in, 871
Freeland, H. W., *disc.* (limits to endowments), 689
Freezing, artificial, see "Refrigeration"
Fungi, edible, letter, M. C. Cooke, 47; see also "Mushrooms"
———, handbook of British, M. C. Cooke, 860

G.

Galena in Queensland, 555
Gamgee, Professor, process of preserving meat, 170
Gas lighting at Bari, 95
——— in Italy, 182
——— works in Italy, 203
Geometry, note-book on practical solid, by J. H. Edgar, 860
Germany, weights in, 117
Gibbs, W. A., gold medal to, 9; harvesting in wet weather, 27
Glass, Roman, in the Slade collection, 631
———, waste in manufacture of, 221
Glass, W. *disc.* (drains), 489, 517
Gooch, Mr., *disc.* (Natal), 39
Goodwin, G., *chairman* (xylography), 154
Grantham, J., on the channel passage, 823
Greece, public instruction in, 184; railways in, 333; agriculture and commerce of, 826
Greenwich hospital, proposed use of, by Felix Summerly, 854
———, schools, the *Times* on the, 884
Gregory, Mr., *disc.* (Natal), 42
Grey, Sir George, *chairman* (colonies), 495
Grove, W. R., Q.C., *disc.* (limits to endowments), 691
Guano from Peru, 355
Gunpowder, Schultze's, 216
Guy, Dr., award of Swiney prize to, 641

H.

Haddan, Mr., cab-system, 574
Hall, A., *disc.* (Indian tea), 327

Haly, Col. *disc.* (hill settlements, India), 430
Hanwell district school, G. C. T. Bartley, 375
Hardwicke (Gamgee), on preserving meat, 170
Hartley, W., *disc.* (Natal), 39; (letter on Natal), 78
Harvesting in wet weather, W. A. Gibbs, 27
Hastings, G.W., *disc.* (limits to endowments), 593
Hay, Lord W., *chairman* (hill settlements in India), 407, 430; *disc.* (waste lands in India), 525; *chairman* (trade between Calcutta, Darjeeling, &c.), 558, 565; paper on cotton in India, 657
Heller, Mr., *disc.* (annual conference), 635
Henderson, Capt., *disc.* (settlements in the colonies), 468
Hendriks, Mr., *disc.* (Indian tea), 296, 328; (Indian silk), 365; letter on Spain, 424
Herring fishery, Dutch, 287
Herschel, Sir J., on Mr. Scarth's proposed cot for avoiding sea sickness, 907, 917
Highley, S., photography and the magic lantern for teaching history, 139
Hight, Mr., transport of live cattle, 31
Hill settlements and sanitaria, India, by Hyde Clarke, 407, 430
Hobhouse, A., on the limitations to dispositions of property to public uses, 675, 694
Holland, P. H., cab question, 576
Hooper, G. N., cab question, 627
Hop leaves as fodder, 78
Hopkinson. Col., trade between Assam, Thibet, and Western China, 561
Horn's safety lamp, 285
Horne, Chas., *disc.* (tea, India), 325; (hill settlements, India), 410; (Indian fibres), 455; (waste lands in India), 529
Horticultural show, France, 289
Hospitals and asylums in France, 871
Hoyte, Mr., *disc.* (electric organ), 90
Hubbuck, Mr., *disc.* (house paint), 58
Hungary, railways in, 839
Huxley, Prof., on scientific education, 785; introductory lecture to women at Kensingn, 919

I

India, committee on, appointment of, 153; list of, 224, 642; deputation to the Duke of Argyll, 673
INDIA CONFERENCES:—
"On tea cultivation in India," by C. H. Fielder, 291, 323
"On silk cultivation and supply in India," by P. L. Simmonds, 357
"On hill settlements and sanitaria," by Hyde Clarke, 407, 430
"On Indian fibres," by Leonard Wray, 452
"On waste lands in India," by George Campbell, 520
"On trade between Calcutta, Darjeeling, Bhootan, and Thibet," by Dr. A. Campbell, 558
"On trade between Assam, Thibet, and Western China," by Col. Hopkinson, 561
"On cotton cultivation and supply," by John Cheetham, 651
India, education, science, &c., in, Mr. Grant Duff, 741
———, the races of, and their architecture, 166
Indian architecture, quotation from the *Athenæum*, 377; movement for preservation of, 868
——— tea, 777
Indicator diagram, the N. P. Burgh, 61
Industries agricoles, 584
Ingres museum at Montauban, 515
Ink, new copying, 815
INSTITUTIONS, PROCEEDINGS OF:—
Batley M.I., 59
Bingley M.I., 59
Birkbeck L. and S.I., 90
Bolton New M.I., 92
Brighouse M.I., 159
Calverley M.I., 159
Castleford M.I., 27
City of London College, 105, 888
Farnham and Aldershot Board, 76
Halifax M.I., 159
Holywell Green M.I., 27
Lancashire and Cheshire Union of Institutes, 92, 830, 900
Lancaster M.I., 127
Marlborough Reading and Mutual Improvement Society, 197
Marsden M.I., 159
Woodhouse M.I., 159
Yorkshire Union of Institutes, 27, 59, 159
Iron, casting, Whitworth metal, 821
—— vessels, enamelling of, 77
Irons, Rev. Dr., *disc.* (limits to endowments), 690
Italy, technical education in, 62, 135; emigration from, 62; lignite in, 77; mushrooms in, 78; tobacco manufacture in, 117; commerce of, 117; lime in, 107; gunpowder, 148; postal statistics, 151; commerce with Great Britain, 201; gas works, 182, 203; industrial arts in, 759; woollen manufacture in, 825; newspapers in, 827; flour mills in, 839; railways in, 840; mineral statistics of, 854, 897

J.

Jackson, Mr., letter on xylography, 185
Jamaica, botanic gardens, &c., 813
Japan, silk, 182; trade and commerce of, W. Davison, 301
Johnson, E., *disc.* (trade marks), 417
Jones, Mr., *disc.* (duties of an architect), 447

K.

Kerr, Professor, *disc.* (duties of an architect), 445
King, T., letter on artificial freezing, 108

L.

Labourer, the agricultural, 200
Lacaze, Dr., scientific prizes, 907
Ladd, Mr., *disc.* (duties of an architect), 447
Laing, Mr., *disc.* (house paint), 51; xylography,), 158
Lamartine, obituary, 288
Land, Mr., *disc.* (xylography), 158
Lands, waste, in India, G. Campbell, 520
Languages, modern, Hyde Clarke on proposed examination in, 797
Larkins, W. G., report on the metropolitan district, 620
Latham, Baldwin, *disc.* (drains), 489
Law courts, site of, debate in House of Commons, 421, 448, 472; Mr. Street's report, 546; see also "Thames embankment committee"
Lawton, T., report on the Lancashire and Cheshire district, 619; *disc.* (annual conference), 635, 638
Leahy, Col., *disc.* (national army), 230
Lectures, Cantor, see "Cantor"
Leeches, 354
Lennox, Lord H. G. *chairman*, opening address, 1; speech on cab question, 459; *chairman*, annual general meeting, 641; questions in House of Commons as to unexhibited specimens of art, 651, 704; re-election of as chairman of council, 673
Lennox, Lord Wm., cab question, 575
Letters, registration of, between France and Belgium, 777
Levy, J. H., *disc.* (annual conference), 633
Libraries and museums, free public, committee, appointment of, 187; list of committee, 243; list of existing free libraries, 573; 615, 640, 643, 651, 704
Licenses, wine and spirit, 583
Liebig, award of Albert medal to, 557, 641
——— on bread-making, 181, 815, 840; on the alleged poisonous quality of beef tea, 43
Lignite in Southern Italy, 77
Lime in Italy, 147
Limpus, Mr., *disc.* (electric organ), 89
Lindon, B., *disc.* (salmon laws), 388
Link motion, &c., N. P. Burgh's work on, 897
Liquid fuel, Dorsett's system, 583
Liverpool industrial schools, G. C. T. Bartley, 819
Locomotion, taxes on, 331
Login, T., C.E., *disc.* (hill settlements, India), 433; (waste lands in India), 532; (cotton in India), 661
Louvre, the, 399
———, M. Lacaze's legacy to the, 896
Lovegrove, J., ventilation of drains, 485; see "drains"
Lowe, George, obituary of, 149
Lyons Society of the Friends of Art, 241
Lyttelton, Lord, *disc.* (limits to endowments) 683

M.

McLeod, W., letter on photography and magic lantern, 221
Macfie, Mr. M.P., patent law, 539
Madeira wines, 60
Malet, Sir A., *disc.* (national army), 254
Malt liquor sold in Great Britain, 217.
Mann, Dr., paper on the industries and prospects of Natal, 32; *disc.* (settlements in the colonies), 466
Marcoartu, A. de, *disc.* (Spain), 397
Marine exhibition at Naples, 220
Marr, Jas., *disc.* (settlements in the colonies), 467; (drains), 490
Marson, G., on national musical education, 761
Maude, Colonel, *disc.* (national army), 231; paper on industrial settlements in the colonies, 461
May, Mr., *disc.* (trade-marks), 421
Measures, international standard, and the French Academy, 906
Meat extract, manufacture of, 59
——— Liebig on alleged poisonous character of, 43
——, preservation of, 424; see also "Food Committee"
—— vans, prizes for improved, 641
——, fresh, from the River Plate, 825
Mechanics, applied (Cantor lectures), John Anderson, 711, 731, 746, 763
Medal, Albert, see "Albert"
——, gold, presentation of to Mr. W. A Gibbs, 9
MEETINGS, ORDINARY, of the 115th Session:—
1st Meeting:—Opening Address by the Chairman of Council, 2
2nd Meeting:—"A glance at the past and present of the Society of Arts, with some suggestions as to the future," by S. T. Davenport, 10
3rd Meeting:—"Further notes on the industries and prospects of Natal," by Dr Mann, 32
4th Meeting:—"On the drying properties of various kinds of house paint," by Charles Tomlinson, F.R.S., 51
5th Meeting:—"Artificial freezing and refrigeration," by Dr. B. H. Paul, 67
6th Meeting:—"Description of the electric organ," by H. Bryceson, 81
7th Meeting:—"Photography and the magic lantern applied to teaching history," by Samuel Highley, 139
8th Meeting:—"On xylography, or printing and graining from the natural surfaces of woods," by William Dean, sen., 154
9th Meeting:—"On the useful application of waste products and undeveloped substances," by P. L. Simmonds, 171
10th Meeting:—"On the training and education of pauper children," by G. C. T. Bartley, 188
11th Meeting:—"On the efficiency and economy of a national army, in connection with the industry and education of the people," by Henry Cole, C.B., 206
Extra Meetings.—Renewed discussion on Mr. Cole's paper on "A national army," 224, 247
12th Meeting:—"On ventilation," by Dr. Edward Smith, F.R.S., 233
13th Meeting:—"On the adaptation and extension of present means for scientific instruction," by H. H. Sales, 261
14th Meeting:—"On modern screw propellers practically considered," by N. P. Burgh, 274
15th Meeting:—"On the trade and commerce of Japan," by W. Davison, 301
16th Meeting:—"Technical education as applied to female schools," by E. A. Davidson, 345
17th Meeting:—"On the theory of boiling in connexion with some processes in the useful arts," by C. Tomlinson, F.R.S., 367

18th Meeting:—"Spain commercially and economically considered," by E. M. Underdown, 389
19th Meeting:—"On trade-marks," by W. Wybrow Robertson, 414
20th Meeting:—"On the duties of an architect with reference to the arrangement and construction of a building," by T. Roger Smith, 440
21st Meeting:—"On the formation of industrial settlements in our colonies," by Col. Francis C. Maude, C.B., 461
22nd Meeting:—"On the ventilation and trapping of drains," by Jas. Lovegrove, 485
23rd Meeting:—"On the progress of the colonies," by John Robinson, 495
Extra Meeting:—"On the limitations which should be placed on dispositions of property to public uses," by Arthur Hobhouse, Q.C., 675
Meeting, annual general, 641
Meiklejohn, Mr., cab-fare system, 575
Melbourne whale trade, 355
Mersey, tunnel under the, 107
Meteorological observatory at Paris, 397
Metz fine art exhibition, 167
Meyer, Mr., *disc.* (ventilation), 239
Meyrick collection of armour, 92, 105, 115
Milan, exports of silk, 241
Military expenditure, see "Army"
Milk, see "Food Committee"
—— cans, prizes for improved, 641
—— conveyance, 49
Miller, Professor W. A., *chairman* (drying properties of house paint), 51
Mineral statistics of Italy, 854
Mines, coal, Mr. Bessemer's mode of lighting, 759
Mining in Victoria, 118; in Prussia, 200
—— School of St. Etienne, 813
Mitchell, J., on the supply and transport of fish, 381
Morris, A., meat preservation, 476
Morson, T. N., *chairman* (electric organ), 81
Moscow society of natural science, 151
Mulhouse working men's club, 150
Mundella, A. J., *chairman* (national army), 206, 225, 247
Munich fine arts exhibition, 378
Museum, industrial, at Turin, 184
Museums and Libraries Committee, see "Libraries"
Mushrooms, poisonous, 47; letters from John Bell, 63; H. W. Reveley, 95; see also "Fungi"
——, Italy, 78, 95
Musical Education Committee, 139, 385, 642; petition to House of Commons, 702; letter from Gervase Marson, 761
—— pitch, information as to, in foreign countries, 699, 841, 863; letter on, by A. S. C., 151; from *Athenæum*, 165
Muskett, E., letter on diamonds at the Cape, 379

N.

Naples marine exhibition, 220
Nash, E., *disc.* (duties of an architect), 447
Natal, industries and prospects of, Dr Mann, 32; (letter on), 78; productive capability of, 220
Natural Science, Society of, at Moscow, 151
"Nature," Messrs. Macmillan's new publica- 860
Naval Architects, Institute of, 309
Neilson, Mr., *disc.* (annual conference), 639
Netherland exhibition, see "Exhibitions"
New South Wales, manufactures in, 61; rolling stock in, 78; cotton in, 106; sugar, 107; revenue of, 134; public debt, 183; state of agriculture, 271; statistics of, 906
Newspapers in France, 184; in Bavaria, 184
Norris, Mr., *disc.* (annual conference), 634, 637

O.

Obituary Notices:—
Cooper, Abraham, 118
Dilke, Sir C. Wentworth, Bart., 516
Ewart, William, 183
Lamartine, A. de, 288
Lowe, George, 149
Omnibuses in Paris, 221, 671
Omnimeter, Eckhold's, 705
Organ, electric, H. Bryceson, 81
Oxyhydrogen light, for street lighting, 355
Oyster culture, F. Pennell, 479

P.

Paint, house, drying properties of, C. Tomlinson, 51
Palermo, shipping at, 270
Palmer, P., *disc.* (ventilation), 240
Paper, wood pulp for, 100
Paris, conservatoire des arts et métiers, 844; cattle show at, 203; commercial school, 216; omnibuses, 221; exhibitions at, see "Exhibition;" budget of the city of, 93, 134; museum of casts at, 116; academy of arts at, 116; secondary education in, 183; price of land in, 184; école pratique des hautes etudes, 198; meteorological observatory, 397
—— improvements from 1852 to 1868, 824, 827, 836
—— parks, gardens, &c., 847
Patent law, debate in House of Commons on, 539; W. B. Adams on, 722; H. W. Reveley on, 761
Paterson, *disc.* (scientific instruction), 267
Paul, B. H., paper on artificial freezing, 67; letters on, 107, 135; letter on waste products, 185
Pauper children, training and education of, G. C. T. Bartley, 188
Pearce, Mr., cab question, 581
Peard, Dr., salmon laws and salmon rivers, 385
Pearls from West Australia, 860
Pearse, Dr., *disc.* (boiling), 373
Pennell, F., oyster culture, 479
Perkin, W. H., lectures on the aniline colours, 99, 109, 121
——, appointment as professor at Glasgow, 827
Phosphorus, antidote to, 355
Photography and the magic lantern applied to teaching history, S. Highley, 139; letter on, Mr. M'Leod, 221
Piscicultural committee, appointment of, 246
——, discussion on the salmon laws, 385
——, oyster culture, F. Pennell, 479
——, council's report, 643
Pitch, musical, see "Musical"
Poor-Law Board, deputation to the president of the, 899
Porpoise oil, letters, C. Cooke, 271, 355
Postage, between England and France, 219, 907
Postal reform committee, 381, 404, 643
—— statistics in Italy, 151
Posthumous dispositions to public uses, limits to be placed upon, A. Hobhouse, 675, 694
Powell, T. S., *disc.* (scientific instruction), 267
Presents, list of, 919
Price, Spencer, *disc.* (waste lands in India), 528; (trade in India, &c.), 566
Prussia, education in, 514; canals in, 850; mining in, 220
Public men, memorials of, 184
Pulse oil and cake, 148

Q.

Queensland, galena in, 555; wheat, 697; imports, &c, 814; gold in, 288, 826, 859; cotton, 61, 827; state of, 897

R.

Railways, lighting of by electric light, 816
—— in Russia, 182; in Greece, 333; in France, 401
Ramsay, Sir G., present of books to institutions, 475
Rawlinson, Sir Henry, *disc.* (trade in India, &c.), 562
Rawlinson, R., *disc.* (ventilation), 240
Recreation and education, discussion at the church congress, 870
Redgrave, S., cab question, 577
Reece's cold-producing machine, 829
Refrigeration, artificial, B. H. Paul, paper on, 67; letters on, 95, 106; C. E. Flower, 95, 119; Messrs. Siebe, 135; C. Tellier, 707; Reece's machine, 829
Report, secretary's, read at the annual conference, 616
——, Council's, to the Society, 641
Reveley, H. W., letter on safety of collieries, 63; on mushrooms, 95; on velocipedes, 221; on Schultze's gunpowder, 289; on patents, 761
Ridgway, Rev. J., letter on Mr. Sales' paper on scientific instruction, 472
Rio Janeiro, commerce of, 400
Robertson, Wybrow, paper on trade marks, 414
Robinson, J., progress of the colonies, 495; *disc.* (Natal), 42
Rogers, Rev. Wm., *chairman* (technical education), 345; Finsbury middle-class school, 858
Rogers, Mr. (cotton in India), 653
Rome, excavations at, 119
Rouen, art exhibition, 181
Rumney, Mr., *disc.* (annual conference), 635
Russia, animal and vegetable substances in, 78; the commerce by way of Asia, 133; agricultural inventions, 151; railways, 182
Ryland, Mr., *disc.* (trade marks), 419

S.

Sales, H. H., paper on scientific instruction, 261; letter by Rev. James Ridgway, 472
——, report on the Yorkshire district, 619; *disc.* (annual conference), 634, 638, 640.
Salmon laws and salmon rivers, by Dr. W. Peard, 385
Sanitaria and hill settlements (India), by Hyde Clarke, 407, 430
Sargeaunt, Mr., *disc.* (Natal), 41
Sartorius, Admiral, *disc.* (national army), 254
Saunders, Trelawney, *disc.* (trade in India, &c.), 568
Savona, port of, 219
Scarth, J., proposed cot to avoid sea-sickness, 897, 907, 917
School, Finsbury middle-class, 858
Schools, endowed, bill, 546
——, the Greenwich, the *Times* on, 884
——, pauper district, G. C. T. Bartley, 375, 398, 629, 669, 697, 818, 894
——, orphan, at Ashley-down, G. C. T. Bartley, 894
——, training in, under the Poor-law Board (visits to Anerley), 665, 699, 727, 745
Schultze's gunpowder, 216; letter by Mr. Reveley, 289
Science department examinations, 629
——, lectures at the School of Mines on the mode of teaching, 758
——, lectures on, at Kensington, 906
—— to women, 916
Scientific association, German, meeting at Innsbruck, 838
—— education, Prof. Huxley on, 785
—— missions, French, 584
—— instruction, on the extension of, H. H. Sales, 261; government grants for, 329; letter by Rev. J. Ridgway, 472
—— societies, government grants to, deputation to Chancellor of Exchequer, 329
Screw propeller, modern, by N. P. Burgh, 274
Selwyn, Capt., *disc.* (waste products), 179
Sewage, application of, in France, 812
Sewers, ventilation of, see "drains
Shand, W., *disc.* (artificial freezing), 74; preservation of meat by cold, 97
Shaw, Mr. (Burnley), *disc.* (scientific instruction) 269
Sheep-washing, new mode of, 839
Shepherds, school for, in France, 221
Ship-lights, Tronsen's system, 631
Shropshire district school, G. C. T. Bartley, 697
Siam, cotton, 117; tin mines, 148
Siebe, Brothers, letter on artificial freezing, 135
Silk-trade labour, Italy and France, 94
—— cultivation and supply in India, P. L. Simmonds, 357
—— manufacture at Zurich, 106

Silk Manufacture at Japan, 182
—— exports from Milan, 241
—— in California, 378
Silkworms' eggs in Japan, 60
Simmonds, P. L., useful application of waste products, 171; silk cultivation and supply in India, 357; *disc* (Society of Arts), 26; (house paint), 56; (Spain), 396; (trade marks), 419; (colonies), 511
Smith, T. Roger, on the duties of an architect, 440
——, Dr. Edward, ventilation, 233
——, J. B., M.P., *disc.* (cotton in India), 655
——, W. G., letter on poisonous mushrooms,
Smoke prevention, 201, 472
Soap and candles in Holland, 516
—— making in Adelaide, 424
Social science congress, Bristol, 788
Society of Arts, past and present of, S. T. Davenport, 10, 127, 143, 160
South Kensington Museum, new theatre at, 424
Spain, commercially and economically considered, E. M. Underdown, 389, 425; railways and canals in, 850
Stallard, Dr., *disc.* (pauper children), 195; (national army), 229; (ventilation), 239
Stamps, international, for payment, 119
Stanley, H., *disc.* (trade in India, &c.), 569
——, Lord, *chairman* (limits to endowments, Mr. Hobhouse), 675, 685
Statues, memorial, in Corsica, 133
Steamers, channel, prizes for designs for, 427, 643
Steel, new mixture for tempering, 333
Stokes, Prof., address to British Association, 773
Street lighting with oxyhydrogen light, 355
——, G. E., Thames embankment, 323, 335; report on the new law courts, 547
Sugar, for brewing, 515; in Queensland, 516; manufacture in West Indies, 554; selling at a loss, 760; in New South Wales, 839
—— cane, 133
Sutton district school, G. C. T. Bartley, 398
Switzerland, railways in, 270; telegraphs, 308; commerce of, 400
Swiney prize, award of, to Dr. Guy, 641

T.

Tait, Mr., *disc.* (tea in India), 300
Taranaki steel, 760
Tasmania, cultivation of beet in, 814
Tea cultivation in India, 291, 323, 329, 777
——, Japanese, 117
Teachers, pensions to aged, E. Chadwick, 513; W. H. Traice, 584
Technical education, petition to Parliament as to, 493; council's report, 644
—— —— in Italy, 62, 135; at Florence, 203
—— —— of females, E. A. Davison, 345, 378
Tennant, Professor, *disc.* (Natal), 40
Teulon, S., *chairman* (Society of Arts), 10; (artificial freezing), 67; (annual conference), 616, 633; *disc.* (cab question), 577
Telegraph statistics in Europe, 861
Tellier, C., refrigeration, 707
Timber, consumption of, 219
Thames embankment committee, appointment of, 187; list of, 243; resolutions, 300; Sir C. Trevelyan and Mr. Field on the site for the law courts, 312; Mr. Street on do., 335; resolutions, 384; Mr. Sheild's statement, 404; resolution, 406; Mr. Hayward's plan, 428; discussion as to Cleopatra's needle, 429; petition to Parliament, 451; council's report, 643; Lord Elcho's letter on Mr. Layard's ceasing to be First Commissioner of Works, 906
—— —— proposed viaduct, deputation to Mr. Layard, 197
Theobald, Mr., *disc.* (tea in India), 326
Thorne, C. *disc.* (Indian fibres), 455
Tobacco in Italy, 117
Tomlinson, Chas., *chairman* (useful application of waste products), 171
——, paper on the theory of boiling, 367; letter on, 401
—— —— drying properties of paint, 51
Tracy, Mr., *disc.* (ventilation), 240
Trade between Calcutta, Darjeeling, Bhootan, and Thibet, Dr. A. Campbell, 558
—— Assam, Thibet, and Western China, Col. Hopkinson, 561
Trade marks, Wybrow Robertson, 414
Traice, W. H. J., on pensions to school teachers, 584; *disc.* (annual conference), 636
Training, national elementary, see "Schools"
Trevelyan, Sir Charles, *disc.* (national army), 214, 233, 247; (Thames Embankment), 312, 338, 405, 406; (tea in India), 326; (India hill settlements), 435; (limits to endowments), 684
Tripe, Dr. J. (drains), 488
Tufnell, E. C., pauper children, (remarks made at Anerley), 668
Turin, education in, 62; industrial museum at, 184
Turkey, public instruction in, Hyde Clarke, 883
Turnbull, M., *disc.* (silk in India), 365; (hill settlements, India), 413; (Indian fibres), 455; (waste lands in India), 535; (cotton in India), 789
Tyndal, C. G., letter on food supply, 184

U.

Underdown, E. M., Spain commercially an economically considered, 389; *disc.* (trademarks), 418; (letter on Spain), 425
United States, coffee in, 60; population of, 62; navy, 333
Utrecht international exhibition, see "Exhibitions"

V.

Varley, Mr., *disc.* (Society of Arts), 25; (house paint), 57; (ventilation), 238
Vegetables, mode of preparing an extract of, 897
Velocipedes, 183; letters, A. S. Churchill, 203; H. W. Reveley, 221; Ch. Cooke, 788
Venice, manufacture of beads at, 270
—— and Alexandria, trade between, 649
——, movement of shipping at, 826
Ventilation, paper on, Dr. Edward Smith, 233
—— —— of drains, see "drains"
Victoria, statistics of, 78, 555, 906; land in, 95; acclimatisation in, 95; railways, 106, 288, 814, 860; mining in, 118; farming prospects, 148; emigration to, 309; gold, 378; revenue of, 707, 826, 860

W

Wake, Capt. *disc.* (national army), 233, 254
Waller, Mr., *disc.* (ventilation), 240
Walpole, S., *disc.* (national army), 232; (salmon laws), 388
Ward, S., *disc.* (tea in India), 299; (trade in India, &c.), 570
Warriner, Mr. *disc.* (boiling), 373
Waste lands in India, G. Campbell, 520
Waste products, useful application of, P. L. Simmonds, 171; letter on, 185
Watches, cheap, 59, 182
Watson, Dr. Forbes, *chairman* (Indian silk), 357
Watts, Dr. *disc.* (annual conference), 634
Webster, Thos., Q.C., *disc.* (Society of Arts), 25
Weights in Germany, 117
Whale trade in Melbourne, 355
Whalley, G. H., letter on national army, 289
Wheat, treatment of with sulphate of copper, 63
White, Geo., *disc.* (technical education), 353
Whitworth scholarships, rules as to, 582; list of successful candidates, 817; particulars of the examination for, 832
—— metal, 821
—— Joseph, Albert medal presented to, 9
Williamson, T., *disc.* (tea in India), 296, 327
Wilson, J. C., *disc.* (ventilation), 239; (tea in India), 329; (India silk), 367; (theory of boiling), 401; (duties of an architect), 447; (Indian fibres), 455; (cotton in India), 664
Wine, heating, 707; duty on Spanish, 760; Madeira, 60; Cape, 61; adulteration of, 77, 94
Wingfield, Sir C., *disc.* (cotton in India), 656; remarks to the Duke of Argyll, 674
Women, technical education of, E. A. Davidson, 345
—— science instruction for (lectures at Kensington), 916
Wood pulp, bleaching of for paper, 106.
—— printing and graining from, see "xylography"
Working men's club at Mulhouse, 150
Wray, Leonard, *disc.* (tea in India), 299; paper on Indian fibres, 452
Wyatt, Sir Digby, *chairman* (duties of an architect), 440
Wyld, Dr. G., cab question, 626
Wyllie, Mr., *disc.* (trade in India, &c.), 564

X

Xylography, or printing and staining from wood, W. Dean, 154; letters on, 185, 203

Y

Yardley, Mr., *disc.* (xylography), 159
Yates, Mr., *disc.* (waste products), 178
Youl, J., *chairman* (salmon laws), 385

Z

Zurich, silk manufacture at, 106

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